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Structural Appraisal Report

18 Orchard Street, Neath

January 2021

Site name: 18 Orchard Street, Neath

Client name: Life Properties Group Limited

Type Of Report: Structural Appraisal Report

Prepared by: Iwan Griffiths BEng (Hons) ICE IStructE

Signed

Date: 7th January 2021

Revision History:

Rev.	Date	Comments
1	13/1/2021	Amendments to notes regarding visual inspection. Added comment regarding version of original structural calculations. Correction of client company name.

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1.Introduction

Grade Consulting Engineers have been appointed by Orchard Street (Neath) Ltd. to undertake a Structural Appraisal of the building at 18 Orchard Street, Neath. The purpose of this report is to give an overview of the existing structural condition of the building and comment on any works that may be required conversion into residential property with a view to making an application for Planning Permission.

This report is based on observations made during a site visit on 29th September 2020 and 5th January 2021. Observations made in this report are based on a visual appraisal of the exposed building structure visible from ground level externally and also within room spaces internally.

A copy of the original structural design calculations by Slawikowski, Blackshaw & Partners, was provided by Neath and Port Talbot County Council, in order to verify the dimensions and suitability of the structural members in-situ. We understand that the calculations provided here are the latest set of calculations made, and we believe on visual inspection of the building that the structural arrangement match that show in the calculations. The dimensions that form the basis of this report have been taken from plans provided by the client and local authority.

Core samples were taken from the concrete at the column bases at basement level and from the concrete slabs at each floor from the ground level and up, at the request of the client. No other intrusive inspections were made.

Comments may be included on non-structural elements, but these are provided for information only as they are beyond the realm of our professional expertise.

This appraisal has been prepared without prejudice and items listed at the most salient points, bearing in mind the purpose of the appraisal. It is not an exhaustive list of defects of condition. This information is provided for the sole use of the named clients and is confidential to them and their professional advisors. No responsibility to other parties is accepted.

The building is situated on Orchard Street, Neath in the town centre. The building is set back from a bend in the road in a row of commercial and residential properties. The front of the building faces east, with the building itself running east to west with the rear portion of the building orientated in a ‘dog-leg’ toward the north west. It is comprised of a basement below the ground level, and five floors including ground level. The floor area in the basement is approx. 455 m2, approx. 500 m2 on the ground and first floor levels, approx. 415m2 on the third floor and approx. 315m2 on the fourth floor.

Refer to the site plan in Appendix A for the location of the building, and Appendix B for floor plans and profile.

2 General Description

The building is a six storey steel framed structure, with the ground floor level measuring approximately a 40m long dog leg with the width varying between 9 and 14m along the length. There is a basement area beneath the ground floor level measuring approximately 34m long with the width varying between 12m and 14m along the length in the same arrangement as the upper floors. The first floor is roughly the same plan as the ground floor. The second and third floor have a slightly smaller area as the rear section of the ground floor and first floor protrudes further in this area. The fourth floor has a smaller area still as it does not extend as far as the other floors in the front of the building. The total height of the building above ground level is approximately 14m in height. The eastern aspect which is the font of the building features a protrusion from ground floor level to the third floor with a duo pitched roof with east and west pitched faces containing a pitched dormer window in the centre. There is also a protrusion at the rear of the building on the ground and first floor levels with a flat roof at second floor level.
The basement floor level is approximately 2.4m below the ground floor level.

Each floor level is made up from suspended in-situ concrete slabs, cast into steel decking.
The external walls of the building are constructed of concrete block, which have a rendered finish on the external face only.

The upper floor comprises a timber frame and the roof is clad with what appears to be slate tiles.

The construction of the building is unfinished and we understand that it has been in this state for several years. Some of the upper floor timber members are rotten and in a state of disrepair and some window openings have been left open which has exposed the inside of the building to the elements and allowed access to intruders.

Evidence of steel corrosion can be seen on the internal structural steel members in the form of iron oxide residue.

It is evident that a fire has occurred on the ground floor immediately inside the main entrance. Ash can be seen on the walls and ceiling in this area and a large volume of burned material not related to the structure remains.

3 Discussion

Steel Frame

The building comprises a steel frame construction. The network of steel beams and columns which make up the frame, remain exposed, which made a visual inspection possible.
Photographs of the steel on the upper floors were provided by the client. (APPENDIX C) . The observations made in this report are based on in-situ visual evidence and from inspecting the photographs provided.

The steel beams and columns that were inspected all appeared to be in a good state of repair. There was some iron oxide residue present on the steel members which were located close to external openings, and those members located away from the openings showed less to no evidence of iron oxide residue.

Some bolts were missing from steel connections in a few locations.

There was evidence that a fire had occurred close to the main entrance on the first floor on a mass of debris that looks to have been placed there.
There was evidence of ash on the walls and ceiling around and above the immediate location of the burned debris mass. The steel beams and columns and the steel decking for the second-floor concrete slab are exposed in this location as they are throughout the building, and the presence of ash on these structural members imply that they were directly exposed to the fire.
While there is evidence of ash on the members in the proximity of where the fire happened there is no evidence of deformation to the steel beams, columns, connections or the steel decking.

The local authority provided us with copies of the structural calculations for the building, which were done by Slowikowski, Blackshaw and Partners. (APPENDIX D)

Retaining Wall

A visual inspection of the basement retaining walls were undertaken. During the site visit, no evidence of deterioration or cracking, that indicated structural failure, could be seen.
From the original calculations it was seen that the retaining party wall in the basement had been underpinned. From a visual inspection there was no evidence to suggest that the underpinning was not adequate.

We are satisfied that the design of the retaining wall and subsequent underpinning are adequate and reflected in the supporting calculations.

Concrete Floor Slabs & Foundations

A visual inspection of the concrete floor slabs was undertaken. The slabs are of a composite construction. The structural information provided by the local authority (APPENDIX D) s tates that they are comprised of Richard Lees Holorib steel decks, with shear stud reinforcement, filled with poured fibre-reinforced concrete.
The observations in this report are made from in-situ visual inspection, photographs and film footage that were made available by the client.

The underside of the ground floor and first floor steel decks were visible, and appeared to be in good condition, with no sign of oxidization or deterioration. Ash was visible at the section of deck immediately above the location where the fire occurred.
The surface of the concrete appeared to be in good condition.

The client requested that core samples of the concrete were taken on all levels for compressive strength testing. Geo Site & Testing Services Ltd were asked to carry out the extraction of core samples and core testing. The core samples were extracted on 12th and 13th October 2020 with the testing carried out on 2nd November 2020. The test results are provided in APPENDIX E.

Core samples were taken from the concrete floor slabs at each level including two samples from the column bases in the basement. Samples were taken at the front of the building close to the main entrance, in the middle of the building near the lift shaft and at the rear of the building.
On the second floor and above, the accessibility for the core plant was restricted and samples were taken in the locations that were accessible on those floors.

The core test results in summary are as follows:

LOCATION	Front	Middle	Rear
Basement column bases	19.5 N/mm		25.6 N/mm
Ground Floor	12 N/mm2	47 N/mm2	34.6 N/mm2
First Floor	36.1 N/mm2	34.2 N/mm2	33.7 N/mm2
Second Floor	23.7 N/mm2	22.4 N/mm2	
Third Floor	13.6 N/mm2	36.7 N/mm2	
Fourth Floor		35.6 N/mm2	

The compressive strength of the concrete appears to be over 30N/mm2 in the majority of the sampled sections.
The compressive strength appears to be considerably lower at the front of the ground floor, the second floor and front of the third floor, being 12 N/mm2, 23.7 N/mm2, 22.4 N/mm2 and 13.6 N/mm2 respectively.

In correspondence received from the local authority building control department (APPENDIX F), it was communicated that some sections of concrete flooring were poured using incorrect reinforcement fibre. This could have an effect on the structural integrity of the composite slab, and the composite beams. The implications could be the reduced crack-control of the concrete over the supports, an effect on the interaction between the concrete and the shear studs in the steel decks and reduce fire resistance of the concrete.
Further specific details have been requested from the local authority building control, to identify the

which incorrect fibres have been used, and where. These details have not yet been provided.

Upper Level Timber Members

Numerous primary and secondary structural timber elements are showing signs of water damage and possible wet rot.

4 Conclusion

The structural condition of the steel frame of the building at 18 Orchard Street shows minimal signs of deterioration over time, and negligible signs of fire damage.

The Steel Construction Institiute [1] state the following regarding the exposure of grade S275 steel to fire.

“

Behaviour of BS EN 10025 grade S275 steel

A grade S275, hot rolled structural steel section, subjected to fire conditions which causes its temperature to rise above 600°C, may suffer some deterioration in residual properties on cooling. In no situation however, irrespective of the fire temperature, will the room temperature yield stress or the tensile strength fall further than 10% below their original values. Thus, where it can be safely concluded that the steel members will be utilised to less than 90% of their maximum load bearing capacity or that any loss in strength will not bring the properties below the guaranteed minimum, replacement should not be considered necessary providing the member satisfies all other engineering requirements (e.g. straightness).

Connections and foundations

The tensile strength reduction for grade 4.6 bolts is similar to that for grade S275 steel. For grade 8.8 bolts, which are heat treated in manufacture, the residual strength reduction is more marked if the material temperature has exceeded 450°C. The residual strength of these bolts falls to 80% and 60% after reaching temperatures of 600°C and 800°C respectively. To err on the side of caution it is recommended that bolts should be replaced if they show any sign of having been heated e.g. blistered paint, smooth grey scaled surface.
Contraction of heated members after the fire can cause distortion of connections. When carrying out an inspection of a fire damaged building it is recommended that special care is taken in inspecting the connections for cracking of welds, end plate damage, bolt failure etc. A number of bolts should be removed to inspect for distortion. Similar care should be taken when inspecting foundations for bolt failure, concrete cracking etc.
”

We could see no signs of deformation in the structural members. We recommend as per the advice from the Steel Construction Institute that a number of bolts in the affected area are removed and inspected for distortion.

In light of no visible deformation of structural members and in anticipation that there is no deformation evident in the bolts we are satisfied that the steel structure remains stable.

Bolts should be replaced, where they are currently missing.

Rotten timbers should be removed and replaced in accordance with building regulations. Further structural analysis to ascertain replacement timber members may be required if deemed necessary by building control.

The concrete decks appear to be in good condition and the core tests show that they would be capable of withstanding any compressive stresses placed on them by domestic use, provided they are covered with

a protective screed.

The main concern regarding the building is the fact that the local authority highlighted incorrect fibres have been used in the concrete for the composite floor decks. As discussed in the previous section this could have an effect on the structural integrity and fire resistance properties of the affected slabs.

We insist that specific information regarding the incorrect fibres should be requested from relevant parties, to identify the affected slabs, and the details of the incorrect fibres used in these locations are known. This information should be communicated to the composite deck manufacturers, Richard Lees so that they can verify whether the decks in place are adequate given the incorrect fibres, and if not, they should be asked to suggest a strengthening solution that also satisfies fire resistance for the affected decks.

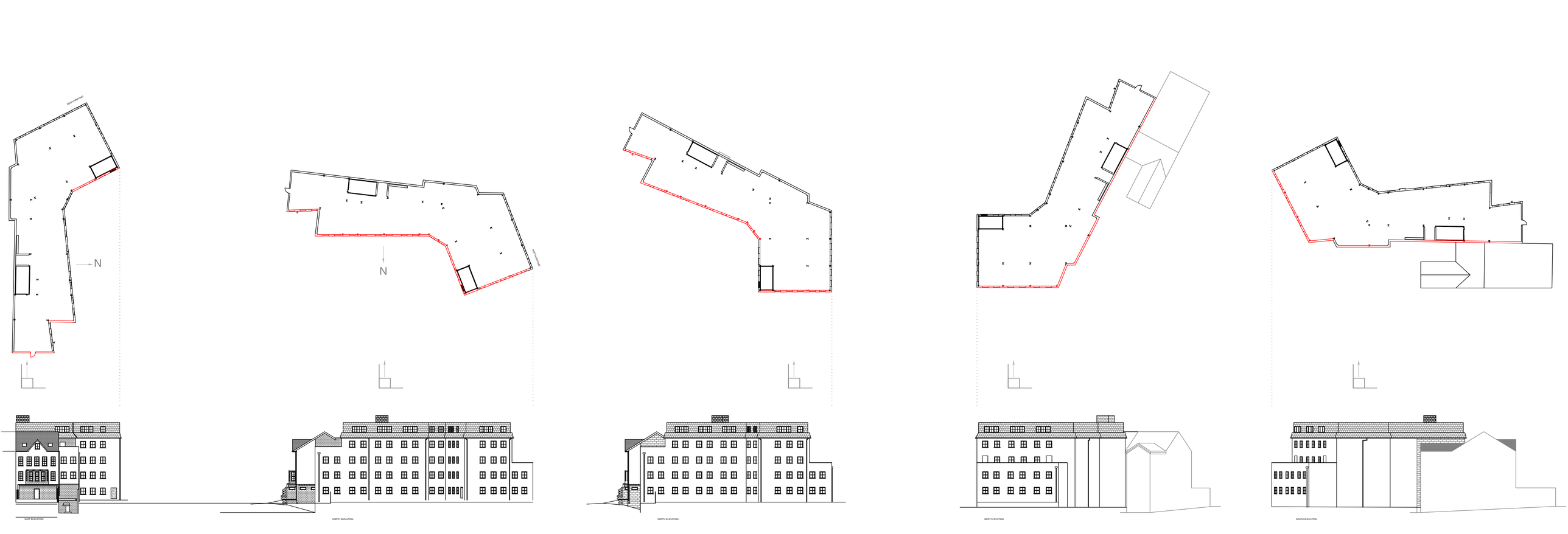
[1]
https://www.steelconstruction.info/Fire_damage_assessment_of_hot_rolled_structural_steelwork

APPENDIX A

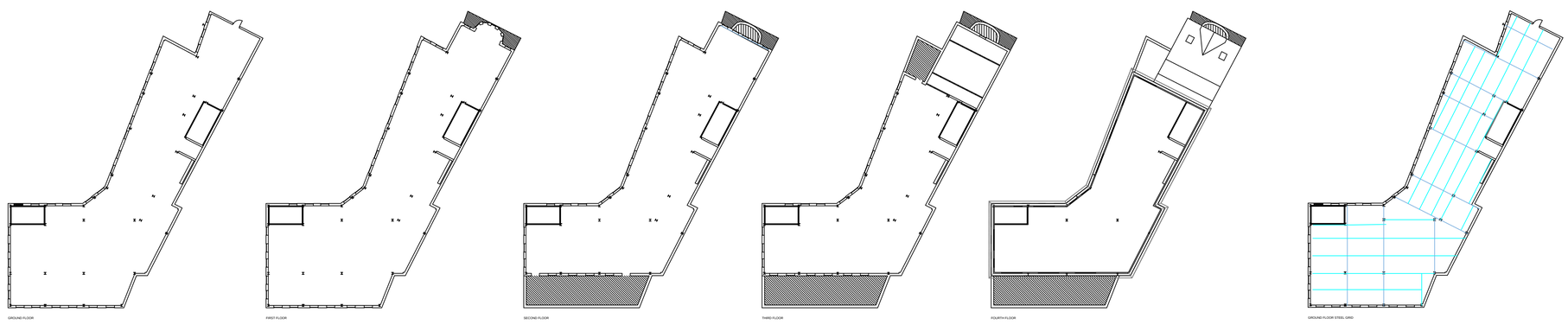
18 Orchard Street, Neath

Map area bounded by: 275264,197431 275406,197573. Produced on 08 January 2021 from the OS National Geographic Database. Reproduction in whole or part is prohibited without the prior permission of Ordnance Survey. © Crown copyright 2021. Supplied by UKPlanningMaps.com a licensed OS partner (100054135). Unique plan reference: p2cuk/555810/752745

APPENDIX B

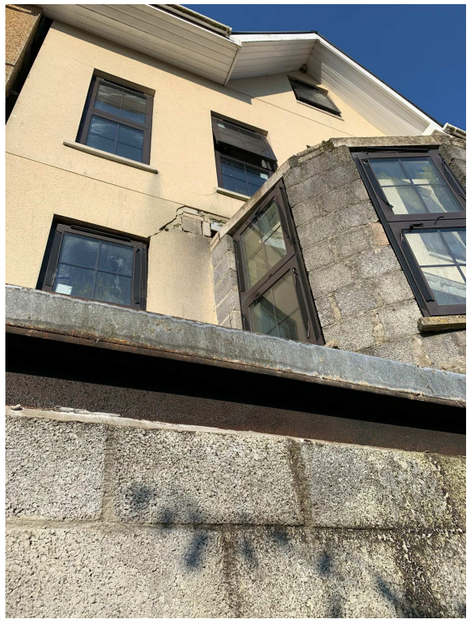

N
N
N
EAST ELEVATION
NORTH ELEVATION
NORTH ELEVATION
WEST ELEVATION
SOUTH ELEVATION

NORTH ELEVATION floor levels
NORTH ELEVATION floor levels
WEST ELEVATION floor levels
SOUTH ELEVATION floor levels


GROUND FLOOR
FIRST FLOOR
SECOND FLOOR
THIRD FLOOR
FOURTH FLOOR
GROUND FLOOR STEEL GRID

APPENDIX C

Revisions



Notes

Do not scale from this drawing. Use figured dimensions only, which are displayed in millimeters unless stated otherwise. The contractor is requested to check all dimensions before work is put in hand. Any discrepancies within the drawing should be reported prior to commencement of works.

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Project	18 ORCHARD ST, NEATH
Project number	N216
Client	CROMPTON LAND & DEVELOPMENTS
Title	EXISTING PHOTOS
Drawing number	A106
Scale	at A3
Revision	
Status	INFORMATION
Drawn	PC
Date	07.11.20

APPENDIX D

REVISED STRUCTURAL CALCULATIONS FOR SUPERSTRUCTURE (PAGES 200-399)

PROPOSED OFFICE DEVELOPMENT AT 18 ORCHARD STREET NEATH

PART II

THOMAS PARRY DESIGN PARTNERSHIP
THE OLD SKETTY COACH HOUSE
GOWER ROAD
SWANSEA

STRUCTURAL ENGINEERS
SLOWIKOWSKI, BLACKSHAW AND PARTNERS

The Maltings, East Tyndall Street
Cardiff Bay, Cardiff CF24 5EA
Tel : 029 2045 1331 Fax : 029 2045 1344

PROJECT NO: GOA/A/1511

JULY 2007

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Vibration Analysis

Beam Deflection		0.02 mm	
Natural Frequency	18/√(0.02) = 143.39 > 4 Hz	143.39 Hz	OK

UNPROPPED NON-COMPOSITE SECONDARY INTERNAL BEAM
Member 644 (N.379-N.381) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	3.592 m Span, 1.04 m to LH Beam and 2.74 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 52.26 kN, RH Support 52.69 kN	< 218.38 kN	OK
Check @ 1.815 m (Max. Moment)	M = 47.12 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 17.92 kN, RH Support 18.06 kN	< 218.38 kN	OK
Check @ 1.815 m (Max. Moment)	M = 16.16 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 20.54 kN, RH Support 20.71 kN		
Super Imposed Dead Load	LH Support 3.01 kN, RH Support 3.04 kN		
Dead Load (Self Weight)	LH Support 10.85 kN, RH Support 10.93 kN		
Maximum Deflection			
Live Loads	4.19 (4.19) mm @ 1.815 m < L / 360 = 9.9 mm	4.19 mm	OK
Super Imposed Dead Loads	0.61 mm @ 1.815 m	0.61 mm	
Dead Loads (Self Weight)	2.21 mm @ 1.815 m	2.21 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 66.1, Super Dead 9.7, SW 34.9 < 275	110.72 N/mm²	OK
TOTAL (Compression)	Live 66.1, Super Dead 9.7, SW 34.9 < 275	110.72 N/mm²	OK

Vibration Analysis

Beam Deflection		3.24 mm	
Natural Frequency	18/√(3.24) = 9.99 > 4 Hz	9.99 Hz	OK

UNPROPPED NON-COMPOSITE SECONDARY INTERNAL BEAM
Member 647 (N.382-N.424) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	3.293 m Span, 1.343 m to LH Beam and 1.266 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick

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Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m		
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame		

Section Properties

Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³		

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 52.6 kN, RH Support 56.05 kN	< 218.38 kN	OK
Check @ 1.663 m (Max. Moment)	M = 44.73 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 17.99 kN, RH Support 19.14 kN	< 218.38 kN	OK
Check @ 1.663 m (Max. Moment)	M = 15.29 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 20.7 kN, RH Support 22.07 kN		
Super Imposed Dead Load	LH Support 3.04 kN, RH Support 3.24 kN		
Dead Load (Self Weight)	LH Support 10.88 kN, RH Support 11.57 kN		
Maximum Deflection			
Live Loads	3.35 (3.35) mm @ 1.663 m < L / 360 = 9.1 mm	3.35 mm	OK
Super Imposed Dead Loads	0.49 mm @ 1.663 m	0.49 mm	
Dead Loads (Self Weight)	1.76 mm @ 1.663 m	1.76 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 62.9, Super Dead 9.2, SW 33 < 275	105.08 N/mm²	OK
TOTAL (Compression)	Live 62.9, Super Dead 9.2, SW 33 < 275	105.08 N/mm²	OK

Vibration Analysis

Beam Deflection		2.58 mm	
Natural Frequency	18/√(2.58) = 11.2 > 4 Hz	11.20 Hz	OK

UNPROPPED NON-COMPOSITE SECONDARY INTERNAL BEAM
Member 649 (N.385-N.388) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	2.81 m Span, 2.285 m to LH Beam and 1.865 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	44.46 kN each side	< 218.38 kN	OK
Check @ 1.405 m (Max. Moment)	M = 31.23 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	15.21 kN each side	< 218.38 kN	OK

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Check @ 1.405 m (Max. Moment)	M = 10.69 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	17.49 kN each side		
Super Imposed Dead Load	2.57 kN each side		
Dead Load (Self Weight)	9.2 kN each side		
Maximum Deflection			
Live Loads	1.70 (1.70) mm @ 1.405 m < L / 360 = 7.8 mm	1.70 mm	OK
Super Imposed Dead Loads	0.25 mm @ 1.405 m	0.25 mm	
Dead Loads (Self Weight)	0.89 mm @ 1.405 m	0.89 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 43.9, Super Dead 6.4, SW 23.1 < 275	73.38 N/mm²	OK
TOTAL (Compression)	Live 43.9, Super Dead 6.4, SW 23.1 < 275	73.38 N/mm²	OK

Vibration Analysis

Beam Deflection		1.31 mm	
Natural Frequency	18/√(1.31) = 15.71 > 4 Hz	15.71 Hz	OK

UNPROPPED NON-COMPOSITE SECONDARY INTERNAL BEAM
Member 650 (E12-E10) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	2.81 m Span, 1.865 m to LH Beam and 2.173 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	43.28 kN each side	< 218.38 kN	OK
Check @ 1.405 m (Max. Moment)	M = 30.4 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	14.82 kN each side	< 218.38 kN	OK
Check @ 1.405 m (Max. Moment)	M = 10.41 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	17.02 kN each side		
Super Imposed Dead Load	2.5 kN each side		
Dead Load (Self Weight)	8.96 kN each side		
Maximum Deflection			
Live Loads	1.66 (1.66) mm @ 1.405 m < L / 360 = 7.8 mm	1.66 mm	OK
Super Imposed Dead Loads	0.24 mm @ 1.405 m	0.24 mm	
Dead Loads (Self Weight)	0.87 mm @ 1.405 m	0.87 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 42.7, Super Dead 6.3, SW 22.5 < 275	71.43 N/mm²	OK

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TOTAL (Compression)	Live 42.7, Super Dead 6.3, SW 22.5 < 275	71.43 N/mm²	OK

Vibration Analysis

Beam Deflection		1.28 mm	
Natural Frequency	18/√(1.28) = 15.91 > 4 Hz	15.91 Hz	OK

UNPROPPED NON-COMPOSITE SECONDARY INTERNAL BEAM
Member 652 (N.389-N.400) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	2.81 m Span, 2.173 m to LH Beam and 1.973 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 44.47 kN, RH Support 44.52 kN	< 218.38 kN	OK
Check @ 1.419 m (Max. Moment)	M = 31.25 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 15.22 kN, RH Support 15.23 kN	< 218.38 kN	OK
Check @ 1.419 m (Max. Moment)	M = 10.69 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 17.5 kN, RH Support 17.51 kN		
Super Imposed Dead Load	2.57 kN each side		
Dead Load (Self Weight)	9.2 kN each side		
Maximum Deflection			
Live Loads	1.70 (1.70) mm @ 1.419 m < L / 360 = 7.8 mm	1.70 mm	OK
Super Imposed Dead Loads	0.25 mm @ 1.419 m	0.25 mm	
Dead Loads (Self Weight)	0.90 mm @ 1.419 m	0.90 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 43.9, Super Dead 6.4, SW 23.1 < 275	73.43 N/mm²	OK
TOTAL (Compression)	Live 43.9, Super Dead 6.4, SW 23.1 < 275	73.43 N/mm²	OK

Vibration Analysis

Beam Deflection		1.32 mm	
Natural Frequency	18/√(1.32) = 15.69 > 4 Hz	15.69 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 654 (N.391-D9) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (86 kg/m)	203x203 UC 86 [S 275]
Floor Area Supported	4.795 m Span, 2.74 m to LH Beam and 1.865 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed @ 275 mm centres

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IMPORTANT: Beam Loads — All internal forces and deflection values are obtained directly from MasterFrame

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 6.94 kN, RH Support 5.87 kN		
Super Imposed Dead Load	LH Support 7.7 kN, RH Support 7.54 kN		
Dead Load (Self Weight)	LH Support 3.79 kN, RH Support 3.25 kN		
Maximum Deflection			
Live Loads	0.40 (0.40) mm @ 1.017 m < L / 360 = 5.7 mm	0.40 mm	OK
Super Imposed Dead Loads	0.48 mm @ 1.017 m	0.48 mm	
Dead Loads (Self Weight)	0.22 mm @ 1.017 m	0.22 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 14.8, Super Dead 17.6, SW 8.2 < 275	40.66 N/mm²	OK
TOTAL (Compression)	Live 14.8, Super Dead 17.6, SW 8.2 < 275	40.66 N/mm²	OK

Vibration Analysis

Beam Deflection		0.74 mm	
Natural Frequency	18/√(0.74) = 20.92 > 4 Hz	20.92 Hz	OK

UNPROPPED COMPOSITE SECONDARY EDGE BEAM
Member 628 (B9-N.379) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (86 kg/m)	203x203 UC 86 [S 275]
Floor Area Supported	6.705 m Span and 2.74 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+193 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 943 mm², b1= 838 mm and b2= 105 mm	Steel Section
Elastic Properties	ye 111.1 mm, A 109.6 cm², Ix 9452 cm⁴, Zt 851 cm³, Zb 851 cm³	Composite
Section Elastic Properties	ye 159.6 mm, Ix 27863 cm⁴, Zs.t 9429 cm³, Zs.b 1446 cm³, Zc.t 17463 cm³	

Section Properties

Concrete Effective Area	79 x 1199 mm², b1= 599 mm and b2= 599 mm
Steel Section Elastic Properties	ye 111.1 mm, A 109.6 cm², Ix 9452 cm⁴, Zt 851 cm³, Zb 851 cm³
Composite Section Elastic Properties	ye 147.7 mm, Ix 30595 cm⁴, Zs.t 17320 cm³, Zs.b 1496 cm³, Zc.t 20719 cm³
Headed Stud Connector	17 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 86.76 kN, RH Support 86.36 kN	< 448.69 kN	OK
Check @ 2.373 m (Max. Moment)	M = 103.76 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 8 < 19.5	Partial	
Axial Resistance (kN)	Rc 1704.62 kN, Rs 2905.2 kN, Rq 697.6 kN	697.6 kN	
Degree of Shear Connection	Na/Np = 8 / 19.5 > 0.4	0.409	OK
Reduced Concrete Area	Area required to resist 697.6 kN	32.3x1198.8mm²	
Moment Capacity	Plastic neutral axis in top flange @ 149.7 mm	378.05 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 275 mm	3.64 per m
Vp = fn(N.4.D.tp.pyp)	Min(3.64x4x19,1000)x1.0x350	96.73 kN

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Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 96.73	314.67 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.64x87.2x0.6/(0.6+0.6)	158.55 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 30.84 kN, RH Support 30.71 kN	< 448.69 kN	OK
Check @ 2.373 m (Max. Moment)	M = 36.89 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 33.44 kN, RH Support 33.28 kN		
Super Imposed Dead Load	LH Support 4.91 kN, RH Support 4.88 kN		
Dead Load (Self Weight)	LH Support 18.85 kN, RH Support 18.77 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	1.53 (2.13) mm @ 2.373 m < L / 360 = 13.3 mm	2.13 mm	OK
Super Imposed Dead Loads	0.22 (0.31) mm @ 2.373 m	0.31 mm	
Dead Loads (Self Weight)	2.79 mm @ 2.373 m	2.79 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 26.7, Super Dead 3.9, SW 26.5 < 265	57.16 N/mm²	OK
TOTAL (Compression)	Live 2.3, Super Dead 0.3, SW 26.5 < 265	29.15 N/mm²	OK
Maximum Concrete Stress	Live 1.93, Super Dead 0.28, SW 0 < 20	2.21 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	1.39 mm	
Natural Frequency	18/√(1.39/1.1) = 16.03 > 4 Hz	16.03 Hz	OK

Headed Stud Connector	22 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2		
Ultimate Limit State (Final Stage)			
Maximum Shear			
Support Reactions (kN)	103.66 kN each side	< 448.69 kN	OK
Check @ 3.353 m (Max. Moment)	M = 173.76 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 11 < 15.4	Partial	
Axial Resistance (kN)	Rc 1340.48 kN, Rs 2905.2 kN, Rq 959.2 kN	959.2 kN	
Degree of Shear Connection	Na/Np = 11 / 15.4 > 0.4	0.716	OK
Reduced Concrete Area	Area required to resist 959.2 kN	56.5x942.7mm²	
Moment Capacity	Plastic neutral axis in top flange @ 147.3 mm	401.07 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	445, 460, 114000, 40, 87.5	367.59 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.84/(0.84+0.1)	255.03 kN	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 656 (D9-D8) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (60 kg/m)	203x203 UC 60 [S 275]
Floor Area Supported	6.705 m Span, 2.74 m to LH Beam and 1.568 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1622 mm², b1= 838 mm and b2= 784 mm
Steel Section Elastic Properties	ye 104.8 mm, A 76.4 cm², Ix 6127 cm⁴, Zt 585 cm³, Zb 585 cm³

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Composite Section Elastic Properties	ye 112.4 mm, Ix 25046 cm^4, Zs.t 14368 cm^3, Zs.b 1111 cm^3, Zc.t 22457 cm^3		
Headed Stud Connector	22 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2		

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 116.47 kN, RH Support 113.98 kN	< 325.09 kN	OK
Check @ 3.318 m (Max. Moment)	M = 193.15 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 10 < 24.1	Partial	
Axial Resistance (kN)	Rc 2306.66 kN, Rs 2100.18 kN, Rq 872 kN	872 kN	
Degree of Shear Connection	Na/Np = 10 / 24.1 > 0.4	0.415	OK
Reduced Concrete Area	Area required to resist 872 kN	29.9x1622.1mm^2	
Moment Capacity	Plastic neutral axis in top flange @ 140.6 mm	311.47 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.84/(0.84+0.78)	148.21 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 40.7 kN, RH Support 39.86 kN	< 325.09 kN	OK
Check @ 3.318 m (Max. Moment)	M = 67.52 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 104.8 mm	180.43 kN.m	OK

UNPROPPED NON-COMPOSITE SECONDARY EDGE BEAM
Member 658 (K12-K10) @ Level 5

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 38.16 kN, RH Support 36.88 kN	< 448.69 kN	OK
Check @ 1.401 m (Max. Moment)	M = 26.56 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 9.56 kN, RH Support 9.14 kN	< 448.69 kN	OK
Check @ 1.401 m (Max. Moment)	M = 6.62 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 9.4 kN, RH Support 8.89 kN		
Super Imposed Dead Load	LH Support 10.58 kN, RH Support 10.51 kN		
Dead Load (Self Weight)	LH Support 5.94 kN, RH Support 5.68 kN		
Maximum Deflection			
Live Loads	0.28 (0.28) mm @ 1.401 m < L / 360 = 7.8 mm	0.28 mm	OK
Super Imposed Dead Loads	0.32 mm @ 1.401 m	0.32 mm	
Dead Loads (Self Weight)	0.18 mm @ 1.401 m	0.18 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 7.6, Super Dead 8.8, SW 4.8 < 265	21.22 N/mm^2	OK
TOTAL (Compression)	Live 7.6, Super Dead 8.8, SW 4.8 < 265	21.22 N/mm^2	OK

Vibration Analysis

Beam Deflection		0.53 mm	
Natural Frequency	18/√(0.53) = 24.79 > 4 Hz	24.79 Hz	OK

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UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 659 (N.397-N.401) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	4.795 m Span, 1.865 m to LH Beam and 1.651 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1199 mm², b1= 599 mm and b2= 599 mm
Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³
Composite Section Elastic Properties	ye 95.2 mm, Ix 13625 cm⁴, Zs.t 3925 cm³, Zs.b 565 cm³, Zc.t 14323 cm³
Headed Stud Connector	15 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 65.18 kN, RH Support 64.8 kN	< 218.38 kN	OK
Check @ 2.373 m (Max. Moment)	M = 77.91 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 7 < 12.1	Partial	
Axial Resistance (kN)	Rc 1704.62 kN, Rs 1050.78 kN, Rq 610.4 kN	610.4 kN	
Degree of Shear Connection	Na/Np = 7 / 12.1 > 0.4	0.581	OK
Reduced Concrete Area	Area required to resist 610.4 kN	28.3x1198.8mm²	
Moment Capacity	Plastic neutral axis in top flange @ 135.8 mm	176.72 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.6/(0.6+0.6)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 22.4 kN, RH Support 22.27 kN	< 218.38 kN	OK
Check @ 2.373 m (Max. Moment)	M = 26.78 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 25.59 kN, RH Support 25.43 kN		
Super Imposed Dead Load	LH Support 3.75 kN, RH Support 3.73 kN		
Dead Load (Self Weight)	LH Support 13.56 kN, RH Support 13.49 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	2.62 (3.84) mm @ 2.373 m < L / 360 = 13.3 mm	3.84 mm	OK
Super Imposed Dead Loads	0.38 (0.56) mm @ 2.373 m	0.56 mm	
Dead Loads (Self Weight)	6.54 mm @ 2.373 m	6.54 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 54.2, Super Dead 7.9, SW 57.9 < 275	119.98 N/mm²	OK
TOTAL (Compression)	Live 7.8, Super Dead 1.1, SW 57.9 < 275	66.82 N/mm²	OK
Maximum Concrete Stress	Live 2.14, Super Dead 0.31, SW 0 < 20	2.45 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	2.34 mm	
Natural Frequency	18/√(2.34/1.1) = 12.35 > 4 Hz	12.35 Hz	OK

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UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 660 (D8-D4) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	3.593 m Span, 2.739 m to LH Beam and 1.567 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 898 mm², b1= 449 mm and b2= 449 mm
Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³
Composite Section Elastic Properties	ye 107.4 mm, Ix 12603 cm⁴, Zs.t 5598 cm³, Zs.b 552 cm³, Zc.t 11803 cm³
Headed Stud Connector	11 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 59.4 kN, RH Support 59.82 kN	< 218.38 kN	OK
Check @ 1.815 m (Max. Moment)	M = 53.54 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 5 < 12.1	Partial	
Axial Resistance (kN)	Rc 1277.31 kN, Rs 1050.78 kN, Rq 436 kN	436 kN	
Degree of Shear Connection	Na/Np = 5 / 12.1 > 0.4	0.415	OK
Reduced Concrete Area	Area required to resist 436 kN	27x898.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 138.2 mm	155.59 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.45/(0.45+0.45)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 20.3 kN, RH Support 20.44 kN	< 218.38 kN	OK
Check @ 1.815 m (Max. Moment)	M = 18.3 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 23.38 kN, RH Support 23.55 kN		
Super Imposed Dead Load	LH Support 3.43 kN, RH Support 3.46 kN		
Dead Load (Self Weight)	LH Support 12.27 kN, RH Support 12.36 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	1.10 (1.74) mm @ 1.815 m < L / 360 = 9.9 mm	1.74 mm	OK
Super Imposed Dead Loads	0.16 (0.26) mm @ 1.815 m	0.26 mm	
Dead Loads (Self Weight)	2.50 mm @ 1.815 m	2.50 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 38.2, Super Dead 5.6, SW 39.5 < 275	83.26 N/mm²	OK
TOTAL (Compression)	Live 3.8, Super Dead 0.6, SW 39.5 < 275	43.82 N/mm²	OK
Maximum Concrete Stress	Live 1.79, Super Dead 0.26, SW 0 < 20	2.05 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	1.01 mm	
Natural Frequency	18/√(1.01/1.1) = 18.82 > 4 Hz	18.82 Hz	OK

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UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 661 (N.400-N.404) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	4.795 m Span, 1.651 m to LH Beam and 1.987 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1199 mm², b1= 599 mm and b2= 599 mm
Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³
Composite Section Elastic Properties	ye 95.2 mm, Ix 13625 cm⁴, Zs.t 3925 cm³, Zs.b 565 cm³, Zc.t 14323 cm³
Headed Stud Connector	15 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	66.63 kN each side	< 218.38 kN	OK
Check @ 2.398 m (Max. Moment)	M = 79.88 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 7 < 12.1	Partial	
Axial Resistance (kN)	Rc 1704.62 kN, Rs 1050.78 kN, Rq 610.4 kN	610.4 kN	
Degree of Shear Connection	Na/Np = 7 / 12.1 > 0.4	0.581	OK
Reduced Concrete Area	Area required to resist 610.4 kN	28.3x1198.8mm²	
Moment Capacity	Plastic neutral axis in top flange @ 135.8 mm	176.72 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.6/(0.6+0.6)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	22.88 kN each side	< 218.38 kN	OK
Check @ 2.398 m (Max. Moment)	M = 27.43 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	26.17 kN each side		
Super Imposed Dead Load	3.84 kN each side		
Dead Load (Self Weight)	13.85 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	2.69 (3.94) mm @ 2.398 m < L / 360 = 13.3 mm	3.94 mm	OK
Super Imposed Dead Loads	0.39 (0.58) mm @ 2.398 m	0.58 mm	
Dead Loads (Self Weight)	6.70 mm @ 2.398 m	6.70 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 55.5, Super Dead 8.1, SW 59.3 < 275	122.97 N/mm²	OK
TOTAL (Compression)	Live 8, Super Dead 1.2, SW 59.3 < 275	68.45 N/mm²	OK
Maximum Concrete Stress	Live 2.19, Super Dead 0.32, SW 0 < 20	2.51 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	2.4 mm	
Natural Frequency	18/√(2.40/1.1) = 12.2 > 4 Hz	12.20 Hz	OK

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UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 662 (N.401-N.405) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	6.712 m Span, 1.566 m to LH Beam and 1.565 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1566 mm², b1= 783 mm and b2= 783 mm
Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³
Composite Section Elastic Properties	ye 85.3 mm, Ix 14515 cm⁴, Zs.t 3245 cm³, Zs.b 577 cm³, Zc.t 17024 cm³
Headed Stud Connector	22 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 86.89 kN, RH Support 83.67 kN	< 218.38 kN	OK
Check @ 3.356 m (Max. Moment)	M = 143.1 kN.m, Fv = 0.8 kN		
Shear Connection	No of shear connectors from nearest support 11 < 12.1	Partial	
Axial Resistance (kN)	Rc 2226.14 kN, Rs 1050.78 kN, Rq 959.2 kN	959.2 kN	
Degree of Shear Connection	Na/Np = 11 / 12.1 > 0.4	0.913	OK
Reduced Concrete Area	Area required to resist 959.2 kN	34x1565.5mm²	
Moment Capacity	Plastic neutral axis in top flange @ 131.1 mm	215.57 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.78/(0.78+0.78)	143.47 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 29.9 kN, RH Support 28.83 kN	< 218.38 kN	OK
Check @ 3.356 m (Max. Moment)	M = 49.27 kN.m, Fv = 0.27 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 34.08 kN, RH Support 32.8 kN		
Super Imposed Dead Load	LH Support 5 kN, RH Support 4.81 kN		
Dead Load (Self Weight)	LH Support 18.11 kN, RH Support 17.47 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	8.85 (10.66) mm @ 3.356 m < L / 360 = 18.6 mm	10.66 mm	OK
Super Imposed Dead Loads	1.30 (1.56) mm @ 3.356 m	1.56 mm	
Dead Loads (Self Weight)	23.58 mm @ 3.356 m	23.58 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 97.2, Super Dead 14.3, SW 106.6 < 275	218.07 N/mm²	OK
TOTAL (Compression)	Live 17.3, Super Dead 2.5, SW 106.6 < 275	126.40 N/mm²	OK
Maximum Concrete Stress	Live 3.3, Super Dead 0.48, SW 0 < 20	3.78 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	7.34 mm	
Natural Frequency	18/√(7.34/1.1) = 6.97 > 4 Hz	6.97 Hz	OK

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UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 663 (N.403-N.409) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	4.795 m Span, 1.987 m to LH Beam and 1.529 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1199 mm², b1= 599 mm and b2= 599 mm
Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³
Composite Section Elastic Properties	ye 95.2 mm, Ix 13625 cm⁴, Zs.t 3925 cm³, Zs.b 565 cm³, Zc.t 14323 cm³
Headed Stud Connector	15 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 69.93 kN, RH Support 67.18 kN	< 218.38 kN	OK
Check @ 2.373 m (Max. Moment)	M = 82.2 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 7 < 12.1	Partial	
Axial Resistance (kN)	Rc 1704.62 kN, Rs 1050.78 kN, Rq 610.4 kN	610.4 kN	
Degree of Shear Connection	Na/Np = 7 / 12.1 > 0.4	0.581	OK
Reduced Concrete Area	Area required to resist 610.4 kN	28.3x1198.8mm²	
Moment Capacity	Plastic neutral axis in top flange @ 135.8 mm	176.72 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.6/(0.6+0.6)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 23.98 kN, RH Support 23.06 kN	< 218.38 kN	OK
Check @ 2.373 m (Max. Moment)	M = 28.2 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 27.48 kN, RH Support 26.38 kN		
Super Imposed Dead Load	LH Support 4.03 kN, RH Support 3.87 kN		
Dead Load (Self Weight)	LH Support 14.51 kN, RH Support 13.96 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	2.77 (4.06) mm @ 2.373 m < L / 360 = 13.3 mm	4.06 mm	OK
Super Imposed Dead Loads	0.41 (0.59) mm @ 2.373 m	0.59 mm	
Dead Loads (Self Weight)	6.88 mm @ 2.373 m	6.88 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 57.2, Super Dead 8.4, SW 60.9 < 275	126.51 N/mm²	OK
TOTAL (Compression)	Live 8.2, Super Dead 1.2, SW 60.9 < 275	70.37 N/mm²	OK
Maximum Concrete Stress	Live 2.25, Super Dead 0.33, SW 0 < 20	2.59 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	2.46 mm	
Natural Frequency	18/√(2.46/1.1) = 12.03 > 4 Hz	12.03 Hz	OK

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UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 664 (N.404-N.410) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	6.716 m Span, 1.564 m to LH Beam and 1.984 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1622 mm², b1= 782 mm and b2= 840 mm
Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³
Composite Section Elastic Properties	ye 84 mm, Ix 14628 cm⁴, Zs.t 3184 cm³, Zs.b 579 cm³, Zc.t 17405 cm³
Headed Stud Connector	22 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 92.47 kN, RH Support 91.76 kN	< 218.38 kN	OK
Check @ 3.323 m (Max. Moment)	M = 154.64 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 10 < 12.1	Partial	
Axial Resistance (kN)	Rc 2305.77 kN, Rs 1050.78 kN, Rq 872 kN	872 kN	
Degree of Shear Connection	Na/Np = 10 / 12.1 > 0.4	0.83	OK
Reduced Concrete Area	Area required to resist 872 kN	29.9x1621.5mm²	
Moment Capacity	Plastic neutral axis in top flange @ 132.2 mm	207.39 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.84/(0.78+0.84)	148.51 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 31.76 kN, RH Support 31.53 kN	< 218.38 kN	OK
Check @ 3.323 m (Max. Moment)	M = 53.13 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 36.31 kN, RH Support 36.02 kN		
Super Imposed Dead Load	LH Support 5.33 kN, RH Support 5.28 kN		
Dead Load (Self Weight)	LH Support 19.23 kN, RH Support 19.09 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	9.51 (11.48) mm @ 3.323 m < L / 360 = 18.6 mm	11.48 mm	OK
Super Imposed Dead Loads	1.39 (1.68) mm @ 3.323 m	1.68 mm	
Dead Loads (Self Weight)	25.44 mm @ 3.323 m	25.44 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 104.9, Super Dead 15.4, SW 114.8 < 275	235.12 N/mm²	OK
TOTAL (Compression)	Live 19.1, Super Dead 2.8, SW 114.8 < 275	136.70 N/mm²	OK
Maximum Concrete Stress	Live 3.49, Super Dead 0.51, SW 0 < 20	4.00 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	7.87 mm	
Natural Frequency	18/√(7.87/1.1) = 6.73 > 4 Hz	6.73 Hz	OK

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UNPROPPED NON-COMPOSITE SECONDARY INTERNAL BEAM
Member 665 (N.405-N.411) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	3.593 m Span, 1.567 m to LH Beam and 1.566 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	43.11 kN each side	< 218.38 kN	OK
Check @ 1.797 m (Max. Moment)	M = 38.73 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	14.88 kN each side	< 218.38 kN	OK
Check @ 1.797 m (Max. Moment)	M = 13.36 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	16.89 kN each side		
Super Imposed Dead Load	2.48 kN each side		
Dead Load (Self Weight)	9.02 kN each side		
Maximum Deflection			
Live Loads	3.44 (3.44) mm @ 1.797 m < L / 360 = 9.9 mm	3.44 mm	OK
Super Imposed Dead Loads	0.50 mm @ 1.797 m	0.50 mm	
Dead Loads (Self Weight)	1.84 mm @ 1.797 m	1.84 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 54.2, Super Dead 7.9, SW 28.9 < 275	91.03 N/mm²	OK
TOTAL (Compression)	Live 54.2, Super Dead 7.9, SW 28.9 < 275	91.03 N/mm²	OK

Vibration Analysis

Beam Deflection		2.68 mm	
Natural Frequency	18/√(2.68) = 10.99 > 4 Hz	10.99 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 668 (N.409-N.414) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	6.716 m Span, 1.984 m to LH Beam and 1.146 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m

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Headed Stud Connector	19x95 mm Placed One per Alternate Trough		
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame		

Section Properties

Concrete Effective Area	79 x 1413 mm², b1= 840 mm and b2= 573 mm		
Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³		
Composite Section Elastic Properties	ye 89 mm, Ix 14178 cm⁴, Zs.t 3456 cm³, Zs.b 572 cm³, Zc.t 15943 cm³		
Headed Stud Connector	22 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2		

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 86.89 kN, RH Support 83.69 kN	< 218.38 kN	OK
Check @ 3.323 m (Max. Moment)	M = 143.21 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 10 < 12.1	Partial	
Axial Resistance (kN)	Rc 2008.58 kN, Rs 1050.78 kN, Rq 872 kN	872 kN	
Degree of Shear Connection	Na/Np = 10 / 12.1 > 0.4	0.83	OK
Reduced Concrete Area	Area required to resist 872 kN	34.3x1412.5mm²	
Moment Capacity	Plastic neutral axis in top flange @ 132.2 mm	205.46 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.84/(0.84+0.57)	170.48 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 29.91 kN, RH Support 28.84 kN	< 218.38 kN	OK
Check @ 3.323 m (Max. Moment)	M = 49.32 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 34.08 kN, RH Support 32.81 kN		
Super Imposed Dead Load	LH Support 5 kN, RH Support 4.81 kN		
Dead Load (Self Weight)	LH Support 18.11 kN, RH Support 17.47 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	9.07 (10.88) mm @ 3.323 m < L / 360 = 18.6 mm	10.88 mm	OK
Super Imposed Dead Loads	1.33 (1.60) mm @ 3.323 m	1.60 mm	
Dead Loads (Self Weight)	23.63 mm @ 3.323 m	23.63 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 98.1, Super Dead 14.4, SW 106.7 < 275	219.19 N/mm²	OK
TOTAL (Compression)	Live 16.2, Super Dead 2.4, SW 106.7 < 275	125.30 N/mm²	OK
Maximum Concrete Stress	Live 3.52, Super Dead 0.52, SW 0 < 20	4.04 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	7.51 mm	
Natural Frequency	18/√(7.51/1.1) = 6.89 > 4 Hz	6.89 Hz	OK

UNPROPPED NON-COMPOSITE SECONDARY INTERNAL BEAM
Member 669 (N.410-N.415) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	3.593 m Span, 1.566 m to LH Beam and 1.986 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m

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IMPORTANT: Beam Loads — All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties — ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	48.78 kN each side	< 218.38 kN	OK
Check @ 1.797 m (Max. Moment)	M = 43.82 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	16.76 kN each side	< 218.38 kN	OK
Check @ 1.797 m (Max. Moment)	M = 15.06 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	19.15 kN each side		
Super Imposed Dead Load	2.81 kN each side		
Dead Load (Self Weight)	10.15 kN each side		
Maximum Deflection			
Live Loads	3.90 (3.90) mm @ 1.797 m < L / 360 = 9.9 mm	3.90 mm	OK
Super Imposed Dead Loads	0.57 mm @ 1.797 m	0.57 mm	
Dead Loads (Self Weight)	2.07 mm @ 1.797 m	2.07 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 61.4, Super Dead 9, SW 32.5 < 275	102.97 N/mm²	OK
TOTAL (Compression)	Live 61.4, Super Dead 9, SW 32.5 < 275	102.97 N/mm²	OK

Vibration Analysis

Beam Deflection		3.03 mm	
Natural Frequency	18/√(3.03) = 10.35 > 4 Hz	10.35 Hz	OK

UNPROPPED NON-COMPOSITE SECONDARY EDGE BEAM
Member 682 (K8-N.429) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (86 kg/m)	203x203 UC 86 [S 275]
Floor Area Supported	1.759 m Span and .822 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties — ye 111.1 mm, A 109.6 cm², Ix 9452 cm⁴, Zt 851 cm³, Zb 851 cm³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 15.89 kN, RH Support 15.19 kN	< 448.69 kN	OK
Check @ 0.871 m (Max. Moment)	M = 6.84 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

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Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 3.33 kN, RH Support 3.1 kN	< 448.69 kN	OK
Check @ 0.871 m (Max. Moment)	M = 1.42 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 2.72 kN, RH Support 2.44 kN		
Super Imposed Dead Load	LH Support 6.12 kN, RH Support 6.08 kN		
Dead Load (Self Weight)	LH Support 2.12 kN, RH Support 1.98 kN		
Maximum Deflection			
Live Loads	0.02 (0.02) mm @ 0.871 m < L / 360 = 4.8 mm	0.02 mm	OK
Super Imposed Dead Loads	0.04 mm @ 0.871 m	0.04 mm	
Dead Loads (Self Weight)	0.02 mm @ 0.871 m	0.02 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 1.3, Super Dead 3.2, SW 1.1 < 265	5.55 N/mm²	OK
TOTAL (Compression)	Live 1.3, Super Dead 3.2, SW 1.1 < 265	5.55 N/mm²	OK

Vibration Analysis

Beam Deflection		0.06 mm	
Natural Frequency	18/√(0.06) = 72.67 > 4 Hz	72.67 Hz	OK

UNPROPPED NON-COMPOSITE SECONDARY EDGE BEAM
Member 684 (N.429-P4) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (86 kg/m)	203x203 UC 86 [S 275]
Floor Area Supported	2.027 m Span and .793 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties	ye 111.1 mm, A 109.6 cm², Ix 9452 cm⁴, Zt 851 cm³, Zb 851 cm³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 18.23 kN, RH Support 19.96 kN	< 448.69 kN	OK
Check @ 1.045 m (Max. Moment)	M = 9.68 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 3.81 kN, RH Support 4.39 kN	< 448.69 kN	OK
Check @ 1.045 m (Max. Moment)	M = 2.08 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 3.1 kN, RH Support 3.8 kN		
Super Imposed Dead Load	LH Support 7.04 kN, RH Support 7.15 kN		
Dead Load (Self Weight)	LH Support 2.43 kN, RH Support 2.78 kN		
Maximum Deflection			
Live Loads	0.04 (0.04) mm @ 1.024 m < L / 360 = 5.6 mm	0.04 mm	OK

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Super Imposed Dead Loads	0.08 mm @ 1.024 m	0.08 mm	
Dead Loads (Self Weight)	0.03 mm @ 1.024 m	0.03 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 2.1, Super Dead 4.2, SW 1.6 < 265	7.84 N/mm²	OK
TOTAL (Compression)	Live 2.1, Super Dead 4.2, SW 1.6 < 265	7.84 N/mm²	OK

Vibration Analysis

Beam Deflection		0.11 mm	
Natural Frequency	18/√(0.11) = 53.8 > 4 Hz	53.80 Hz	OK

UNPROPPED NON-COMPOSITE SECONDARY EDGE BEAM
Member 685 (P4-M6) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	2.055 m Span and 1.557 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 27.18 kN, RH Support 24.49 kN	< 169.03 kN	OK
Check @ 0.996 m (Max. Moment)	M = 13.29 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 6.23 kN, RH Support 5.34 kN	< 169.03 kN	OK
Check @ 0.996 m (Max. Moment)	M = 2.98 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 6.94 kN, RH Support 5.87 kN		
Super Imposed Dead Load	LH Support 7.7 kN, RH Support 7.54 kN		
Dead Load (Self Weight)	LH Support 3.79 kN, RH Support 3.25 kN		
Maximum Deflection			
Live Loads	0.40 (0.40) mm @ 1.017 m < L / 360 = 5.7 mm	0.40 mm	OK
Super Imposed Dead Loads	0.48 mm @ 1.017 m	0.48 mm	
Dead Loads (Self Weight)	0.22 mm @ 1.017 m	0.22 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 14.8, Super Dead 17.6, SW 8.2 < 275	40.66 N/mm²	OK
TOTAL (Compression)	Live 14.8, Super Dead 17.6, SW 8.2 < 275	40.66 N/mm²	OK

Vibration Analysis

Beam Deflection		0.74 mm	
Natural Frequency	18/√(0.74) = 20.92 > 4 Hz	20.92 Hz	OK

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UNPROPPED NON-COMPOSITE PRIMARY INTERNAL BEAM
Member 688 (M6-M5) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (132 kg/m)	254x254 UC 132 [S 275]		
Floor Area Supported	2.016 m Span, 1.588 m to LH Beam and 5.085 m to RH Beam		
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick		
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m		
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame		

Section Properties

Steel Section Elastic Properties	ye 138.2 mm, A 168.1 cm², Ix 22536 cm⁴, Zt 1631 cm³, Zb 1631 cm³		

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	1.86 kN each side	< 672.16 kN	OK
Check @ 1.008 m (Max. Moment)	M = 0.94 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 138.2 mm	495.39 kN.m	OK

Lateral Torsional Buckling (Final Stage)

Check between 0 and 2.016 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 0, 1	0 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.016 m, 6.7 cm, 1, 0.851, 0.915	495.391 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	1.86 kN each side	< 672.16 kN	OK
Check @ 1.008 m (Max. Moment)	M = 0.94 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 138.2 mm	495.39 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.016 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 0, 1	0 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.016 m, 6.7 cm, 1, 0.851, 0.915	495.391 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	0 kN each side		
Super Imposed Dead Load	0 kN each side		
Dead Load (Self Weight)	1.33 kN each side		
Maximum Deflection			
Live Loads	0.00 (0.00) mm @ 1.028 m < L / 360 = 5.6 mm	0.00 mm	OK
Super Imposed Dead Loads	0.00 mm @ 1.028 m	0.00 mm	
Dead Loads (Self Weight)	0.01 mm @ 1.008 m	0.01 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 0, Super Dead 0, SW 0.4 < 265	0.41 N/mm²	OK
TOTAL (Compression)	Live 0, Super Dead 0, SW 0.4 < 265	0.41 N/mm²	OK

Vibration Analysis

Beam Deflection		0.01 mm	
Natural Frequency	18/√(0.01) = 230.3 > 4 Hz	230.30 Hz	OK

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UNPROPPED NON-COMPOSITE PRIMARY INTERNAL BEAM
Member 691 (N6-N3) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (73 kg/m)	254x254 UC 73 [S 275]		
Floor Area Supported	2.499 m Span, 5.085 m to LH Beam and 4.643 m to RH Beam		
Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick		
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m		
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame		

Section Properties

Steel Section Elastic Properties	ye 127.1 mm, A 93.1 cm², Ix 11414 cm⁴, Zt 898 cm³, Zb 898 cm³		

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	1.28 kN each side	< 360.57 kN	OK
Check @ 1.249 m (Max. Moment)	M = 0.8 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 127.1 mm	272.83 kN.m	OK

Lateral Torsional Buckling (Final Stage)

Check between 0 and 2.499 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 0, 1	0 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.499 m, 6.48 cm, 1, 0.849, 0.946	272.828 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	1.28 kN each side	< 360.57 kN	OK
Check @ 1.249 m (Max. Moment)	M = 0.8 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 127.1 mm	272.83 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.499 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 0, 1	0 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.499 m, 6.48 cm, 1, 0.849, 0.946	272.828 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	0 kN each side		
Super Imposed Dead Load	0 kN each side		
Dead Load (Self Weight)	0.91 kN each side		
Maximum Deflection			
Live Loads	0.00 (0.00) mm @ 0.999 m < L / 360 = 6.9 mm	0.00 mm	OK
Super Imposed Dead Loads	0.00 mm @ 0.924 m	0.00 mm	
Dead Loads (Self Weight)	0.02 mm @ 1.249 m	0.02 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 0, Super Dead 0, SW 0.6 < 275	0.64 N/mm²	OK
TOTAL (Compression)	Live 0, Super Dead 0, SW 0.6 < 275	0.64 N/mm²	OK

Vibration Analysis

Beam Deflection		0.02 mm	
Natural Frequency	18/√(0.02) = 143.41 > 4 Hz	143.41 Hz	OK

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UNPROPPED COMPOSITE PRIMARY EDGE BEAM
Members 1 and 5-6 (B15-F15) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (86 kg/m)	203x203 UC 86 [S 275]
Floor Area Supported	7.33 m Span and 1.91 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+393 mm²/m
Headed Stud Connector	19x95 mm Placed @ 300 mm centre
Transverse Beams	@ 2.443 and 4.887 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	122 x 848 mm², b1= 764 mm and b2= 84 mm
Steel Section Elastic Properties	ye 111.1 mm, A 109.6 cm², Ix 9452 cm⁴, Zt 851 cm³, Zb 851 cm³
Composite Section Elastic Properties	ye 153.7 mm, Ix 27995 cm⁴, Zs.t 11820 cm³, Zs.b 1410 cm³, Zc.t 18216 cm³
Headed Stud Connector	24 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	72.91 kN each side	< 448.69 kN	OK
Check @ 3.665 m (Max. Moment)	M = 155.08 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 12 < 21.3	Partial	
Axial Resistance (kN)	Rc 1860.62 kN, Rs 2905.2 kN, Rq 1046.4 kN	1046.4 kN	
Degree of Shear Connection	Na/Np = 12 / 21.3 > 0.4	0.562	OK
Reduced Concrete Area	Area required to resist 1046.4 kN	68.6x847.6mm²	
Moment Capacity	Plastic neutral axis in top flange @ 146.6 mm	405.11 kN.m	OK
Check @ 2.443 m	M = 147.4 kN.m, Fv = 47.75 kN		
Shear Connection	No of shear connectors from nearest support 8 < 21.3	Partial	
Axial Resistance (kN)	Rc 1860.62 kN, Rs 2905.2 kN, Rq 697.6 kN	697.6 kN	
Reduced Concrete Area	Area required to resist 697.6 kN	45.7x847.6mm²	
Moment Capacity	Plastic neutral axis in top flange @ 149.7 mm	373.38 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 300 mm	3.33 per m	
Vr = fn(Asv,fy,Acv,fcu)	645, 460, 79000, 40	302.49 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.33x87.2x0.76/(0.76+0.08)	261.99 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	16.4 kN each side	< 448.69 kN	OK
Check @ 3.665 m (Max. Moment)	M = 37.38 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 2.443 m	M = 36.49 kN.m, Fv = 13.46 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.443 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 36.485, 0.6	21.891 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.443 m, 5.34 cm, 1, 0.85, 0.841	258.826 kN.m	OK

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Check between 2.443 and 4.887 m

m_{LT}.MA=fn(M1,M2,m_{LT})	36.485, 36.485, 1	36.485 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.444 m, 5.34 cm, 1, 0.85, 0.841	258.826 kN.m	OK

Serviceability Limit State

Support Reactions (kN)

Live Loads	13.85 kN each side		
Super Imposed Dead Load	25.85 kN each side		
Dead Load (Self Weight)	10.39 kN each side		

Maximum Deflection (Partial Connection All Loads)

Live Loads	3.37 (4.24) mm @ 3.665 m < L / 360 = 20.3 mm	4.24 mm	OK
Super Imposed Dead Loads	4.75 (5.97) mm @ 3.665 m	5.97 mm	
Dead Loads (Self Weight)	6.89 mm @ 3.665 m	6.89 mm	

Maximum Steel Stress

TOTAL (Tension)	Live 24, Super Dead 34.5, SW 27.6 < 265	86.08 N/mm²	OK
TOTAL (Compression)	Live 2.9, Super Dead 4.1, SW 27.6 < 265	34.57 N/mm²	OK
Maximum Concrete Stress	Live 1.86, Super Dead 2.67, SW 0 < 20	4.53 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	8.73 mm	
Natural Frequency	18/√(8.73/1.1) = 6.39 > 4 Hz	6.39 Hz	OK

UNPROPPED COMPOSITE PRIMARY INTERNAL BEAM
Members 2 and 7-9 (B14-N.55) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (86 kg/m)	203x203 UC 86 [S 275]
Floor Area Supported	7.54 m Span, 4.17 m to LH Beam and .955 m to RH Beam
Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 13.79, Gr 40 with 252+503 mm²/m
Headed Stud Connector	19x95 mm Placed @ 200 mm centre
Transverse Beams	@ 2.367, 4.733 and 7.1 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	122 x 1325 mm², b1= 943 mm and b2= 382 mm
Steel Section Elastic Properties	ye 111.1 mm, A 109.6 cm², Ix 9452 cm⁴, Zt 851 cm³, Zb 851 cm³
Composite Section Elastic Properties	ye 148.1 mm, Ix 29276 cm⁴, Zs.t 16212 cm³, Zs.b 1434 cm³, Zc.t 27268 cm³
Headed Stud Connector	37 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)

Ultimate Limit State (Final Stage)

Maximum Shear

Support Reactions (kN)	LH Support 121.92 kN, RH Support 167.34 kN	< 448.69 kN	OK
Check @ 4.675 m (Max. Moment)	M = 307.86 kN.m, Fv = 8.43 kN		
Shear Connection	No of shear connectors from nearest support 14 < 33.3	Partial	
Axial Resistance (kN)	Rc 2907.35 kN, Rs 2905.2 kN, Rq 1220.8 kN	1220.8 kN	
Degree of Shear Connection	Na/Np = 14 / 33.3 > 0.4	0.42	OK
Reduced Concrete Area	Area required to resist 1220.8 kN	51.2x1324.5mm²	
Moment Capacity	Plastic neutral axis in top flange @ 145 mm	435.16 kN.m	OK
Check @ 2.367 m	M = 285.22 kN.m, Fv = 119.08 kN		
Shear Connection	No of shear connectors from nearest support 11 < 33.3	Partial	
Axial Resistance (kN)	Rc 2907.35 kN, Rs 2905.2 kN, Rq 959.2 kN	959.2 kN	

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Reduced Concrete Area	Area required to resist 959.2 kN	40.2x1324.5mm²	
Moment Capacity	Plastic neutral axis in top flange @ 147.3 mm	408.88 kN.m	OK
Check @ 4.733 m	M = 308.35 kN.m, Fv = 98.11 kN		
Shear Connection	No of shear connectors from nearest support 14 < 33.3	Partial	
Axial Resistance (kN)	Rc 2907.35 kN, Rs 2905.2 kN, Rq 1220.8 kN	1220.8 kN	
Reduced Concrete Area	Area required to resist 1220.8 kN	51.2x1324.5mm²	
Moment Capacity	Plastic neutral axis in top flange @ 145 mm	435.16 kN.m	OK
Check @ 7.1 m	M = 73.35 kN.m, Fv = 166.8 kN		
Shear Connection	No of shear connectors from nearest support 2 < 33.3	Partial	
Axial Resistance (kN)	Rc 2907.35 kN, Rs 2905.2 kN, Rq 174.4 kN	174.4 kN	
Reduced Concrete Area	Area required to resist 174.4 kN	7.3x1324.5mm²	
Moment Capacity	Plastic neutral axis in web @ 215.2 mm	295.89 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 200 mm	5 per m	
Vr = fn(Asv,fy,Acv,fcu)	755, 460, 79000, 40	337.91 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	5x87.2x0.94/(0.94+0.38)	310.25 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 44.6 kN, RH Support 60.17 kN	< 448.69 kN	OK
Check @ 4.675 m (Max. Moment)	M = 110.38 kN.m, Fv = 2.17 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 2.367 m	M = 102.2 kN.m, Fv = 41.75 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 4.733 m	M = 110.51 kN.m, Fv = 34.25 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 7.1 m	M = 26.29 kN.m, Fv = 59.64 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.367 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 102.202, 0.6	61.321 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.367 m, 5.34 cm, 1, 0.85, 0.847	258.826 kN.m	OK
Check between 2.367 and 4.733 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	102.202, 110.508, 0.97	107.186 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.366 m, 5.34 cm, 1, 0.85, 0.847	258.826 kN.m	OK
Check between 4.733 and 7.1 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	110.508, 26.294, 0.695	76.822 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.367 m, 5.34 cm, 1, 0.85, 0.847	258.826 kN.m	OK
Check between 7.1 and 7.54 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	26.294, 0, 0.6	15.776 kN.m	
Mb=fn(L,ry,β_w,u,v)	0.44 m, 5.34 cm, 1, 0.85, 0.992	258.826 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 46.24 kN, RH Support 64.1 kN		
Super Imposed Dead Load	LH Support 6.78 kN, RH Support 9.4 kN		
Dead Load (Self Weight)	LH Support 27.46 kN, RH Support 36.87 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	11.50 (14.83) mm @ 3.77 m < L / 360 = 20.9 mm	14.83 mm	OK
Super Imposed Dead Loads	1.69 (2.18) mm @ 3.77 m	2.18 mm	
Dead Loads (Self Weight)	20.53 mm @ 3.77 m	20.53 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 82.3, Super Dead 12.1, SW 79.5 < 265	173.87 N/mm²	OK
TOTAL (Compression)	Live 7.3, Super Dead 1.1, SW 79.5 < 265	87.81 N/mm²	OK
Maximum Concrete Stress	Live 4.33, Super Dead 0.64, SW 0 < 20	4.97 N/mm²	OK

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Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	10.29 mm	
Natural Frequency	$18/\sqrt{(10.29/1.1)} = 5.89 > 4$ Hz	5.89 Hz	OK

UNPROPPED NON-COMPOSITE PRIMARY EDGE BEAM
Members 3 and 25 (A8-D8) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (107 kg/m)	254x254 UC 107 [S 275]
Floor Area Supported	3.78 m Span and 3.592 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m
Transverse Beam	@ 1.04 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties	ye 133.4 mm, A 136.4 cm², Ix 17517 cm⁴, Zt 1314 cm³, Zb 1314 cm³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 123.13 kN, RH Support 46.69 kN	< 542.79 kN	OK
Check @ 1.058 m (Max. Moment)	M = 121.53 kN.m, Fv = 42.61 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK
Check @ 1.04 m	M = 122.32 kN.m, Fv = 112.12 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK

Lateral Torsional Buckling (Final Stage)

Check between 0 and 1.04 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 122.324, 0.6	73.394 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.04 m, 6.6 cm, 1, 0.848, 0.981	393.366 kN.m	OK
Check between 1.04 and 3.78 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	122.324, 0, 0.6	73.394 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.74 m, 6.6 cm, 1, 0.848, 0.895	393.366 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 34.56 kN, RH Support 14.87 kN	< 542.79 kN	OK
Check @ 1.058 m (Max. Moment)	M = 34.93 kN.m, Fv = 10.79 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK
Check @ 1.04 m	M = 35.13 kN.m, Fv = 33 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 1.04 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 35.132, 0.6	21.079 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.04 m, 6.6 cm, 1, 0.848, 0.981	393.366 kN.m	OK
Check between 1.04 and 3.78 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	35.132, 0, 0.6	21.079 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.74 m, 6.6 cm, 1, 0.848, 0.895	393.366 kN.m	OK

Serviceability Limit State

Support Reactions (kN)	
Live Loads	LH Support 34.86 kN, RH Support 13.23 kN
Super Imposed Dead Load	LH Support 26.74 kN, RH Support 8.87 kN
Dead Load (Self Weight)	LH Support 21.37 kN, RH Support 9.36 kN

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Maximum Deflection			
Live Loads	1.13 (1.13) mm @ 1.663 m < L / 360 = 10.5 mm	1.13 mm	OK
Super Imposed Dead Loads	0.76 mm @ 1.663 m	0.76 mm	
Dead Loads (Self Weight)	0.71 mm @ 1.701 m	0.71 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 27.4, Super Dead 18.4, SW 16.4 < 265	62.17 N/mm²	OK
TOTAL (Compression)	Live 27.4, Super Dead 18.4, SW 16.4 < 265	62.17 N/mm²	OK

Vibration Analysis

Beam Deflection		1.59 mm	
Natural Frequency	18/√(1.59) = 14.29 > 4 Hz	14.29 Hz	OK

UNPROPPED COMPOSITE PRIMARY INTERNAL BEAM
Members 4 and 10-11 (B13-F13) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (86 kg/m)	203x203 UC 86 [S 275]
Floor Area Supported	6.52 m Span, 4.735 m to LH Beam and 4.17 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+503 mm²/m
Headed Stud Connector	19x95 mm Placed @ 150 mm centre
Transverse Beams	@ 2.443 and 4.347 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	122 x 1630 mm², b1= 815 mm and b2= 815 mm
Steel Section Elastic Properties	ye 111.1 mm, A 109.6 cm², Ix 9452 cm⁴, Zt 851 cm³, Zb 851 cm³
Composite Section Elastic Properties	ye 125 mm, Ix 34841 cm⁴, Zs.t 69739 cm³, Zs.b 1534 cm³, Zc.t 27872 cm³
Headed Stud Connector	43 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 143.9 kN, RH Support 153.95 kN	< 448.69 kN	OK
Check @ 2.478 m (Max. Moment)	M = 347.69 kN.m, Fv = 7.43 kN		
Shear Connection	No of shear connectors from nearest support 16 < 33.3	Partial	
Axial Resistance (kN)	Rc 3577.94 kN, Rs 2905.2 kN, Rq 1395.2 kN	1395.2 kN	
Degree of Shear Connection	Na/Np = 16 / 33.3 > 0.4	0.48	OK
Reduced Concrete Area	Area required to resist 1395.2 kN	47.6x1630mm²	
Moment Capacity	Plastic neutral axis in top flange @ 143.4 mm	458.39 kN.m	OK
Check @ 2.443 m	M = 347.95 kN.m, Fv = 140.96 kN		
Shear Connection	No of shear connectors from nearest support 16 < 33.3	Partial	
Axial Resistance (kN)	Rc 3577.94 kN, Rs 2905.2 kN, Rq 1395.2 kN	1395.2 kN	
Reduced Concrete Area	Area required to resist 1395.2 kN	47.6x1630mm²	
Moment Capacity	Plastic neutral axis in top flange @ 143.4 mm	458.39 kN.m	OK
Check @ 4.347 m	M = 331.7 kN.m, Fv = 151.33 kN		
Shear Connection	No of shear connectors from nearest support 15 < 33.3	Partial	
Axial Resistance (kN)	Rc 3577.94 kN, Rs 2905.2 kN, Rq 1308 kN	1308 kN	
Reduced Concrete Area	Area required to resist 1308 kN	44.6x1630mm²	
Moment Capacity	Plastic neutral axis in top flange @ 144.2 mm	449.87 kN.m	OK

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Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 150 mm	6.67 per m	
Vr = fn(Asv,fy,Acv,fcu)	755, 460, 79000, 40	337.91 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	6.67x87.2x0.82/(0.82+0.82)	290.67 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 51.78 kN, RH Support 55.24 kN	< 448.69 kN	OK
Check @ 2.478 m (Max. Moment)	M = 122.83 kN.m, Fv = 1.9 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 2.443 m	M = 122.9 kN.m, Fv = 48.84 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 4.347 m	M = 117.18 kN.m, Fv = 52.62 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.443 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 122.9, 0.6	73.74 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.443 m, 5.34 cm, 1, 0.85, 0.841	258.826 kN.m	OK
Check between 2.443 and 4.347 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	122.9, 117.179, 0.981	120.612 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.904 m, 5.34 cm, 1, 0.85, 0.888	258.826 kN.m	OK
Check between 4.347 and 6.52 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	117.179, 0, 0.6	70.307 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.173 m, 5.34 cm, 1, 0.85, 0.864	258.826 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 55.09 kN, RH Support 59.04 kN		
Super Imposed Dead Load	LH Support 8.08 kN, RH Support 8.66 kN		
Dead Load (Self Weight)	LH Support 31.74 kN, RH Support 33.83 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	8.15 (10.58) mm @ 3.26 m < L / 360 = 18.1 mm	10.58 mm	OK
Super Imposed Dead Loads	1.20 (1.55) mm @ 3.26 m	1.55 mm	
Dead Loads (Self Weight)	16.83 mm @ 3.26 m	16.83 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 87.7, Super Dead 12.9, SW 88.1 < 265	188.62 N/mm²	OK
TOTAL (Compression)	Live 1.9, Super Dead 0.3, SW 88.1 < 265	90.28 N/mm²	OK
Maximum Concrete Stress	Live 4.82, Super Dead 0.71, SW 0 < 20	5.53 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	7.17 mm	
Natural Frequency	18/√(7.17/1.1) = 7.05 > 4 Hz	7.05 Hz	OK

UNPROPPED COMPOSITE PRIMARY EDGE BEAM
Members 12-14 (F13-K13) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	4.702 m Span and 4.735 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+393 mm²/m
Headed Stud Connector	19x95 mm Placed @ 300 mm centre

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Transverse Beams	@ 0.928 and 2.351 m		
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame		
Section Properties			
Concrete Effective Area	122 x 649 mm², b1= 588 mm and b2= 61 mm		
Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³		
Composite Section Elastic Properties	ye 109.2 mm, Ix 8365 cm⁴, Zs.t 4010 cm³, Zs.b 469 cm³, Zc.t 7660 cm³		
Headed Stud Connector	15 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)		
Ultimate Limit State (Final Stage)			
Maximum Shear			
Support Reactions (kN)	LH Support 90.58 kN, RH Support 70.2 kN	< 169.03 kN	OK
Check @ 2.351 m (Max. Moment)	M = 138.73 kN.m, Fv = 47.82 kN		
Shear Connection	No of shear connectors from nearest support 7 < 12.1	Partial	
Axial Resistance (kN)	Rc 1424.39 kN, Rs 1052.15 kN, Rq 610.4 kN	610.4 kN	
Degree of Shear Connection	Na/Np = 7 / 12.1 > 0.4	0.58	OK
Reduced Concrete Area	Area required to resist 610.4 kN	52.3x648.9mm²	
Moment Capacity	Plastic neutral axis in top flange @ 135.1 mm	144.15 kN.m	OK
Check @ 0.928 m	M = 79.95 kN.m, Fv = 81.75 kN		
Shear Connection	No of shear connectors from nearest support 3 < 12.1	Partial	
Axial Resistance (kN)	Rc 1424.39 kN, Rs 1052.15 kN, Rq 261.6 kN	261.6 kN	
Reduced Concrete Area	Area required to resist 261.6 kN	22.4x648.9mm²	
Moment Capacity	Plastic neutral axis in top flange @ 139.2 mm	109.33 kN.m	OK
Transverse Reinforcement			
Max. No. of Shear Connectors (N)	Average minimum spacing 300 mm	3.33 per m	
Vr = fn(Asv,fy,Acv,fcu)	645, 460, 79000, 40	302.49 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.33x87.2x0.59/(0.59+0.06)	263.27 kN	OK
Ultimate Limit State (Construction Stage)			
Maximum Shear			
Support Reactions (kN)	LH Support 20.36 kN, RH Support 16.3 kN	< 169.03 kN	OK
Check @ 2.351 m (Max. Moment)	M = 37.15 kN.m, Fv = 15.31 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK
Check @ 0.928 m	M = 18.71 kN.m, Fv = 19.97 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK
Lateral Torsional Buckling (Construction Stage)			
Check between 0 and 0.928 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 18.714, 0.6	11.228 kN.m	
Mb=fn(L,ry,β_w,u,v)	0.928 m, 3.83 cm, 1, 0.849, 0.973	68.117 kN.m	OK
Check between 0.928 and 2.351 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	18.714, 37.153, 0.801	29.777 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.423 m, 3.83 cm, 1, 0.849, 0.942	68.117 kN.m	OK
Check between 2.351 and 4.702 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	37.153, 0, 0.6	22.292 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.351 m, 3.83 cm, 1, 0.849, 0.871	61.72 kN.m	OK
Serviceability Limit State			
Support Reactions (kN)			
Live Loads	LH Support 20.16 kN, RH Support 17.13 kN		
Super Imposed Dead Load	LH Support 29.17 kN, RH Support 20.42 kN		
Dead Load (Self Weight)	LH Support 12.63 kN, RH Support 10.01 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	4.42 (6.53) mm @ 2.351 m < L / 360 = 13 mm	6.53 mm	OK
Super Imposed Dead Loads	4.01 (5.92) mm @ 2.257 m	5.92 mm	
Dead Loads (Self Weight)	12.18 mm @ 2.304 m	12.18 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 86, Super Dead 64.1, SW 102.3 < 275	252.42 N/mm²	OK
TOTAL (Compression)	Live 10, Super Dead 7.5, SW 102.3 < 275	119.85 N/mm²	OK

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Maximum Concrete Stress	Live 5.26, Super Dead 3.92, SW 0 < 20	9.18 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	9.12 mm	
Natural Frequency	$18/\sqrt{(9.12/1.1)} = 6.25 > 4$ Hz	6.25 Hz	OK

UNPROPPED NON-COMPOSITE PRIMARY INTERNAL BEAM
Members 15 and 28 (A4-D4) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	3.875 m Span, 1.042 m to LH Beam and 3.592 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m
Transverse Beam	@ 1.04 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 39.36 kN, RH Support 14.95 kN	< 218.38 kN	OK
Check @ 1.046 m (Max. Moment)	M = 40.62 kN.m, Fv = 13.76 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK
Check @ 1.04 m	M = 40.71 kN.m, Fv = 38.93 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Lateral Torsional Buckling (Final Stage)

Check between 0 and 1.04 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 40.707, 0.6	24.424 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.04 m, 3.18 cm, 1, 0.882, 0.973	86.46 kN.m	OK
Check between 1.04 and 3.875 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	40.707, 0, 0.6	24.424 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.835 m, 3.18 cm, 1, 0.882, 0.856	61.27 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 14.03 kN, RH Support 5.66 kN	< 218.38 kN	OK
Check @ 1.046 m (Max. Moment)	M = 14.33 kN.m, Fv = 4.47 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK
Check @ 1.04 m	M = 14.36 kN.m, Fv = 13.59 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 1.04 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 14.362, 0.6	8.617 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.04 m, 3.18 cm, 1, 0.882, 0.973	86.46 kN.m	OK
Check between 1.04 and 3.875 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	14.362, 0, 0.6	8.617 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.835 m, 3.18 cm, 1, 0.882, 0.856	61.27 kN.m	OK

Serviceability Limit State

Support Reactions (kN)	
Live Loads	LH Support 15.15 kN, RH Support 5.56 kN
Super Imposed Dead Load	LH Support 2.22 kN, RH Support 0.82 kN

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Dead Load (Self Weight)	LH Support 8.58 kN, RH Support 3.51 kN		
Maximum Deflection			
Live Loads	3.12 (3.12) mm @ 1.705 m < L / 360 = 10.7 mm	3.12 mm	OK
Super Imposed Dead Loads	0.46 mm @ 1.705 m	0.46 mm	
Dead Loads (Self Weight)	1.79 mm @ 1.744 m	1.79 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 56.1, Super Dead 8.2, SW 31.2 < 275	95.54 N/mm²	OK
TOTAL (Compression)	Live 56.1, Super Dead 8.2, SW 31.2 < 275	95.54 N/mm²	OK

Vibration Analysis

Beam Deflection		2.56 mm	
Natural Frequency	18/√(2.56) = 11.24 > 4 Hz	11.24 Hz	OK

UNPROPPED COMPOSITE PRIMARY EDGE BEAM
Members 18 and 29-30 (B15-F15) @ Level 2

Summary of Design Data (Integrated Design)

Steel Section (86 kg/m)	203x203 UC 86 [S 275]
Floor Area Supported	7.33 m Span and 1.91 m to LH Beam
Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 13.79, Gr 40 with 252+193 mm²/m
Headed Stud Connector	19x95 mm Placed @ 400 mm centre
Transverse Beams	@ 2.443 and 4.887 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	122 x 848 mm², b1= 764 mm and b2= 84 mm
Steel Section Elastic Properties	ye 111.1 mm, A 109.6 cm², Ix 9452 cm⁴, Zt 851 cm³, Zb 851 cm³
Composite Section Elastic Properties	ye 168 mm, Ix 24825 cm⁴, Zs.t 6541 cm³, Zs.b 1347 cm³, Zc.t 20383 cm³
Headed Stud Connector	18 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	72.91 kN each side	< 448.69 kN	OK
Check @ 3.665 m (Max. Moment)	M = 155.07 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 9 < 21.3	Partial	
Axial Resistance (kN)	Rc 1860.62 kN, Rs 2905.2 kN, Rq 784.8 kN	784.8 kN	
Degree of Shear Connection	Na/Np = 9 / 21.3 > 0.4	0.422	OK
Reduced Concrete Area	Area required to resist 784.8 kN	51.4x847.6mm²	
Moment Capacity	Plastic neutral axis in top flange @ 148.9 mm	382.16 kN.m	OK
Check @ 2.443 m	M = 147.39 kN.m, Fv = 47.75 kN		
Shear Connection	No of shear connectors from nearest support 6 < 21.3	Partial	
Axial Resistance (kN)	Rc 1860.62 kN, Rs 2905.2 kN, Rq 523.2 kN	523.2 kN	
Reduced Concrete Area	Area required to resist 523.2 kN	34.3x847.6mm²	
Moment Capacity	Plastic neutral axis in web @ 163.4 mm	353.58 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 400 mm	2.5 per m	
Vr = fn(Asv,fy,Acv,fcu)	445, 460, 79000, 40	238.09 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	2.5x87.2x0.76/(0.76+0.08)	196.49 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	16.4 kN each side	< 448.69 kN	OK

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Check @ 3.665 m (Max. Moment)	M = 37.38 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 2.443 m	M = 36.48 kN.m, Fv = 13.46 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.443 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 36.479, 0.6	21.887 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.443 m, 5.34 cm, 1, 0.85, 0.841	258.826 kN.m	OK
Check between 2.443 and 4.887 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	36.479, 36.479, 1	36.479 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.444 m, 5.34 cm, 1, 0.85, 0.841	258.826 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	13.85 kN each side		
Super Imposed Dead Load	25.86 kN each side		
Dead Load (Self Weight)	10.39 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	3.81 (4.88) mm @ 3.665 m < L / 360 = 20.3 mm	4.88 mm	OK
Super Imposed Dead Loads	5.36 (6.87) mm @ 3.665 m	6.87 mm	
Dead Loads (Self Weight)	6.89 mm @ 3.665 m	6.89 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 25.1, Super Dead 36.1, SW 27.6 < 265	88.79 N/mm²	OK
TOTAL (Compression)	Live 5.2, Super Dead 7.4, SW 27.6 < 265	40.20 N/mm²	OK
Maximum Concrete Stress	Live 1.66, Super Dead 2.38, SW 0 < 20	4.05 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	9.98 mm	
Natural Frequency	18/√(9.98/1.1) = 5.98 > 4 Hz	5.98 Hz	OK

UNPROPPED COMPOSITE PRIMARY INTERNAL BEAM
Members 19 and 31-32 (B14-F14) @ Level 2

Summary of Design Data (Integrated Design)

Steel Section (86 kg/m)	203x203 UC 86 [S 275]
Floor Area Supported	7.1 m Span, 4.17 m to LH Beam and 1.91 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+193 mm²/m
Headed Stud Connector	19x95 mm Placed @ 225 mm centre
Transverse Beams	@ 2.367 and 4.733 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	122 x 1652 mm², b1= 888 mm and b2= 764 mm
Steel Section Elastic Properties	ye 111.1 mm, A 109.6 cm², Ix 9452 cm⁴, Zt 851 cm³, Zb 851 cm³
Composite Section Elastic Properties	ye 124.5 mm, Ix 34980 cm⁴, Zs.t 63190 cm³, Zs.b 1536 cm³, Zc.t 28104 cm³
Headed Stud Connector	31 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 111.68 kN, RH Support 111.21 kN	< 448.69 kN	OK
Check @ 3.195 m (Max. Moment)	M = 261.34 kN.m, Fv = 0.04 kN		
Shear Connection	No of shear connectors from nearest support 14 < 33.3	Partial	

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Axial Resistance (kN)	Rc 3625.13 kN, Rs 2905.2 kN, Rq 1220.8 kN	1220.8 kN	
Degree of Shear Connection	Na/Np = 14 / 33.3 > 0.4	0.42	OK
Reduced Concrete Area	Area required to resist 1220.8 kN	41.1x1651.5mm²	
Moment Capacity	Plastic neutral axis in top flange @ 145 mm	441.35 kN.m	OK
Check @ 2.367 m	M = 260.97 kN.m, Fv = 108.83 kN		
Shear Connection	No of shear connectors from nearest support 10 < 33.3	Partial	
Axial Resistance (kN)	Rc 3625.13 kN, Rs 2905.2 kN, Rq 872 kN	872 kN	
Reduced Concrete Area	Area required to resist 872 kN	29.3x1651.5mm²	
Moment Capacity	Plastic neutral axis in top flange @ 148.1 mm	402.51 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 225 mm	4.44 per m	
Vr = fn(Asv,fy,Acv,fcu)	445, 460, 79000, 40	238.09 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	4.44x87.2x0.89/(0.89+0.76)	208.27 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 40.93 kN, RH Support 40.77 kN	< 448.69 kN	OK
Check @ 3.408 m (Max. Moment)	M = 94.16 kN.m, Fv = 0.02 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 2.367 m	M = 93.5 kN.m, Fv = 38.08 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.367 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 93.503, 0.6	56.102 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.367 m, 5.34 cm, 1, 0.85, 0.847	258.826 kN.m	OK
Check between 2.367 and 4.733 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	93.503, 93.503, 1	93.503 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.366 m, 5.34 cm, 1, 0.85, 0.847	258.826 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 42.31 kN, RH Support 42.13 kN		
Super Imposed Dead Load	LH Support 6.21 kN, RH Support 6.18 kN		
Dead Load (Self Weight)	LH Support 25.2 kN, RH Support 25.11 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	7.48 (10.81) mm @ 3.55 m < L / 360 = 19.7 mm	10.81 mm	OK
Super Imposed Dead Loads	1.10 (1.59) mm @ 3.55 m	1.59 mm	
Dead Loads (Self Weight)	15.96 mm @ 3.55 m	15.96 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 65.2, Super Dead 9.6, SW 67.9 < 265	142.62 N/mm²	OK
TOTAL (Compression)	Live 1.6, Super Dead 0.2, SW 67.9 < 265	69.68 N/mm²	OK
Maximum Concrete Stress	Live 3.56, Super Dead 0.52, SW 0 < 20	4.09 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	6.98 mm	
Natural Frequency	18/√(6.98/1.1) = 7.15 > 4 Hz	7.15 Hz	OK

UNPROPPED COMPOSITE PRIMARY INTERNAL BEAM
Members 20 and 34-35 (B13-F13) @ Level 2

Summary of Design Data (Integrated Design)

Steel Section (86 kg/m)	203x203 UC 86 [S 275]
Floor Area Supported	6.52 m Span, 4.735 m to LH Beam and 4.17 m to RH Beam

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Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick		
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+503 mm²/m		
Headed Stud Connector	19x95 mm Placed @ 150 mm centre		
Transverse Beams	@ 2.443 and 4.347 m		
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame		

Section Properties

Concrete Effective Area	122 x 1630 mm², b1= 815 mm and b2= 815 mm		
Steel Section Elastic Properties	ye 111.1 mm, A 109.6 cm², Ix 9452 cm⁴, Zt 851 cm³, Zb 851 cm³		
Composite Section Elastic Properties	ye 125 mm, Ix 34841 cm⁴, Zs.t 69739 cm³, Zs.b 1534 cm³, Zc.t 27872 cm³		
Headed Stud Connector	43 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)		

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 143.9 kN, RH Support 153.95 kN	< 448.69 kN	OK
Check @ 2.478 m (Max. Moment)	M = 347.68 kN.m, Fv = 7.43 kN		
Shear Connection	No of shear connectors from nearest support 16 < 33.3	Partial	
Axial Resistance (kN)	Rc 3577.94 kN, Rs 2905.2 kN, Rq 1395.2 kN	1395.2 kN	
Degree of Shear Connection	Na/Np = 16 / 33.3 > 0.4	0.48	OK
Reduced Concrete Area	Area required to resist 1395.2 kN	47.6x1630mm²	
Moment Capacity	Plastic neutral axis in top flange @ 143.4 mm	458.39 kN.m	OK
Check @ 2.443 m	M = 347.95 kN.m, Fv = 140.96 kN		
Shear Connection	No of shear connectors from nearest support 16 < 33.3	Partial	
Axial Resistance (kN)	Rc 3577.94 kN, Rs 2905.2 kN, Rq 1395.2 kN	1395.2 kN	
Reduced Concrete Area	Area required to resist 1395.2 kN	47.6x1630mm²	
Moment Capacity	Plastic neutral axis in top flange @ 143.4 mm	458.39 kN.m	OK
Check @ 4.347 m	M = 331.7 kN.m, Fv = 151.33 kN		
Shear Connection	No of shear connectors from nearest support 15 < 33.3	Partial	
Axial Resistance (kN)	Rc 3577.94 kN, Rs 2905.2 kN, Rq 1308 kN	1308 kN	
Reduced Concrete Area	Area required to resist 1308 kN	44.6x1630mm²	
Moment Capacity	Plastic neutral axis in top flange @ 144.2 mm	449.87 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 150 mm	6.67 per m	
Vr = fn(Asv,fy,Acv,fcu)	755, 460, 79000, 40	337.91 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	6.67x87.2x0.82/(0.82+0.82)	290.67 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 51.78 kN, RH Support 55.24 kN	< 448.69 kN	OK
Check @ 2.478 m (Max. Moment)	M = 122.83 kN.m, Fv = 1.9 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 2.443 m	M = 122.9 kN.m, Fv = 48.84 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 4.347 m	M = 117.18 kN.m, Fv = 52.62 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.443 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 122.9, 0.6	73.74 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.443 m, 5.34 cm, 1, 0.85, 0.841	258.826 kN.m	OK
Check between 2.443 and 4.347 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	122.9, 117.175, 0.981	120.61 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.904 m, 5.34 cm, 1, 0.85, 0.888	258.826 kN.m	OK
Check between 4.347 and 6.52 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	117.175, 0, 0.6	70.305 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.173 m, 5.34 cm, 1, 0.85, 0.864	258.826 kN.m	OK

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Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 55.09 kN, RH Support 59.04 kN		
Super Imposed Dead Load	LH Support 8.08 kN, RH Support 8.66 kN		
Dead Load (Self Weight)	LH Support 31.74 kN, RH Support 33.83 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	8.15 (10.58) mm @ 3.26 m < L / 360 = 18.1 mm	10.58 mm	OK
Super Imposed Dead Loads	1.20 (1.55) mm @ 3.26 m	1.55 mm	
Dead Loads (Self Weight)	16.83 mm @ 3.26 m	16.83 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 87.7, Super Dead 12.9, SW 88.1 < 265	188.62 N/mm²	OK
TOTAL (Compression)	Live 1.9, Super Dead 0.3, SW 88.1 < 265	90.28 N/mm²	OK
Maximum Concrete Stress	Live 4.82, Super Dead 0.71, SW 0 < 20	5.53 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	7.17 mm	
Natural Frequency	$18/\sqrt{(7.17/1.1)} = 7.05 > 4$ Hz	7.05 Hz	OK

UNPROPPED NON-COMPOSITE PRIMARY INTERNAL BEAM
Members 21 and 43 (B12-E12) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	4.15 m Span, 2.81 m to LH Beam and 4.735 m to RH Beam
Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m
Transverse Beam	@ 2.285 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 0.48 kN, RH Support 0.39 kN	< 169.03 kN	OK
Check @ 1.121 m (Max. Moment)	M = 0.27 kN.m, Fv = 0.01 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK
Check @ 2.285 m	M = 0 kN.m, Fv = 0.48 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Lateral Torsional Buckling (Final Stage)

Check between 0 and 2.285 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 0, 1	0 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.285 m, 3.83 cm, 1, 0.849, 0.876	62.316 kN.m	OK
Check between 2.285 and 4.15 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 0, 1	0 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.865 m, 3.83 cm, 1, 0.849, 0.909	66.261 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 0.48 kN, RH Support 0.39 kN	< 169.03 kN	OK
Check @ 1.121 m (Max. Moment)	M = 0.27 kN.m, Fv = 0.01 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK
Check @ 2.285 m	M = 0 kN.m, Fv = 0.48 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

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Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.285 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 0, 1	0 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.285 m, 3.83 cm, 1, 0.849, 0.876	62.316 kN.m	OK
Check between 2.285 and 4.15 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 0, 1	0 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.865 m, 3.83 cm, 1, 0.849, 0.909	66.261 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	0 kN each side		
Super Imposed Dead Load	0 kN each side		
Dead Load (Self Weight)	LH Support 0.34 kN, RH Support 0.28 kN		
Maximum Deflection			
Live Loads	0.00 (0.00) mm @ 3.86 m < L / 360 = 11.5 mm	0.00 mm	OK
Super Imposed Dead Loads	0.00 mm @ 4.067 m	0.00 mm	
Dead Loads (Self Weight)	0.07 mm @ 1.702 m	0.07 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 0, Super Dead 0, SW 0.9 < 275	0.88 N/mm²	OK
TOTAL (Compression)	Live 0, Super Dead 0, SW 0.9 < 275	0.88 N/mm²	OK

Vibration Analysis

Beam Deflection		0.07 mm	
Natural Frequency	18/√(0.07) = 68.58 > 4 Hz	68.58 Hz	OK

UNPROPPED NON-COMPOSITE PRIMARY INTERNAL BEAM
Members 22, 45 and 48 (N.70-E10) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (86 kg/m)	203x203 UC 86 [S 275]
Floor Area Supported	4.15 m Span, 4.795 m to LH Beam and 2.81 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m
Transverse Beams	@ 2.285 and 2.745 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties	ye 111.1 mm, A 109.6 cm², Ix 9452 cm⁴, Zt 851 cm³, Zb 851 cm³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 51.8 kN, RH Support 84.42 kN	< 448.69 kN	OK
Check @ 2.739 m (Max. Moment)	M = 117.19 kN.m, Fv = 4.04 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 2.285 m	M = 115.23 kN.m, Fv = 49.05 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 2.745 m	M = 117.34 kN.m, Fv = 82.73 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

Lateral Torsional Buckling (Final Stage)

Check between 0 and 2.285 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 115.234, 0.6	69.14 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.285 m, 5.34 cm, 1, 0.85, 0.854	258.826 kN.m	OK
Check between 2.285 and 2.745 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	115.234, 117.336, 0.993	116.495 kN.m	
Mb=fn(L,ry,β_w,u,v)	0.46 m, 5.34 cm, 1, 0.85, 0.991	258.826 kN.m	OK

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Check between 2.745 and 4.15 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	117.336, 0, 0.6	70.402 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.405 m, 5.34 cm, 1, 0.85, 0.931	258.826 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 19.74 kN, RH Support 31.32 kN	< 448.69 kN	OK
Check @ 2.739 m (Max. Moment)	M = 42.65 kN.m, Fv = 1.23 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 2.285 m	M = 41.97 kN.m, Fv = 16.99 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 2.745 m	M = 42.78 kN.m, Fv = 29.62 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.285 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 41.968, 0.6	25.181 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.285 m, 5.34 cm, 1, 0.85, 0.854	258.826 kN.m	OK
Check between 2.285 and 2.745 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	41.968, 42.778, 0.992	42.454 kN.m	
Mb=fn(L,ry,β_w,u,v)	0.46 m, 5.34 cm, 1, 0.85, 0.991	258.826 kN.m	OK
Check between 2.745 and 4.15 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	42.778, 0, 0.6	25.667 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.405 m, 5.34 cm, 1, 0.85, 0.931	258.826 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 19.14 kN, RH Support 31.79 kN		
Super Imposed Dead Load	LH Support 2.79 kN, RH Support 4.68 kN		
Dead Load (Self Weight)	LH Support 12.28 kN, RH Support 19.34 kN		
Maximum Deflection			
Live Loads	3.55 (3.55) mm @ 2.2 m < L / 360 = 11.5 mm	3.55 mm	OK
Super Imposed Dead Loads	0.52 mm @ 2.2 m	0.52 mm	
Dead Loads (Self Weight)	2.12 mm @ 2.2 m	2.12 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 52.3, Super Dead 7.6, SW 30.8 < 265	90.76 N/mm²	OK
TOTAL (Compression)	Live 52.3, Super Dead 7.6, SW 30.8 < 265	90.76 N/mm²	OK

Vibration Analysis

Beam Deflection		2.99 mm	
Natural Frequency	18/√(2.99) = 10.4 > 4 Hz	10.40 Hz	OK

UNPROPPED NON-COMPOSITE PRIMARY EDGE BEAM
Members 24 and 56 (A8-D8) @ Level 2

Summary of Design Data (Integrated Design)

Steel Section (107 kg/m)	254x254 UC 107 [S 275]
Floor Area Supported	3.78 m Span and 3.592 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m
Transverse Beam	@ 1.04 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties	ye 133.4 mm, A 136.4 cm², Ix 17517 cm⁴, Zt 1314 cm³, Zb 1314 cm³

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Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 123.13 kN, RH Support 46.69 kN	< 542.79 kN	OK
Check @ 1.058 m (Max. Moment)	M = 121.53 kN.m, Fv = 42.61 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK
Check @ 1.04 m	M = 122.33 kN.m, Fv = 112.12 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK

Lateral Torsional Buckling (Final Stage)

Check between 0 and 1.04 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 122.325, 0.6	73.395 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.04 m, 6.6 cm, 1, 0.848, 0.981	393.366 kN.m	OK
Check between 1.04 and 3.78 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	122.325, 0, 0.6	73.395 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.74 m, 6.6 cm, 1, 0.848, 0.895	393.366 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 34.56 kN, RH Support 14.87 kN	< 542.79 kN	OK
Check @ 1.058 m (Max. Moment)	M = 34.93 kN.m, Fv = 10.79 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK
Check @ 1.04 m	M = 35.13 kN.m, Fv = 33 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 1.04 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 35.132, 0.6	21.079 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.04 m, 6.6 cm, 1, 0.848, 0.981	393.366 kN.m	OK
Check between 1.04 and 3.78 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	35.132, 0, 0.6	21.079 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.74 m, 6.6 cm, 1, 0.848, 0.895	393.366 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 34.86 kN, RH Support 13.23 kN		
Super Imposed Dead Load	LH Support 26.74 kN, RH Support 8.87 kN		
Dead Load (Self Weight)	LH Support 21.37 kN, RH Support 9.36 kN		
Maximum Deflection			
Live Loads	1.13 (1.13) mm @ 1.663 m < L / 360 = 10.5 mm	1.13 mm	OK
Super Imposed Dead Loads	0.76 mm @ 1.663 m	0.76 mm	
Dead Loads (Self Weight)	0.71 mm @ 1.701 m	0.71 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 27.4, Super Dead 18.4, SW 16.4 < 265	62.16 N/mm²	OK
TOTAL (Compression)	Live 27.4, Super Dead 18.4, SW 16.4 < 265	62.16 N/mm²	OK

Vibration Analysis

Beam Deflection		1.59 mm	
Natural Frequency	18/√(1.59) = 14.29 > 4 Hz	14.29 Hz	OK

UNPROPPED NON-COMPOSITE PRIMARY INTERNAL BEAM
Members 26 and 73 (A4-D4) @ Level 2

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	3.875 m Span, 1.042 m to LH Beam and 3.592 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m

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Transverse Beam	@ 1.04 m		
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame		

Section Properties

Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³		

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 39.36 kN, RH Support 14.95 kN	< 218.38 kN	OK
Check @ 1.046 m (Max. Moment)	M = 40.62 kN.m, Fv = 13.76 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK
Check @ 1.04 m	M = 40.71 kN.m, Fv = 38.93 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Lateral Torsional Buckling (Final Stage)

Check between 0 and 1.04 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 40.707, 0.6	24.424 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.04 m, 3.18 cm, 1, 0.882, 0.973	86.46 kN.m	OK
Check between 1.04 and 3.875 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	40.707, 0, 0.6	24.424 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.835 m, 3.18 cm, 1, 0.882, 0.856	61.27 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 14.03 kN, RH Support 5.66 kN	< 218.38 kN	OK
Check @ 1.046 m (Max. Moment)	M = 14.33 kN.m, Fv = 4.47 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK
Check @ 1.04 m	M = 14.36 kN.m, Fv = 13.59 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 1.04 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 14.362, 0.6	8.617 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.04 m, 3.18 cm, 1, 0.882, 0.973	86.46 kN.m	OK
Check between 1.04 and 3.875 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	14.362, 0, 0.6	8.617 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.835 m, 3.18 cm, 1, 0.882, 0.856	61.27 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 15.15 kN, RH Support 5.56 kN		
Super Imposed Dead Load	LH Support 2.22 kN, RH Support 0.82 kN		
Dead Load (Self Weight)	LH Support 8.58 kN, RH Support 3.51 kN		
Maximum Deflection			
Live Loads	3.12 (3.12) mm @ 1.705 m < L / 360 = 10.7 mm	3.12 mm	OK
Super Imposed Dead Loads	0.46 mm @ 1.705 m	0.46 mm	
Dead Loads (Self Weight)	1.79 mm @ 1.744 m	1.79 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 56.1, Super Dead 8.2, SW 31.2 < 275	95.54 N/mm²	OK
TOTAL (Compression)	Live 56.1, Super Dead 8.2, SW 31.2 < 275	95.54 N/mm²	OK

Vibration Analysis

Beam Deflection		2.56 mm	
Natural Frequency	18/√(2.56) = 11.24 > 4 Hz	11.24 Hz	OK

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UNPROPPED NON-COMPOSITE PRIMARY EDGE BEAM
Members 36-38 (F13-K13) @ Level 2

Summary of Design Data (Integrated Design)

Steel Section (198 kg/m)	305x305 UC 198 [S 275]
Floor Area Supported	4.702 m Span and 4.735 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m
Transverse Beams	@ 0.928 and 2.351 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties	ye 170 mm, A 252.4 cm², Ix 50918 cm⁴, Zt 2996 cm³, Zb 2996 cm³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 798.5 kN, RH Support 207.96 kN	< 1032.24 kN	OK
Check @ 0.893 m (Max. Moment)	M = 708.62 kN.m, Fv = 787.89 kN		
Moment Capacity	Plastic neutral axis in web @ 170 mm	851.93 kN.m	OK
Check @ 0.928 m	M = 735.89 kN.m, Fv = 787.49 kN		
Moment Capacity	Plastic neutral axis in web @ 170 mm	852.07 kN.m	OK
Check @ 2.351 m	M = 456.2 kN.m, Fv = 180.06 kN		
Moment Capacity	Plastic neutral axis in web @ 170 mm	911.6 kN.m	OK

Lateral Torsional Buckling (Final Stage)

Check between 0 and 0.928 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 735.89, 0.6	441.534 kN.m	
Mb=fn(L,ry,β_w,u,v)	0.928 m, 8.04 cm, 1, 0.854, 1	911.6 kN.m	OK
Check between 0.928 and 2.351 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	735.89, 456.196, 0.848	624.012 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.423 m, 8.04 cm, 1, 0.854, 1	911.6 kN.m	OK
Check between 2.351 and 4.702 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	456.196, 0, 0.6	273.718 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.351 m, 8.04 cm, 1, 0.854, 1	911.6 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 251.19 kN, RH Support 65.07 kN	< 1032.24 kN	OK
Check @ 0.893 m (Max. Moment)	M = 223.3 kN.m, Fv = 248.71 kN		
Moment Capacity	Plastic neutral axis in web @ 170 mm	911.6 kN.m	OK
Check @ 0.928 m	M = 231.91 kN.m, Fv = 248.62 kN		
Moment Capacity	Plastic neutral axis in web @ 170 mm	911.6 kN.m	OK
Check @ 2.351 m	M = 145.34 kN.m, Fv = 58.55 kN		
Moment Capacity	Plastic neutral axis in web @ 170 mm	911.6 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 0.928 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 231.909, 0.6	139.145 kN.m	
Mb=fn(L,ry,β_w,u,v)	0.928 m, 8.04 cm, 1, 0.854, 1	911.6 kN.m	OK
Check between 0.928 and 2.351 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	231.909, 145.342, 0.851	197.282 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.423 m, 8.04 cm, 1, 0.854, 1	911.6 kN.m	OK
Check between 2.351 and 4.702 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	145.342, 0, 0.6	87.205 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.351 m, 8.04 cm, 1, 0.854, 1	911.6 kN.m	OK

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Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 256.64 kN, RH Support 63.13 kN		
Super Imposed Dead Load	LH Support 114.33 kN, RH Support 34.3 kN		
Dead Load (Self Weight)	LH Support 154.98 kN, RH Support 40.47 kN		
Maximum Deflection			
Live Loads	3.55 (3.55) mm @ 2.116 m < L / 360 = 13 mm	3.55 mm	OK
Super Imposed Dead Loads	1.53 mm @ 2.116 m	1.53 mm	
Dead Loads (Self Weight)	2.15 mm @ 2.116 m	2.15 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 76.5, Super Dead 33.2, SW 45.9 < 265	155.70 N/mm²	OK
TOTAL (Compression)	Live 76.5, Super Dead 33.2, SW 45.9 < 265	155.70 N/mm²	OK

Vibration Analysis

Beam Deflection		4.03 mm	
Natural Frequency	18/√(4.03) = 8.96 > 4 Hz	8.96 Hz	OK

UNPROPPED COMPOSITE PRIMARY EDGE BEAM
Members 40, 79 and 87 (B14-F14) @ Level 3

Summary of Design Data (Integrated Design)

Steel Section (86 kg/m)	203x203 UC 86 [S 275]
Floor Area Supported	7.1 m Span and 4.17 m to LH Beam
Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 13.79, Gr 40 with 252+252 mm²/m
Headed Stud Connector	19x95 mm Placed @ 325 mm centre
Transverse Beams	@ 2.367 and 4.733 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	122 x 971 mm², b1= 888 mm and b2= 84 mm
Steel Section Elastic Properties	ye 111.1 mm, A 109.6 cm², Ix 9452 cm⁴, Zt 851 cm³, Zb 851 cm³
Composite Section Elastic Properties	ye 162 mm, Ix 26140 cm⁴, Zs.t 8175 cm³, Zs.b 1374 cm³, Zc.t 22255 cm³
Headed Stud Connector	21 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 109.22 kN, RH Support 108.75 kN	< 448.69 kN	OK
Check @ 3.479 m (Max. Moment)	M = 236.31 kN.m, Fv = 0.26 kN		
Shear Connection	No of shear connectors from nearest support 10 < 24.4	Partial	
Axial Resistance (kN)	Rc 2131.7 kN, Rs 2905.2 kN, Rq 872 kN	872 kN	
Degree of Shear Connection	Na/Np = 10 / 24.4 > 0.4	0.409	OK
Reduced Concrete Area	Area required to resist 872 kN	49.9x971.1mm²	
Moment Capacity	Plastic neutral axis in top flange @ 148.1 mm	393.55 kN.m	OK
Check @ 2.367 m	M = 229.66 kN.m, Fv = 84.84 kN		
Shear Connection	No of shear connectors from nearest support 7 < 24.4	Partial	
Axial Resistance (kN)	Rc 2131.7 kN, Rs 2905.2 kN, Rq 610.4 kN	610.4 kN	
Reduced Concrete Area	Area required to resist 610.4 kN	34.9x971.1mm²	
Moment Capacity	Plastic neutral axis in top flange @ 150.5 mm	365.58 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 325 mm	3.08 per m	
Vr = fn(Asv,fy,Acv,fcu)	504, 460, 79000, 40	257.09 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.08x87.2x0.89/(0.89+0.08)	245.20 kN	OK

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Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 29.07 kN, RH Support 28.92 kN	< 448.69 kN	OK
Check @ 3.408 m (Max. Moment)	M = 66.11 kN.m, Fv = 0.02 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 2.367 m	M = 65.44 kN.m, Fv = 26.22 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.367 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 65.44, 0.6	39.264 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.367 m, 5.34 cm, 1, 0.85, 0.847	258.826 kN.m	OK
Check between 2.367 and 4.733 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	65.44, 65.44, 1	65.44 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.366 m, 5.34 cm, 1, 0.85, 0.847	258.826 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 28.61 kN, RH Support 28.43 kN		
Super Imposed Dead Load	LH Support 27.27 kN, RH Support 27.24 kN		
Dead Load (Self Weight)	LH Support 18.04 kN, RH Support 17.95 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	6.76 (8.88) mm @ 3.55 m < L / 360 = 19.7 mm	8.88 mm	OK
Super Imposed Dead Loads	5.00 (6.57) mm @ 3.55 m	6.57 mm	
Dead Loads (Self Weight)	11.26 mm @ 3.55 m	11.26 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 49.3, Super Dead 37, SW 48 < 265	134.23 N/mm²	OK
TOTAL (Compression)	Live 8.3, Super Dead 6.2, SW 48 < 265	62.46 N/mm²	OK
Maximum Concrete Stress	Live 3.04, Super Dead 2.28, SW 0 < 20	5.33 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	11.53 mm	
Natural Frequency	18/√(11.53/1.1) = 5.56 > 4 Hz	5.56 Hz	OK

UNPROPPED COMPOSITE PRIMARY INTERNAL BEAM
Members 41 and 93-94 (B13-F13) @ Level 3

Summary of Design Data (Integrated Design)

Steel Section (86 kg/m)	203x203 UC 86 [S 275]
Floor Area Supported	6.52 m Span, 4.735 m to LH Beam and 4.17 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+503 mm²/m
Headed Stud Connector	19x95 mm Placed @ 150 mm centre
Transverse Beams	@ 2.443 and 4.347 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	122 x 1630 mm², b1= 815 mm and b2= 815 mm
Steel Section Elastic Properties	ye 111.1 mm, A 109.6 cm², Ix 9452 cm⁴, Zt 851 cm³, Zb 851 cm³
Composite Section Elastic Properties	ye 125 mm, Ix 34841 cm⁴, Zs.t 69739 cm³, Zs.b 1534 cm³, Zc.t 27872 cm³
Headed Stud Connector	43 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 143.9 kN, RH Support 153.95 kN	< 448.69 kN	OK
Check @ 2.478 m (Max. Moment)	M = 347.68 kN.m, Fv = 7.43 kN		
Shear Connection	No of shear connectors from nearest support 16 < 33.3	Partial	

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Axial Resistance (kN)	Rc 3577.94 kN, Rs 2905.2 kN, Rq 1395.2 kN	1395.2 kN	
Degree of Shear Connection	Na/Np = 16 / 33.3 > 0.4	0.48	OK
Reduced Concrete Area	Area required to resist 1395.2 kN	47.6x1630mm²	
Moment Capacity	Plastic neutral axis in top flange @ 143.4 mm	458.39 kN.m	OK
Check @ 2.443 m	M = 347.95 kN.m, Fv = 140.96 kN		
Shear Connection	No of shear connectors from nearest support 16 < 33.3	Partial	
Axial Resistance (kN)	Rc 3577.94 kN, Rs 2905.2 kN, Rq 1395.2 kN	1395.2 kN	
Reduced Concrete Area	Area required to resist 1395.2 kN	47.6x1630mm²	
Moment Capacity	Plastic neutral axis in top flange @ 143.4 mm	458.39 kN.m	OK
Check @ 4.347 m	M = 331.7 kN.m, Fv = 151.33 kN		
Shear Connection	No of shear connectors from nearest support 15 < 33.3	Partial	
Axial Resistance (kN)	Rc 3577.94 kN, Rs 2905.2 kN, Rq 1308 kN	1308 kN	
Reduced Concrete Area	Area required to resist 1308 kN	44.6x1630mm²	
Moment Capacity	Plastic neutral axis in top flange @ 144.2 mm	449.87 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 150 mm	6.67 per m	
Vr = fn(Asv,fy,Acv,fcu)	755, 460, 79000, 40	337.91 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	6.67x87.2x0.82/(0.82+0.82)	290.67 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 51.78 kN, RH Support 55.23 kN	< 448.69 kN	OK
Check @ 2.478 m (Max. Moment)	M = 122.82 kN.m, Fv = 1.9 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 2.443 m	M = 122.91 kN.m, Fv = 48.84 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 4.347 m	M = 117.17 kN.m, Fv = 52.62 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.443 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 122.905, 0.6	73.743 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.443 m, 5.34 cm, 1, 0.85, 0.841	258.826 kN.m	OK
Check between 2.443 and 4.347 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	122.905, 117.173, 0.981	120.612 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.904 m, 5.34 cm, 1, 0.85, 0.888	258.826 kN.m	OK
Check between 4.347 and 6.52 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	117.173, 0, 0.6	70.304 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.173 m, 5.34 cm, 1, 0.85, 0.864	258.826 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 55.1 kN, RH Support 59.04 kN		
Super Imposed Dead Load	LH Support 8.08 kN, RH Support 8.66 kN		
Dead Load (Self Weight)	LH Support 31.74 kN, RH Support 33.83 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	8.15 (10.58) mm @ 3.26 m < L / 360 = 18.1 mm	10.58 mm	OK
Super Imposed Dead Loads	1.20 (1.55) mm @ 3.26 m	1.55 mm	
Dead Loads (Self Weight)	16.83 mm @ 3.26 m	16.83 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 87.7, Super Dead 12.9, SW 88.1 < 265	188.61 N/mm²	OK
TOTAL (Compression)	Live 1.9, Super Dead 0.3, SW 88.1 < 265	90.28 N/mm²	OK
Maximum Concrete Stress	Live 4.82, Super Dead 0.71, SW 0 < 20	5.53 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	7.17 mm	
Natural Frequency	18/√(7.17/1.1) = 7.05 > 4 Hz	7.05 Hz	OK

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UNPROPPED NON-COMPOSITE PRIMARY INTERNAL BEAM
Members 42 and 102 (B12-E12) @ Level 2

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]		
Floor Area Supported	4.15 m Span, 2.81 m to LH Beam and 4.735 m to RH Beam		
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick		
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m		
Transverse Beam	@ 2.285 m		
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame		

Section Properties

Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³		

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 0.48 kN, RH Support 0.39 kN	< 169.03 kN	OK
Check @ 1.121 m (Max. Moment)	M = 0.27 kN.m, Fv = 0.01 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK
Check @ 2.285 m	M = 0 kN.m, Fv = 0.48 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Lateral Torsional Buckling (Final Stage)

Check between 0 and 2.285 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 0, 1	0 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.285 m, 3.83 cm, 1, 0.849, 0.876	62.316 kN.m	OK
Check between 2.285 and 4.15 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 0, 1	0 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.865 m, 3.83 cm, 1, 0.849, 0.909	66.261 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 0.48 kN, RH Support 0.39 kN	< 169.03 kN	OK
Check @ 1.121 m (Max. Moment)	M = 0.27 kN.m, Fv = 0.01 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK
Check @ 2.285 m	M = 0 kN.m, Fv = 0.48 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.285 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 0, 1	0 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.285 m, 3.83 cm, 1, 0.849, 0.876	62.316 kN.m	OK
Check between 2.285 and 4.15 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 0, 1	0 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.865 m, 3.83 cm, 1, 0.849, 0.909	66.261 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	0 kN each side		
Super Imposed Dead Load	0 kN each side		
Dead Load (Self Weight)	LH Support 0.34 kN, RH Support 0.28 kN		
Maximum Deflection			
Live Loads	0.00 (0.00) mm @ 3.984 m < L / 360 = 11.5 mm	0.00 mm	OK

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Super Imposed Dead Loads	0.00 mm @ 4.026 m	0.00 mm	
Dead Loads (Self Weight)	0.07 mm @ 1.702 m	0.07 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 0, Super Dead 0, SW 0.9 < 275	0.88 N/mm²	OK
TOTAL (Compression)	Live 0, Super Dead 0, SW 0.9 < 275	0.88 N/mm²	OK

Vibration Analysis

Beam Deflection		0.07 mm	
Natural Frequency	18/√(0.07) = 68.58 > 4 Hz	68.58 Hz	OK

UNPROPPED COMPOSITE PRIMARY INTERNAL BEAM
Members 44, 47 and 50 (E12-K12) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (86 kg/m)	203x203 UC 86 [S 275]
Floor Area Supported	6.497 m Span, 2.81 m to LH Beam and 4.735 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+252 mm²/m
Headed Stud Connector	19x95 mm Placed @ 175 mm centre
Transverse Beams	@ 2.173 and 4.146 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	122 x 1624 mm², b1= 812 mm and b2= 812 mm	Steel Section
Elastic Properties	ye 111.1 mm, A 109.6 cm², Ix 9452 cm⁴, Zt 851 cm³, Zb 851 cm³	Composite
Section Elastic Properties	ye 125.2 mm, Ix 34803 cm⁴, Zs.t 71760 cm³, Zs.b 1533 cm³, Zc.t 27809 cm³	
Headed Stud Connector	37 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)	

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 130.17 kN, RH Support 124.55 kN	< 448.69 kN	OK
Check @ 4.093 m (Max. Moment)	M = 289.3 kN.m, Fv = 3.69 kN		
Shear Connection	No of shear connectors from nearest support 14 < 33.3	Partial	
Axial Resistance (kN)	Rc 3565.31 kN, Rs 2905.2 kN, Rq 1220.8 kN	1220.8 kN	
Degree of Shear Connection	Na/Np = 14 / 33.3 > 0.4	0.42	OK
Reduced Concrete Area	Area required to resist 1220.8 kN	41.8x1624.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 145 mm	440.93 kN.m	OK
Check @ 2.173 m	M = 280.02 kN.m, Fv = 127.55 kN		
Shear Connection	No of shear connectors from nearest support 12 < 33.3	Partial	
Axial Resistance (kN)	Rc 3565.31 kN, Rs 2905.2 kN, Rq 1046.4 kN	1046.4 kN	
Reduced Concrete Area	Area required to resist 1046.4 kN	35.8x1624.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 146.6 mm	422.27 kN.m	OK
Check @ 4.146 m	M = 289.49 kN.m, Fv = 121.72 kN		
Shear Connection	No of shear connectors from nearest support 14 < 33.3	Partial	
Axial Resistance (kN)	Rc 3565.31 kN, Rs 2905.2 kN, Rq 1220.8 kN	1220.8 kN	
Reduced Concrete Area	Area required to resist 1220.8 kN	41.8x1624.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 145 mm	440.93 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 175 mm	5.71 per m	
Vr = fn(Asv,fy,Acv,fcu)	504, 460, 79000, 40	257.09 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	5.71x87.2x0.81/(0.81+0.81)	249.14 kN	OK

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Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 47.09 kN, RH Support 45.16 kN	< 448.69 kN	OK
Check @ 4.093 m (Max. Moment)	M = 102.8 kN.m, Fv = 0.58 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 2.173 m	M = 99.48 kN.m, Fv = 44.47 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 4.146 m	M = 102.83 kN.m, Fv = 42.32 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.173 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 99.477, 0.6	59.686 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.173 m, 5.34 cm, 1, 0.85, 0.864	258.826 kN.m	OK
Check between 2.173 and 4.146 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	99.477, 102.825, 0.987	101.486 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.973 m, 5.34 cm, 1, 0.85, 0.882	258.826 kN.m	OK
Check between 4.146 and 6.497 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	102.825, 0, 0.6	61.695 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.351 m, 5.34 cm, 1, 0.85, 0.849	258.826 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 49.69 kN, RH Support 47.49 kN		
Super Imposed Dead Load	LH Support 7.29 kN, RH Support 6.96 kN		
Dead Load (Self Weight)	LH Support 28.9 kN, RH Support 27.73 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	6.81 (9.33) mm @ 3.249 m < L / 360 = 18 mm	9.33 mm	OK
Super Imposed Dead Loads	1.00 (1.37) mm @ 3.249 m	1.37 mm	
Dead Loads (Self Weight)	14.20 mm @ 3.249 m	14.20 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 72.8, Super Dead 10.7, SW 73.8 < 265	157.25 N/mm²	OK
TOTAL (Compression)	Live 1.6, Super Dead 0.2, SW 73.8 < 265	75.61 N/mm²	OK
Maximum Concrete Stress	Live 4.01, Super Dead 0.59, SW 0 < 20	4.60 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	6.16 mm	
Natural Frequency	18/√(6.16/1.1) = 7.61 > 4 Hz	7.61 Hz	OK

UNPROPPED NON-COMPOSITE PRIMARY INTERNAL BEAM
Members 46, 105 and 107 (N.97-E10) @ Level 2

Summary of Design Data (Integrated Design)

Steel Section (86 kg/m)	203x203 UC 86 [S 275]
Floor Area Supported	4.15 m Span, 4.795 m to LH Beam and 2.81 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m
Transverse Beams	@ 2.285 and 2.745 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties	ye 111.1 mm, A 109.6 cm², Ix 9452 cm⁴, Zt 851 cm³, Zb 851 cm³

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Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 51.8 kN, RH Support 84.42 kN	< 448.69 kN	OK
Check @ 2.739 m (Max. Moment)	M = 117.2 kN.m, Fv = 4.04 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 2.285 m	M = 115.24 kN.m, Fv = 49.05 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 2.745 m	M = 117.33 kN.m, Fv = 82.73 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

Lateral Torsional Buckling (Final Stage)

Check between 0 and 2.285 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 115.24, 0.6	69.144 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.285 m, 5.34 cm, 1, 0.85, 0.854	258.826 kN.m	OK
Check between 2.285 and 2.745 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	115.24, 117.332, 0.993	116.495 kN.m	
Mb=fn(L,ry,β_w,u,v)	0.46 m, 5.34 cm, 1, 0.85, 0.991	258.826 kN.m	OK
Check between 2.745 and 4.15 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	117.332, 0, 0.6	70.399 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.405 m, 5.34 cm, 1, 0.85, 0.931	258.826 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 19.74 kN, RH Support 31.32 kN	< 448.69 kN	OK
Check @ 2.739 m (Max. Moment)	M = 42.65 kN.m, Fv = 1.23 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 2.285 m	M = 41.97 kN.m, Fv = 16.99 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 2.745 m	M = 42.78 kN.m, Fv = 29.62 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.285 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 41.971, 0.6	25.183 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.285 m, 5.34 cm, 1, 0.85, 0.854	258.826 kN.m	OK
Check between 2.285 and 2.745 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	41.971, 42.776, 0.992	42.454 kN.m	
Mb=fn(L,ry,β_w,u,v)	0.46 m, 5.34 cm, 1, 0.85, 0.991	258.826 kN.m	OK
Check between 2.745 and 4.15 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	42.776, 0, 0.6	25.666 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.405 m, 5.34 cm, 1, 0.85, 0.931	258.826 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 19.14 kN, RH Support 31.79 kN		
Super Imposed Dead Load	LH Support 2.79 kN, RH Support 4.68 kN		
Dead Load (Self Weight)	LH Support 12.28 kN, RH Support 19.34 kN		
Maximum Deflection			
Live Loads	3.55 (3.55) mm @ 2.2 m < L / 360 = 11.5 mm	3.55 mm	OK
Super Imposed Dead Loads	0.52 mm @ 2.2 m	0.52 mm	
Dead Loads (Self Weight)	2.12 mm @ 2.2 m	2.12 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 52.3, Super Dead 7.6, SW 30.8 < 265	90.77 N/mm²	OK
TOTAL (Compression)	Live 52.3, Super Dead 7.6, SW 30.8 < 265	90.77 N/mm²	OK

Vibration Analysis

Beam Deflection		2.99 mm	
Natural Frequency	18/√(2.99) = 10.4 > 4 Hz	10.40 Hz	OK

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UNPROPPED COMPOSITE PRIMARY INTERNAL BEAM
Members 51, 54, 57 and 63 (E10-K10) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (86 kg/m)	203x203 UC 86 [S 275]
Floor Area Supported	6.147 m Span, 4.795 m to LH Beam and 2.81 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+393 mm²/m
Headed Stud Connector	19x95 mm Placed @ 150 mm centre
Transverse Beams	@ 0.522, 2.173 and 4.16 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	122 x 1537 mm², b1= 768 mm and b2= 768 mm
Steel Section Elastic Properties	ye 111.1 mm, A 109.6 cm², Ix 9452 cm⁴, Zt 851 cm³, Zb 851 cm³
Composite Section Elastic Properties	ye 127.5 mm, Ix 34216 cm⁴, Zs.t 134470 cm³, Zs.b 1522 cm³, Zc.t 26846 cm³
Headed Stud Connector	40 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 171.98 kN, RH Support 125.52 kN	< 448.69 kN	OK
Check @ 2.213 m (Max. Moment)	M = 262.97 kN.m, Fv = 7.01 kN		
Shear Connection	No of shear connectors from nearest support 14 < 33.3	Partial	
Axial Resistance (kN)	Rc 3373.25 kN, Rs 2905.2 kN, Rq 1220.8 kN	1220.8 kN	
Degree of Shear Connection	Na/Np = 14 / 33.3 > 0.4	0.42	OK
Reduced Concrete Area	Area required to resist 1220.8 kN	44.1x1536.8mm²	
Moment Capacity	Plastic neutral axis in top flange @ 145 mm	439.48 kN.m	OK
Check @ 0.522 m	M = 89.71 kN.m, Fv = 171.35 kN		
Shear Connection	No of shear connectors from nearest support 3 < 33.3	Partial	
Axial Resistance (kN)	Rc 3373.25 kN, Rs 2905.2 kN, Rq 261.6 kN	261.6 kN	
Reduced Concrete Area	Area required to resist 261.6 kN	9.5x1536.8mm²	
Moment Capacity	Plastic neutral axis in web @ 202.2 mm	313.49 kN.m	OK
Check @ 2.173 m	M = 263.25 kN.m, Fv = 104.18 kN		
Shear Connection	No of shear connectors from nearest support 14 < 33.3	Partial	
Axial Resistance (kN)	Rc 3373.25 kN, Rs 2905.2 kN, Rq 1220.8 kN	1220.8 kN	
Reduced Concrete Area	Area required to resist 1220.8 kN	44.1x1536.8mm²	
Moment Capacity	Plastic neutral axis in top flange @ 145 mm	439.48 kN.m	OK
Check @ 4.16 m	M = 247.05 kN.m, Fv = 123.12 kN		
Shear Connection	No of shear connectors from nearest support 13 < 33.3	Partial	
Axial Resistance (kN)	Rc 3373.25 kN, Rs 2905.2 kN, Rq 1133.6 kN	1133.6 kN	
Reduced Concrete Area	Area required to resist 1133.6 kN	41x1536.8mm²	
Moment Capacity	Plastic neutral axis in top flange @ 145.8 mm	430.51 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 150 mm	6.67 per m	
Vr = fn(Asv,fy,Acv,fcu)	645, 460, 79000, 40	302.49 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	6.67x87.2x0.77/(0.77+0.77)	290.67 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 61.45 kN, RH Support 45.46 kN	< 448.69 kN	OK
Check @ 2.213 m (Max. Moment)	M = 93.62 kN.m, Fv = 1.73 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 0.522 m	M = 31.94 kN.m, Fv = 60.82 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

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Check @ 2.173 m	M = 93.7 kN.m, Fv = 36.43 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 4.16 m	M = 87.97 kN.m, Fv = 43.07 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 0.522 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 31.944, 0.6	19.166 kN.m	
Mb=fn(L,ry,β_w,u,v)	0.522 m, 5.34 cm, 1, 0.85, 0.989	258.826 kN.m	OK
Check between 0.522 and 2.173 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	31.944, 93.695, 0.736	68.995 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.651 m, 5.34 cm, 1, 0.85, 0.91	258.826 kN.m	OK
Check between 2.173 and 4.16 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	93.695, 87.965, 0.976	91.403 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.987 m, 5.34 cm, 1, 0.85, 0.881	258.826 kN.m	OK
Check between 4.16 and 6.147 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	87.965, 0, 0.6	52.779 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.987 m, 5.34 cm, 1, 0.85, 0.881	258.826 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 66.11 kN, RH Support 47.88 kN		
Super Imposed Dead Load	LH Support 9.7 kN, RH Support 7.02 kN		
Dead Load (Self Weight)	LH Support 37.59 kN, RH Support 27.91 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	5.68 (7.47) mm @ 3.074 m < L / 360 = 17 mm	7.47 mm	OK
Super Imposed Dead Loads	0.83 (1.10) mm @ 3.074 m	1.10 mm	
Dead Loads (Self Weight)	11.69 mm @ 3.074 m	11.69 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 66.5, Super Dead 9.8, SW 67.3 < 265	143.55 N/mm²	OK
TOTAL (Compression)	Live 0.8, Super Dead 0.1, SW 67.3 < 265	68.13 N/mm²	OK
Maximum Concrete Stress	Live 3.77, Super Dead 0.55, SW 0 < 20	4.33 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	5.07 mm	
Natural Frequency	18/√(5.07/1.1) = 8.38 > 4 Hz	8.38 Hz	OK

UNPROPPED COMPOSITE PRIMARY INTERNAL BEAM
Members 52, 58, 64 and 67 (D9-K9) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (107 kg/m)	254x254 UC 107 [S 275]
Floor Area Supported	7.032 m Span, 6.705 m to LH Beam and 4.795 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+393 mm²/m
Headed Stud Connector	19x95 mm Placed @ 175 mm centre
Transverse Beams	@ 1.865, 3.516 and 5.503 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	122 x 1758 mm², b1= 879 mm and b2= 879 mm
Steel Section Elastic Properties	ye 133.4 mm, A 136.4 cm², Ix 17517 cm⁴, Zt 1314 cm³, Zb 1314 cm³

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Composite Section Elastic Properties	ye 139.7 mm, Ix 54313 cm^4, Zs.t 56228 cm^3, Zs.b 2113 cm^3, Zc.t 38889 cm^3		
Headed Stud Connector	40 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)		

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 230.34 kN, RH Support 247.69 kN	< 542.79 kN	OK
Check @ 3.516 m (Max. Moment)	M = 550.18 kN.m, Fv = 73.38 kN		
Shear Connection	No of shear connectors from nearest support 20 < 41.4	Partial	
Axial Resistance (kN)	Rc 3858.9 kN, Rs 3614.07 kN, Rq 1744 kN	1744 kN	
Degree of Shear Connection	Na/Np = 20 / 41.4 > 0.4	0.483	OK
Reduced Concrete Area	Area required to resist 1744 kN	55.1x1758mm²	
Moment Capacity	Plastic neutral axis in top flange @ 143.4 mm	643.46 kN.m	OK
Check @ 1.865 m	M = 427.05 kN.m, Fv = 227.55 kN		
Shear Connection	No of shear connectors from nearest support 10 < 41.4	Partial	
Axial Resistance (kN)	Rc 3858.9 kN, Rs 3614.07 kN, Rq 872 kN	872 kN	
Reduced Concrete Area	Area required to resist 872 kN	27.6x1758mm²	
Moment Capacity	Plastic neutral axis in top flange @ 149.7 mm	551.72 kN.m	OK
Check @ 5.503 m	M = 377.01 kN.m, Fv = 245.39 kN		
Shear Connection	No of shear connectors from nearest support 9 < 41.4	Partial	
Axial Resistance (kN)	Rc 3858.9 kN, Rs 3614.07 kN, Rq 784.8 kN	784.8 kN	
Reduced Concrete Area	Area required to resist 784.8 kN	24.8x1758mm²	
Moment Capacity	Plastic neutral axis in top flange @ 150.4 mm	540.91 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 175 mm	5.71 per m	
Vr = fn(Asv,fy,Acv,fcu)	645, 460, 79000, 40	302.49 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	5.71x87.2x0.88/(0.88+0.88)	249.14 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 83.01 kN, RH Support 89.95 kN	< 542.79 kN	OK
Check @ 3.516 m (Max. Moment)	M = 196.46 kN.m, Fv = 25.57 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK
Check @ 1.865 m	M = 152.23 kN.m, Fv = 80.22 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK
Check @ 5.503 m	M = 135.77 kN.m, Fv = 87.66 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 1.865 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 152.23, 0.6	91.338 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.865 m, 6.6 cm, 1, 0.848, 0.944	393.366 kN.m	OK
Check between 1.865 and 3.516 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	152.23, 196.461, 0.91	178.769 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.651 m, 6.6 cm, 1, 0.848, 0.955	393.366 kN.m	OK
Check between 3.516 and 5.503 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	196.461, 135.768, 0.876	172.184 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.987 m, 6.6 cm, 1, 0.848, 0.937	393.366 kN.m	OK
Check between 5.503 and 7.032 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	135.768, 0, 0.6	81.461 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.529 m, 6.6 cm, 1, 0.848, 0.961	393.366 kN.m	OK

Serviceability Limit State

Support Reactions (kN)	
Live Loads	LH Support 88.11 kN, RH Support 94.35 kN
Super Imposed Dead Load	LH Support 12.92 kN, RH Support 13.84 kN
Dead Load (Self Weight)	LH Support 50.9 kN, RH Support 55.26 kN

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Maximum Deflection (Partial Connection All Loads)			
Live Loads	9.26 (12.28) mm @ 3.516 m < L / 360 = 19.5 mm	12.28 mm	OK
Super Imposed Dead Loads	1.36 (1.80) mm @ 3.516 m	1.80 mm	
Dead Loads (Self Weight)	16.40 mm @ 3.516 m	16.40 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 100.1, Super Dead 14.7, SW 91.5 < 265	206.27 N/mm²	OK
TOTAL (Compression)	Live 3.8, Super Dead 0.6, SW 91.5 < 265	95.80 N/mm²	OK
Maximum Concrete Stress	Live 5.44, Super Dead 0.8, SW 0 < 20	6.24 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	8.32 mm	
Natural Frequency	18/√(8.32/1.1) = 6.55 > 4 Hz	6.55 Hz	OK

UNPROPPED NON-COMPOSITE PRIMARY EDGE BEAM
Members 53 and 128 (A8-D8) @ Level 3

Summary of Design Data (Integrated Design)

Steel Section (107 kg/m)	254x254 UC 107 [S 275]
Floor Area Supported	3.78 m Span and 3.592 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m
Transverse Beam	@ 1.04 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties	ye 133.4 mm, A 136.4 cm², Ix 17517 cm⁴, Zt 1314 cm³, Zb 1314 cm³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 123.13 kN, RH Support 46.69 kN	< 542.79 kN	OK
Check @ 1.058 m (Max. Moment)	M = 121.52 kN.m, Fv = 42.61 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK
Check @ 1.04 m	M = 122.33 kN.m, Fv = 112.12 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK

Lateral Torsional Buckling (Final Stage)

Check between 0 and 1.04 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 122.326, 0.6	73.396 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.04 m, 6.6 cm, 1, 0.848, 0.981	393.366 kN.m	OK
Check between 1.04 and 3.78 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	122.326, 0, 0.6	73.396 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.74 m, 6.6 cm, 1, 0.848, 0.895	393.366 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 34.56 kN, RH Support 14.87 kN	< 542.79 kN	OK
Check @ 1.058 m (Max. Moment)	M = 34.93 kN.m, Fv = 10.79 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK
Check @ 1.04 m	M = 35.13 kN.m, Fv = 33.01 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 1.04 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 35.133, 0.6	21.08 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.04 m, 6.6 cm, 1, 0.848, 0.981	393.366 kN.m	OK

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Check between 1.04 and 3.78 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	35.133, 0, 0.6	21.08 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.74 m, 6.6 cm, 1, 0.848, 0.895	393.366 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 34.86 kN, RH Support 13.23 kN		
Super Imposed Dead Load	LH Support 26.74 kN, RH Support 8.87 kN		
Dead Load (Self Weight)	LH Support 21.37 kN, RH Support 9.36 kN		
Maximum Deflection			
Live Loads	1.13 (1.13) mm @ 1.663 m < L / 360 = 10.5 mm	1.13 mm	OK
Super Imposed Dead Loads	0.76 mm @ 1.663 m	0.76 mm	
Dead Loads (Self Weight)	0.71 mm @ 1.701 m	0.71 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 27.4, Super Dead 18.4, SW 16.4 < 265	62.16 N/mm²	OK
TOTAL (Compression)	Live 27.4, Super Dead 18.4, SW 16.4 < 265	62.16 N/mm²	OK

Vibration Analysis

Beam Deflection		1.59 mm	
Natural Frequency	18/√(1.59) = 14.29 > 4 Hz	14.29 Hz	OK

UNPROPPED COMPOSITE PRIMARY INTERNAL BEAM
Members 55, 65, 68 and 71 (D8-K8) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (107 kg/m)	254x254 UC 107 [S 275]
Floor Area Supported	6.27 m Span, 1.74 m to LH Beam and 6.705 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+393 mm²/m
Headed Stud Connector	19x95 mm Placed @ 175 mm centre
Transverse Beams	@ 1.568, 3.135 and 5.122 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	122 x 1480 mm², b1= 696 mm and b2= 784 mm
Steel Section Elastic Properties	ye 133.4 mm, A 136.4 cm², Ix 17517 cm⁴, Zt 1314 cm³, Zb 1314 cm³
Composite Section Elastic Properties	ye 148.1 mm, Ix 51566 cm⁴, Zs.t 28511 cm³, Zs.b 2074 cm³, Zc.t 34822 cm³
Headed Stud Connector	35 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 193.47 kN, RH Support 211.15 kN	< 542.79 kN	OK
Check @ 3.135 m (Max. Moment)	M = 400.49 kN.m, Fv = 61.98 kN		
Shear Connection	No of shear connectors from nearest support 17 < 37.2	Partial	
Axial Resistance (kN)	Rc 3248.13 kN, Rs 3614.07 kN, Rq 1482.4 kN	1482.4 kN	
Degree of Shear Connection	Na/Np = 17 / 37.2 > 0.4	0.456	OK
Reduced Concrete Area	Area required to resist 1482.4 kN	55.7x1479.8mm²	
Moment Capacity	Plastic neutral axis in top flange @ 145.3 mm	612.51 kN.m	OK
Check @ 1.568 m	M = 301.58 kN.m, Fv = 191.12 kN		
Shear Connection	No of shear connectors from nearest support 8 < 37.2	Partial	
Axial Resistance (kN)	Rc 3248.13 kN, Rs 3614.07 kN, Rq 697.6 kN	697.6 kN	
Reduced Concrete Area	Area required to resist 697.6 kN	26.2x1479.8mm²	
Moment Capacity	Plastic neutral axis in web @ 160.5 mm	528.05 kN.m	OK

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Check @ 5.122 m	M = 241.53 kN.m, Fv = 209.43 kN		
Shear Connection	No of shear connectors from nearest support 6 < 37.2	Partial	
Axial Resistance (kN)	Rc 3248.13 kN, Rs 3614.07 kN, Rq 523.2 kN	523.2 kN	
Reduced Concrete Area	Area required to resist 523.2 kN	19.6x1479.8mm²	
Moment Capacity	Plastic neutral axis in web @ 186.2 mm	501.81 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 175 mm	5.71 per m	
Vr = fn(Asv,fy,Acv,fcu)	645, 460, 79000, 40	302.49 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	5.71x87.2x0.78/(0.7+0.78)	263.92 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 70.02 kN, RH Support 77.21 kN	< 542.79 kN	OK
Check @ 3.135 m (Max. Moment)	M = 143.65 kN.m, Fv = 21.62 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK
Check @ 1.568 m	M = 107.97 kN.m, Fv = 67.67 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK
Check @ 5.122 m	M = 87.73 kN.m, Fv = 75.49 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 1.568 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 107.966, 0.6	64.78 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.568 m, 6.6 cm, 1, 0.848, 0.959	393.366 kN.m	OK
Check between 1.568 and 3.135 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	107.966, 143.653, 0.901	129.378 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.567 m, 6.6 cm, 1, 0.848, 0.959	393.366 kN.m	OK
Check between 3.135 and 5.122 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	143.653, 87.725, 0.844	121.282 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.987 m, 6.6 cm, 1, 0.848, 0.937	393.366 kN.m	OK
Check between 5.122 and 6.27 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	87.725, 0, 0.6	52.635 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.148 m, 6.6 cm, 1, 0.848, 0.977	393.366 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 73.84 kN, RH Support 80.1 kN		
Super Imposed Dead Load	LH Support 10.83 kN, RH Support 11.75 kN		
Dead Load (Self Weight)	LH Support 42.98 kN, RH Support 47.52 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	5.59 (7.36) mm @ 3.135 m < L / 360 = 17.4 mm	7.36 mm	OK
Super Imposed Dead Loads	0.82 (1.08) mm @ 3.135 m	1.08 mm	
Dead Loads (Self Weight)	9.49 mm @ 3.135 m	9.49 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 74.1, Super Dead 10.9, SW 67 < 265	151.91 N/mm²	OK
TOTAL (Compression)	Live 5.4, Super Dead 0.8, SW 67 < 265	73.15 N/mm²	OK
Maximum Concrete Stress	Live 4.41, Super Dead 0.65, SW 0 < 20	5.06 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	5.04 mm	
Natural Frequency	18/√(5.04/1.1) = 8.41 > 4 Hz	8.41 Hz	OK

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UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Members 59, 66, 69, 72 and 76 (D4-P4) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (107 kg/m)	254x254 UC 107 [S 275]
Floor Area Supported	6.739 m Span, .18 m to LH Beam and 1.79 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+393 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 932 mm², b1= 90 mm and b2= 842 mm
Steel Section Elastic Properties	ye 133.4 mm, A 136.4 cm², Ix 17517 cm⁴, Zt 1314 cm³, Zb 1314 cm³
Composite Section Elastic Properties	ye 184.8 mm, Ix 41866 cm⁴, Zs.t 7633 cm³, Zs.b 1976 cm³, Zc.t 22649 cm³
Headed Stud Connector	22 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 166.74 kN, RH Support 190.22 kN	< 542.79 kN	OK
Check @ 3.167 m (Max. Moment)	M = 358.56 kN.m, Fv = 9.68 kN		
Shear Connection	No of shear connectors from nearest support 10 < 15.2	Partial	
Axial Resistance (kN)	Rc 1325.84 kN, Rs 3614.07 kN, Rq 872 kN	872 kN	
Degree of Shear Connection	Na/Np = 10 / 15.2 > 0.4	0.658	OK
Reduced Concrete Area	Area required to resist 872 kN	52x932.4mm²	
Moment Capacity	Plastic neutral axis in top flange @ 149.7 mm	541.08 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	645, 460, 114000, 40, 87.5	431.99 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.84/(0.09+0.84)	259.15 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 59.73 kN, RH Support 67.51 kN	< 542.79 kN	OK
Check @ 3.167 m (Max. Moment)	M = 126.8 kN.m, Fv = 3.26 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 64.01 kN, RH Support 73.39 kN		
Super Imposed Dead Load	LH Support 9.39 kN, RH Support 10.76 kN		
Dead Load (Self Weight)	LH Support 36.56 kN, RH Support 41.23 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	7.45 (8.52) mm @ 3.37 m < L / 360 = 18.7 mm	8.52 mm	OK
Super Imposed Dead Loads	1.09 (1.25) mm @ 3.37 m	1.25 mm	
Dead Loads (Self Weight)	9.96 mm @ 3.37 m	9.96 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 70.1, Super Dead 10.3, SW 58.9 < 265	139.32 N/mm²	OK
TOTAL (Compression)	Live 18.2, Super Dead 2.7, SW 58.9 < 265	79.72 N/mm²	OK
Maximum Concrete Stress	Live 6.12, Super Dead 0.9, SW 0 < 20	7.02 N/mm²	OK

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Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	6.27 mm	
Natural Frequency	$18/\sqrt{(6.27/1.1)} = 7.54 > 4$ Hz	7.54 Hz	OK

UNPROPPED NON-COMPOSITE PRIMARY INTERNAL BEAM
Members 61 and 140 (A4-D4) @ Level 3

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	3.875 m Span, 1.042 m to LH Beam and 3.592 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m
Transverse Beam	@ 1.04 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 39.36 kN, RH Support 14.95 kN	< 218.38 kN	OK
Check @ 1.046 m (Max. Moment)	M = 40.62 kN.m, Fv = 13.76 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK
Check @ 1.04 m	M = 40.71 kN.m, Fv = 38.93 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Lateral Torsional Buckling (Final Stage)

Check between 0 and 1.04 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 40.707, 0.6	24.424 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.04 m, 3.18 cm, 1, 0.882, 0.973	86.46 kN.m	OK
Check between 1.04 and 3.875 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	40.707, 0, 0.6	24.424 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.835 m, 3.18 cm, 1, 0.882, 0.856	61.27 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 14.03 kN, RH Support 5.66 kN	< 218.38 kN	OK
Check @ 1.046 m (Max. Moment)	M = 14.33 kN.m, Fv = 4.47 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK
Check @ 1.04 m	M = 14.36 kN.m, Fv = 13.59 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 1.04 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 14.362, 0.6	8.617 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.04 m, 3.18 cm, 1, 0.882, 0.973	86.46 kN.m	OK
Check between 1.04 and 3.875 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	14.362, 0, 0.6	8.617 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.835 m, 3.18 cm, 1, 0.882, 0.856	61.27 kN.m	OK

Serviceability Limit State

Support Reactions (kN)	
Live Loads	LH Support 15.15 kN, RH Support 5.56 kN
Super Imposed Dead Load	LH Support 2.22 kN, RH Support 0.82 kN

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Dead Load (Self Weight)	LH Support 8.58 kN, RH Support 3.51 kN		
Maximum Deflection			
Live Loads	3.12 (3.12) mm @ 1.705 m < L / 360 = 10.7 mm	3.12 mm	OK
Super Imposed Dead Loads	0.46 mm @ 1.705 m	0.46 mm	
Dead Loads (Self Weight)	1.79 mm @ 1.744 m	1.79 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 56.1, Super Dead 8.2, SW 31.2 < 275	95.54 N/mm²	OK
TOTAL (Compression)	Live 56.1, Super Dead 8.2, SW 31.2 < 275	95.54 N/mm²	OK

Vibration Analysis

Beam Deflection		2.56 mm	
Natural Frequency	18/√(2.56) = 11.24 > 4 Hz	11.24 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Members 70 and 81 (H5-M5) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (107 kg/m)	254x254 UC 107 [S 275]
Floor Area Supported	6.853 m Span, 2.338 m to LH Beam and .376 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1045 mm², b1= 857 mm and b2= 188 mm
Steel Section Elastic Properties	ye 133.4 mm, A 136.4 cm², Ix 17517 cm⁴, Zt 1314 cm³, Zb 1314 cm³
Composite Section Elastic Properties	ye 179 mm, Ix 43709 cm⁴, Zs.t 8927 cm³, Zs.b 2007 cm³, Zc.t 24424 cm³
Headed Stud Connector (+1)	23 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 109.57 kN, RH Support 133.34 kN	< 542.79 kN	OK
Check @ 3.632 m (Max. Moment)	M = 217.01 kN.m, Fv = 0.08 kN		
Shear Connection	No of shear connectors from nearest support 12 < 17	Partial	
Axial Resistance (kN)	Rc 1485.46 kN, Rs 3614.07 kN, Rq 1046.4 kN	1046.4 kN	
Degree of Shear Connection	Na/Np = 12 / 17 > 0.4	0.704	OK
Reduced Concrete Area	Area required to resist 1046.4 kN	55.6x1044.6mm²	
Moment Capacity	Plastic neutral axis in top flange @ 148.5 mm	560.62 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.86/(0.86+0.19)	235.22 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 39.95 kN, RH Support 47.87 kN	< 542.79 kN	OK
Check @ 3.632 m (Max. Moment)	M = 78.19 kN.m, Fv = 0.23 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 41.64 kN, RH Support 51.12 kN		
Super Imposed Dead Load	LH Support 6.11 kN, RH Support 7.5 kN		
Dead Load (Self Weight)	LH Support 24.57 kN, RH Support 29.32 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	4.50 (5.22) mm @ 3.495 m < L / 360 = 19 mm	5.22 mm	OK

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Super Imposed Dead Loads	0.66 (0.76) mm @ 3.495 m	0.76 mm	
Dead Loads (Self Weight)	6.49 mm @ 3.495 m	6.49 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 41.4, Super Dead 6.1, SW 36.5 < 265	83.93 N/mm²	OK
TOTAL (Compression)	Live 9.3, Super Dead 1.4, SW 36.5 < 265	47.16 N/mm²	OK
Maximum Concrete Stress	Live 3.4, Super Dead 0.5, SW 0 < 20	3.90 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	3.89 mm	
Natural Frequency	18/√(3.89/1.1) = 9.57 > 4 Hz	9.57 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Members 78 and 82 (H2-M2) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (107 kg/m)	254x254 UC 107 [S 275]
Floor Area Supported	7.311 m Span, 2.1 m to LH Beam and 2.142 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+503 mm²/m
Headed Stud Connector	19x95 mm Placed One per Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1828 mm², b1= 914 mm and b2= 914 mm
Steel Section Elastic Properties	ye 133.4 mm, A 136.4 cm², Ix 17517 cm⁴, Zt 1314 cm³, Zb 1314 cm³
Composite Section Elastic Properties	ye 148.2 mm, Ix 53413 cm⁴, Zs.t 29298 cm³, Zs.b 2150 cm³, Zc.t 36033 cm³
Headed Stud Connector	48 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 184.98 kN, RH Support 147.77 kN	< 542.79 kN	OK
Check @ 2.924 m (Max. Moment)	M = 323.17 kN.m, Fv = 1.25 kN		
Shear Connection	No of shear connectors from nearest support 19 < 29.8	Partial	
Axial Resistance (kN)	Rc 2599.06 kN, Rs 3614.07 kN, Rq 1656.8 kN	1656.8 kN	
Degree of Shear Connection	Na/Np = 19 / 29.8 > 0.4	0.637	OK
Reduced Concrete Area	Area required to resist 1656.8 kN	50.4x1827.8mm²	
Moment Capacity	Plastic neutral axis in top flange @ 144 mm	637.27 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 152 mm	6.58 per m	
Vp = fn(N.4.D.tp.pyp)	Min(6.58x4x19,1000)x1.0x350	175.00 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	755, 460, 114000, 40, 175	554.91 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	6.58x87.2x0.91/(0.91+0.91)	286.84 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 55.77 kN, RH Support 50.24 kN	< 542.79 kN	OK
Check @ 3.217 m (Max. Moment)	M = 102.99 kN.m, Fv = 0.16 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK

Serviceability Limit State

Support Reactions (kN)	
Live Loads	LH Support 58.97 kN, RH Support 53.03 kN

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Super Imposed Dead Load	LH Support 30.52 kN, RH Support 14.11 kN		
Dead Load (Self Weight)	LH Support 34.22 kN, RH Support 30.83 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	5.55 (6.33) mm @ 3.582 m < L / 360 = 20.3 mm	6.33 mm	OK
Super Imposed Dead Loads	2.10 (2.39) mm @ 3.363 m	2.39 mm	
Dead Loads (Self Weight)	9.79 mm @ 3.582 m	9.79 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 50.8, Super Dead 22, SW 48.1 < 265	120.94 N/mm²	OK
TOTAL (Compression)	Live 3.7, Super Dead 1.6, SW 48.1 < 265	53.43 N/mm²	OK
Maximum Concrete Stress	Live 3.03, Super Dead 1.31, SW 0 < 20	4.35 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	6.24 mm	
Natural Frequency	$18/\sqrt{(6.24/1.1)} = 7.56 > 4$ Hz	7.56 Hz	OK

UNPROPPED COMPOSITE PRIMARY EDGE BEAM
Members 95-97 (F13-K13) @ Level 3

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	4.702 m Span and 4.735 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+393 mm²/m
Headed Stud Connector	19x95 mm Placed @ 300 mm centre
Transverse Beams	@ 0.928 and 2.351 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	122 x 649 mm², b1= 588 mm and b2= 61 mm
Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³
Composite Section Elastic Properties	ye 109.2 mm, Ix 8365 cm⁴, Zs.t 4010 cm³, Zs.b 469 cm³, Zc.t 7660 cm³
Headed Stud Connector	15 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support -281.27 kN, RH Support 20.82 kN	< 542.79 kN	OK
Check @ 0.893 m (Max. Moment)	M = -251.45 kN.m, Fv = 281.65 kN		
Negative Moments	Program designs only simply supported composite beams. Design as standard steel member in MasterKey Steel Design.		Warning

UNPROPPED COMPOSITE PRIMARY EDGE BEAM
Members 99, 176 and 181 (B14-F14) @ Level 4

Summary of Design Data (Integrated Design)

Steel Section (86 kg/m)	203x203 UC 86 [S 275]
Floor Area Supported	7.1 m Span and 4.17 m to LH Beam
Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 13.79, Gr 40 with 252+252 mm²/m
Headed Stud Connector	19x95 mm Placed @ 325 mm centre
Transverse Beams	@ 2.367 and 4.733 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

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Section Properties

Concrete Effective Area	122 x 971 mm², b1= 888 mm and b2= 84 mm		
Steel Section Elastic Properties	ye 111.1 mm, A 109.6 cm², Ix 9452 cm⁴, Zt 851 cm³, Zb 851 cm³		
Composite Section Elastic Properties	ye 162 mm, Ix 26140 cm⁴, Zs.t 8175 cm³, Zs.b 1374 cm³, Zc.t 22255 cm³		
Headed Stud Connector	21 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)		

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 109.22 kN, RH Support 108.75 kN	< 448.69 kN	OK
Check @ 3.479 m (Max. Moment)	M = 236.31 kN.m, Fv = 0.26 kN		
Shear Connection	No of shear connectors from nearest support 10 < 24.4	Partial	
Axial Resistance (kN)	Rc 2131.7 kN, Rs 2905.2 kN, Rq 872 kN	872 kN	
Degree of Shear Connection	Na/Np = 10 / 24.4 > 0.4	0.409	OK
Reduced Concrete Area	Area required to resist 872 kN	49.9x971.1mm²	
Moment Capacity	Plastic neutral axis in top flange @ 148.1 mm	393.55 kN.m	OK
Check @ 2.367 m	M = 229.66 kN.m, Fv = 84.84 kN		
Shear Connection	No of shear connectors from nearest support 7 < 24.4	Partial	
Axial Resistance (kN)	Rc 2131.7 kN, Rs 2905.2 kN, Rq 610.4 kN	610.4 kN	
Reduced Concrete Area	Area required to resist 610.4 kN	34.9x971.1mm²	
Moment Capacity	Plastic neutral axis in top flange @ 150.5 mm	365.58 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 325 mm	3.08 per m	
Vr = fn(Asv,fy,Acv,fcu)	504, 460, 79000, 40	257.09 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.08x87.2x0.89/(0.89+0.08)	245.20 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 29.07 kN, RH Support 28.92 kN	< 448.69 kN	OK
Check @ 3.408 m (Max. Moment)	M = 66.11 kN.m, Fv = 0.02 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 2.367 m	M = 65.44 kN.m, Fv = 26.22 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.367 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 65.44, 0.6	39.264 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.367 m, 5.34 cm, 1, 0.85, 0.847	258.826 kN.m	OK
Check between 2.367 and 4.733 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	65.44, 65.44, 1	65.44 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.366 m, 5.34 cm, 1, 0.85, 0.847	258.826 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 28.61 kN, RH Support 28.43 kN		
Super Imposed Dead Load	LH Support 27.27 kN, RH Support 27.24 kN		
Dead Load (Self Weight)	LH Support 18.04 kN, RH Support 17.95 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	6.76 (8.88) mm @ 3.55 m < L / 360 = 19.7 mm	8.88 mm	OK
Super Imposed Dead Loads	5.00 (6.57) mm @ 3.55 m	6.57 mm	
Dead Loads (Self Weight)	11.26 mm @ 3.55 m	11.26 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 49.3, Super Dead 37, SW 48 < 265	134.23 N/mm²	OK
TOTAL (Compression)	Live 8.3, Super Dead 6.2, SW 48 < 265	62.46 N/mm²	OK
Maximum Concrete Stress	Live 3.04, Super Dead 2.28, SW 0 < 20	5.33 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	11.53 mm	
Natural Frequency	18/√(11.53/1.1) = 5.56 > 4 Hz	5.56 Hz	OK

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UNPROPPED COMPOSITE PRIMARY INTERNAL BEAM
Members 100, 191 and 194 (B13-F13) @ Level 4

Summary of Design Data (Integrated Design)

Steel Section (86 kg/m)	203x203 UC 86 [S 275]
Floor Area Supported	6.52 m Span, 4.735 m to LH Beam and 4.17 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+503 mm²/m
Headed Stud Connector	19x95 mm Placed @ 150 mm centre
Transverse Beams	@ 2.443 and 4.347 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	122 x 1630 mm², b1= 815 mm and b2= 815 mm
Steel Section Elastic Properties	ye 111.1 mm, A 109.6 cm², Ix 9452 cm⁴, Zt 851 cm³, Zb 851 cm³
Composite Section Elastic Properties	ye 125 mm, Ix 34841 cm⁴, Zs.t 69739 cm³, Zs.b 1534 cm³, Zc.t 27872 cm³
Headed Stud Connector	43 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 143.9 kN, RH Support 153.95 kN	< 448.69 kN	OK
Check @ 2.478 m (Max. Moment)	M = 347.68 kN.m, Fv = 7.43 kN		
Shear Connection	No of shear connectors from nearest support 16 < 33.3	Partial	
Axial Resistance (kN)	Rc 3577.94 kN, Rs 2905.2 kN, Rq 1395.2 kN	1395.2 kN	
Degree of Shear Connection	Na/Np = 16 / 33.3 > 0.4	0.48	OK
Reduced Concrete Area	Area required to resist 1395.2 kN	47.6x1630mm²	
Moment Capacity	Plastic neutral axis in top flange @ 143.4 mm	458.39 kN.m	OK
Check @ 2.443 m	M = 347.95 kN.m, Fv = 140.96 kN		
Shear Connection	No of shear connectors from nearest support 16 < 33.3	Partial	
Axial Resistance (kN)	Rc 3577.94 kN, Rs 2905.2 kN, Rq 1395.2 kN	1395.2 kN	
Reduced Concrete Area	Area required to resist 1395.2 kN	47.6x1630mm²	
Moment Capacity	Plastic neutral axis in top flange @ 143.4 mm	458.39 kN.m	OK
Check @ 4.347 m	M = 331.7 kN.m, Fv = 151.33 kN		
Shear Connection	No of shear connectors from nearest support 15 < 33.3	Partial	
Axial Resistance (kN)	Rc 3577.94 kN, Rs 2905.2 kN, Rq 1308 kN	1308 kN	
Reduced Concrete Area	Area required to resist 1308 kN	44.6x1630mm²	
Moment Capacity	Plastic neutral axis in top flange @ 144.2 mm	449.87 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 150 mm	6.67 per m	
Vr = fn(Asv,fy,Acv,fcu)	755, 460, 79000, 40	337.91 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	6.67x87.2x0.82/(0.82+0.82)	290.67 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 51.78 kN, RH Support 55.23 kN	< 448.69 kN	OK
Check @ 2.478 m (Max. Moment)	M = 122.82 kN.m, Fv = 1.9 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 2.443 m	M = 122.91 kN.m, Fv = 48.84 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 4.347 m	M = 117.18 kN.m, Fv = 52.62 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

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Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.443 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 122.907, 0.6	73.744 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.443 m, 5.34 cm, 1, 0.85, 0.841	258.826 kN.m	OK
Check between 2.443 and 4.347 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	122.907, 117.177, 0.981	120.615 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.904 m, 5.34 cm, 1, 0.85, 0.888	258.826 kN.m	OK
Check between 4.347 and 6.52 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	117.177, 0, 0.6	70.306 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.173 m, 5.34 cm, 1, 0.85, 0.864	258.826 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 55.1 kN, RH Support 59.04 kN		
Super Imposed Dead Load	LH Support 8.08 kN, RH Support 8.66 kN		
Dead Load (Self Weight)	LH Support 31.74 kN, RH Support 33.83 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	8.15 (10.58) mm @ 3.26 m < L / 360 = 18.1 mm	10.58 mm	OK
Super Imposed Dead Loads	1.20 (1.55) mm @ 3.26 m	1.55 mm	
Dead Loads (Self Weight)	16.83 mm @ 3.26 m	16.83 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 87.7, Super Dead 12.9, SW 88.1 < 265	188.61 N/mm²	OK
TOTAL (Compression)	Live 1.9, Super Dead 0.3, SW 88.1 < 265	90.28 N/mm²	OK
Maximum Concrete Stress	Live 4.82, Super Dead 0.71, SW 0 < 20	5.53 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	7.17 mm	
Natural Frequency	18/√(7.17/1.1) = 7.05 > 4 Hz	7.05 Hz	OK

UNPROPPED NON-COMPOSITE PRIMARY INTERNAL BEAM
Members 101 and 110 (B12-E12) @ Level 3

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	4.15 m Span, 2.81 m to LH Beam and 4.735 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m
Transverse Beam	@ 2.285 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 0.48 kN, RH Support 0.39 kN	< 169.03 kN	OK
Check @ 1.121 m (Max. Moment)	M = 0.27 kN.m, Fv = 0.01 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK
Check @ 2.285 m	M = 0 kN.m, Fv = 0.48 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Lateral Torsional Buckling (Final Stage)

Check between 0 and 2.285 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 0, 1	0 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.285 m, 3.83 cm, 1, 0.849, 0.876	62.316 kN.m	OK

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Check between 2.285 and 4.15 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 0, 1	0 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.865 m, 3.83 cm, 1, 0.849, 0.909	66.261 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 0.48 kN, RH Support 0.39 kN	< 169.03 kN	OK
Check @ 1.121 m (Max. Moment)	M = 0.27 kN.m, Fv = 0.01 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK
Check @ 2.285 m	M = 0 kN.m, Fv = 0.48 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.285 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 0, 1	0 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.285 m, 3.83 cm, 1, 0.849, 0.876	62.316 kN.m	OK
Check between 2.285 and 4.15 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 0, 1	0 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.865 m, 3.83 cm, 1, 0.849, 0.909	66.261 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	0 kN each side		
Super Imposed Dead Load	0 kN each side		
Dead Load (Self Weight)	LH Support 0.34 kN, RH Support 0.28 kN		
Maximum Deflection			
Live Loads	0.00 (0.00) mm @ 3.652 m < L / 360 = 11.5 mm	0.00 mm	OK
Super Imposed Dead Loads	0.00 mm @ 3.818 m	0.00 mm	
Dead Loads (Self Weight)	0.07 mm @ 1.702 m	0.07 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 0, Super Dead 0, SW 0.9 < 275	0.88 N/mm²	OK
TOTAL (Compression)	Live 0, Super Dead 0, SW 0.9 < 275	0.88 N/mm²	OK

Vibration Analysis

Beam Deflection		0.07 mm	
Natural Frequency	18/√(0.07) = 68.58 > 4 Hz	68.58 Hz	OK

UNPROPPED COMPOSITE PRIMARY INTERNAL BEAM
Members 103, 106 and 109 (E12-K12) @ Level 2

Summary of Design Data (Integrated Design)

Steel Section (86 kg/m)	203x203 UC 86 [S 275]
Floor Area Supported	6.497 m Span, 2.81 m to LH Beam and 4.735 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+252 mm²/m
Headed Stud Connector	19x95 mm Placed @ 175 mm centre
Transverse Beams	@ 2.173 and 4.146 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	122 x 1624 mm², b1= 812 mm and b2= 812 mm
Steel Section Elastic Properties	ye 111.1 mm, A 109.6 cm², Ix 9452 cm⁴, Zt 851 cm³, Zb 851 cm³
Composite Section Elastic Properties	ye 125.2 mm, Ix 34803 cm⁴, Zs.t 71760 cm³, Zs.b 1533 cm³, Zc.t 27809 cm³
Headed Stud Connector	37 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)

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Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 130.17 kN, RH Support 124.55 kN	< 448.69 kN	OK
Check @ 4.093 m (Max. Moment)	M = 289.3 kN.m, Fv = 3.69 kN		
Shear Connection	No of shear connectors from nearest support 14 < 33.3	Partial	
Axial Resistance (kN)	Rc 3565.31 kN, Rs 2905.2 kN, Rq 1220.8 kN	1220.8 kN	
Degree of Shear Connection	Na/Np = 14 / 33.3 > 0.4	0.42	OK
Reduced Concrete Area	Area required to resist 1220.8 kN	41.8x1624.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 145 mm	440.93 kN.m	OK
Check @ 2.173 m	M = 280.02 kN.m, Fv = 127.55 kN		
Shear Connection	No of shear connectors from nearest support 12 < 33.3	Partial	
Axial Resistance (kN)	Rc 3565.31 kN, Rs 2905.2 kN, Rq 1046.4 kN	1046.4 kN	
Reduced Concrete Area	Area required to resist 1046.4 kN	35.8x1624.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 146.6 mm	422.27 kN.m	OK
Check @ 4.146 m	M = 289.49 kN.m, Fv = 121.72 kN		
Shear Connection	No of shear connectors from nearest support 14 < 33.3	Partial	
Axial Resistance (kN)	Rc 3565.31 kN, Rs 2905.2 kN, Rq 1220.8 kN	1220.8 kN	
Reduced Concrete Area	Area required to resist 1220.8 kN	41.8x1624.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 145 mm	440.93 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 175 mm	5.71 per m	
Vr = fn(Asv,fy,Acv,fcu)	504, 460, 79000, 40	257.09 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	5.71x87.2x0.81/(0.81+0.81)	249.14 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 47.09 kN, RH Support 45.15 kN	< 448.69 kN	OK
Check @ 4.093 m (Max. Moment)	M = 102.79 kN.m, Fv = 0.58 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 2.173 m	M = 99.48 kN.m, Fv = 44.47 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 4.146 m	M = 102.82 kN.m, Fv = 42.32 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.173 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 99.477, 0.6	59.686 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.173 m, 5.34 cm, 1, 0.85, 0.864	258.826 kN.m	OK
Check between 2.173 and 4.146 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	99.477, 102.824, 0.987	101.485 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.973 m, 5.34 cm, 1, 0.85, 0.882	258.826 kN.m	OK
Check between 4.146 and 6.497 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	102.824, 0, 0.6	61.694 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.351 m, 5.34 cm, 1, 0.85, 0.849	258.826 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 49.69 kN, RH Support 47.48 kN		
Super Imposed Dead Load	LH Support 7.29 kN, RH Support 6.96 kN		
Dead Load (Self Weight)	LH Support 28.9 kN, RH Support 27.73 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	6.81 (9.33) mm @ 3.249 m < L / 360 = 18 mm	9.33 mm	OK
Super Imposed Dead Loads	1.00 (1.37) mm @ 3.249 m	1.37 mm	
Dead Loads (Self Weight)	14.20 mm @ 3.249 m	14.20 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 72.8, Super Dead 10.7, SW 73.8 < 265	157.25 N/mm²	OK

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TOTAL (Compression)	Live 1.6, Super Dead 0.2, SW 73.8 < 265	75.61 N/mm²	OK
Maximum Concrete Stress	Live 4.01, Super Dead 0.59, SW 0 < 20	4.60 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	6.16 mm	
Natural Frequency	$18/\sqrt{(6.16/1.1)} = 7.61 > 4$ Hz	7.61 Hz	OK

UNPROPPED NON-COMPOSITE PRIMARY INTERNAL BEAM
Members 104 and 225 (B12-E12) @ Level 4

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	4.15 m Span, 2.81 m to LH Beam and 4.735 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m
Transverse Beam	@ 2.285 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 0.48 kN, RH Support 0.39 kN	< 169.03 kN	OK
Check @ 1.121 m (Max. Moment)	M = 0.27 kN.m, Fv = 0.01 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK
Check @ 2.285 m	M = 0 kN.m, Fv = 0.48 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Lateral Torsional Buckling (Final Stage)

Check between 0 and 2.285 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 0, 1	0 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.285 m, 3.83 cm, 1, 0.849, 0.876	62.316 kN.m	OK
Check between 2.285 and 4.15 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 0, 1	0 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.865 m, 3.83 cm, 1, 0.849, 0.909	66.261 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 0.48 kN, RH Support 0.39 kN	< 169.03 kN	OK
Check @ 1.121 m (Max. Moment)	M = 0.27 kN.m, Fv = 0.01 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK
Check @ 2.285 m	M = 0 kN.m, Fv = 0.48 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.285 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 0, 1	0 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.285 m, 3.83 cm, 1, 0.849, 0.876	62.316 kN.m	OK
Check between 2.285 and 4.15 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 0, 1	0 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.865 m, 3.83 cm, 1, 0.849, 0.909	66.261 kN.m	OK

Serviceability Limit State

Support Reactions (kN)	
Live Loads	0 kN each side
Super Imposed Dead Load	0 kN each side

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Dead Load (Self Weight)	LH Support 0.34 kN, RH Support 0.28 kN		
Maximum Deflection			
Live Loads	0.00 (0.00) mm @ 3.777 m < L / 360 = 11.5 mm	0.00 mm	OK
Super Imposed Dead Loads	0.00 mm @ 3.611 m	0.00 mm	
Dead Loads (Self Weight)	0.07 mm @ 1.702 m	0.07 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 0, Super Dead 0, SW 0.9 < 275	0.88 N/mm²	OK
TOTAL (Compression)	Live 0, Super Dead 0, SW 0.9 < 275	0.88 N/mm²	OK

Vibration Analysis

Beam Deflection		0.07 mm	
Natural Frequency	$18/\sqrt{(0.07)} = 68.58 > 4$ Hz	68.58 Hz	OK

UNPROPPED NON-COMPOSITE PRIMARY INTERNAL BEAM
Members 108, 122 and 137 (N.168-E10) @ Level 3

Summary of Design Data (Integrated Design)

Steel Section (86 kg/m)	203x203 UC 86 [S 275]
Floor Area Supported	4.15 m Span, 4.795 m to LH Beam and 2.81 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m
Transverse Beams	@ 2.285 and 2.745 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties	ye 111.1 mm, A 109.6 cm², Ix 9452 cm⁴, Zt 851 cm³, Zb 851 cm³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 51.81 kN, RH Support 84.42 kN	< 448.69 kN	OK
Check @ 2.739 m (Max. Moment)	M = 117.2 kN.m, Fv = 4.05 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 2.285 m	M = 115.25 kN.m, Fv = 49.06 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 2.745 m	M = 117.33 kN.m, Fv = 82.72 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

Lateral Torsional Buckling (Final Stage)

Check between 0 and 2.285 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 115.245, 0.6	69.147 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.285 m, 5.34 cm, 1, 0.85, 0.854	258.826 kN.m	OK
Check between 2.285 and 2.745 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	115.245, 117.326, 0.993	116.494 kN.m	
Mb=fn(L,ry,β_w,u,v)	0.46 m, 5.34 cm, 1, 0.85, 0.991	258.826 kN.m	OK
Check between 2.745 and 4.15 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	117.326, 0, 0.6	70.396 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.405 m, 5.34 cm, 1, 0.85, 0.931	258.826 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 19.74 kN, RH Support 31.32 kN	< 448.69 kN	OK
Check @ 2.739 m (Max. Moment)	M = 42.65 kN.m, Fv = 1.23 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 2.285 m	M = 41.97 kN.m, Fv = 16.99 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 2.745 m	M = 42.77 kN.m, Fv = 29.62 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

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Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.285 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 41.972, 0.6	25.183 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.285 m, 5.34 cm, 1, 0.85, 0.854	258.826 kN.m	OK
Check between 2.285 and 2.745 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	41.972, 42.774, 0.993	42.453 kN.m	
Mb=fn(L,ry,β_w,u,v)	0.46 m, 5.34 cm, 1, 0.85, 0.991	258.826 kN.m	OK
Check between 2.745 and 4.15 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	42.774, 0, 0.6	25.664 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.405 m, 5.34 cm, 1, 0.85, 0.931	258.826 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 19.15 kN, RH Support 31.79 kN		
Super Imposed Dead Load	LH Support 2.79 kN, RH Support 4.68 kN		
Dead Load (Self Weight)	LH Support 12.28 kN, RH Support 19.34 kN		
Maximum Deflection			
Live Loads	3.55 (3.55) mm @ 2.2 m < L / 360 = 11.5 mm	3.55 mm	OK
Super Imposed Dead Loads	0.52 mm @ 2.2 m	0.52 mm	
Dead Loads (Self Weight)	2.12 mm @ 2.2 m	2.12 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 52.3, Super Dead 7.6, SW 30.8 < 265	90.77 N/mm²	OK
TOTAL (Compression)	Live 52.3, Super Dead 7.6, SW 30.8 < 265	90.77 N/mm²	OK

Vibration Analysis

Beam Deflection		2.99 mm	
Natural Frequency	18/√(2.99) = 10.4 > 4 Hz	10.40 Hz	OK

UNPROPPED COMPOSITE PRIMARY INTERNAL BEAM
Members 111, 113, 117 and 121 (E10-K10) @ Level 2

Summary of Design Data (Integrated Design)

Steel Section (86 kg/m)	203x203 UC 86 [S 275]
Floor Area Supported	6.147 m Span, 4.795 m to LH Beam and 2.81 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+393 mm²/m
Headed Stud Connector	19x95 mm Placed @ 150 mm centre
Transverse Beams	@ 0.522, 2.173 and 4.16 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	122 x 1537 mm², b1= 768 mm and b2= 768 mm
Steel Section Elastic Properties	ye 111.1 mm, A 109.6 cm², Ix 9452 cm⁴, Zt 851 cm³, Zb 851 cm³
Composite Section Elastic Properties	ye 127.5 mm, Ix 34216 cm⁴, Zs.t 134470 cm³, Zs.b 1522 cm³, Zc.t 26846 cm³
Headed Stud Connector	40 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 171.98 kN, RH Support 125.52 kN	< 448.69 kN	OK
Check @ 2.213 m (Max. Moment)	M = 262.97 kN.m, Fv = 7.01 kN		
Shear Connection	No of shear connectors from nearest support 14 < 33.3	Partial	
Axial Resistance (kN)	Rc 3373.25 kN, Rs 2905.2 kN, Rq 1220.8 kN	1220.8 kN	
Degree of Shear Connection	Na/Np = 14 / 33.3 > 0.4	0.42	OK

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Reduced Concrete Area	Area required to resist 1220.8 kN	44.1x1536.8mm²	
Moment Capacity	Plastic neutral axis in top flange @ 145 mm	439.48 kN.m	OK
Check @ 0.522 m	M = 89.71 kN.m, Fv = 171.35 kN		
Shear Connection	No of shear connectors from nearest support 3 < 33.3	Partial	
Axial Resistance (kN)	Rc 3373.25 kN, Rs 2905.2 kN, Rq 261.6 kN	261.6 kN	
Reduced Concrete Area	Area required to resist 261.6 kN	9.5x1536.8mm²	
Moment Capacity	Plastic neutral axis in web @ 202.2 mm	313.49 kN.m	OK
Check @ 2.173 m	M = 263.25 kN.m, Fv = 104.18 kN		
Shear Connection	No of shear connectors from nearest support 14 < 33.3	Partial	
Axial Resistance (kN)	Rc 3373.25 kN, Rs 2905.2 kN, Rq 1220.8 kN	1220.8 kN	
Reduced Concrete Area	Area required to resist 1220.8 kN	44.1x1536.8mm²	
Moment Capacity	Plastic neutral axis in top flange @ 145 mm	439.48 kN.m	OK
Check @ 4.16 m	M = 247.05 kN.m, Fv = 123.12 kN		
Shear Connection	No of shear connectors from nearest support 13 < 33.3	Partial	
Axial Resistance (kN)	Rc 3373.25 kN, Rs 2905.2 kN, Rq 1133.6 kN	1133.6 kN	
Reduced Concrete Area	Area required to resist 1133.6 kN	41x1536.8mm²	
Moment Capacity	Plastic neutral axis in top flange @ 145.8 mm	430.51 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 150 mm	6.67 per m	
Vr = fn(Asv,fy,Acv,fcu)	645, 460, 79000, 40	302.49 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	6.67x87.2x0.77/(0.77+0.77)	290.67 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear Support Reactions (kN)	LH Support 61.45 kN, RH Support 45.46 kN	< 448.69 kN	OK
Check @ 2.213 m (Max. Moment)	M = 93.62 kN.m, Fv = 1.73 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 0.522 m	M = 31.94 kN.m, Fv = 60.82 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 2.173 m	M = 93.69 kN.m, Fv = 36.43 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 4.16 m	M = 87.97 kN.m, Fv = 43.07 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 0.522 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 31.944, 0.6	19.166 kN.m	
Mb=fn(L,ry,β_w,u,v)	0.522 m, 5.34 cm, 1, 0.85, 0.989	258.826 kN.m	OK
Check between 0.522 and 2.173 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	31.944, 93.694, 0.736	68.994 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.651 m, 5.34 cm, 1, 0.85, 0.91	258.826 kN.m	OK
Check between 2.173 and 4.16 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	93.694, 87.965, 0.976	91.402 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.987 m, 5.34 cm, 1, 0.85, 0.881	258.826 kN.m	OK
Check between 4.16 and 6.147 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	87.965, 0, 0.6	52.779 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.987 m, 5.34 cm, 1, 0.85, 0.881	258.826 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 66.11 kN, RH Support 47.88 kN		
Super Imposed Dead Load	LH Support 9.7 kN, RH Support 7.02 kN		
Dead Load (Self Weight)	LH Support 37.59 kN, RH Support 27.91 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	5.68 (7.47) mm @ 3.074 m < L / 360 = 17 mm	7.47 mm	OK
Super Imposed Dead Loads	0.83 (1.10) mm @ 3.074 m	1.10 mm	

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Dead Loads (Self Weight)	11.69 mm @ 3.074 m	11.69 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 66.5, Super Dead 9.8, SW 67.3 < 265	143.55 N/mm²	OK
TOTAL (Compression)	Live 0.8, Super Dead 0.1, SW 67.3 < 265	68.13 N/mm²	OK
Maximum Concrete Stress	Live 3.77, Super Dead 0.55, SW 0 < 20	4.33 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	5.07 mm	
Natural Frequency	18/√(5.07/1.1) = 8.38 > 4 Hz	8.38 Hz	OK

UNPROPPED COMPOSITE PRIMARY INTERNAL BEAM
Members 112, 118, 123 and 126 (D9-K9) @ Level 2

Summary of Design Data (Integrated Design)

Steel Section (107 kg/m)	254x254 UC 107 [S 275]
Floor Area Supported	7.032 m Span, 6.705 m to LH Beam and 4.795 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+393 mm²/m
Headed Stud Connector	19x95 mm Placed @ 175 mm centre
Transverse Beams	@ 1.865, 3.516 and 5.503 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	122 x 1758 mm², b1= 879 mm and b2= 879 mm
Steel Section Elastic Properties	ye 133.4 mm, A 136.4 cm², Ix 17517 cm⁴, Zt 1314 cm³, Zb 1314 cm³
Composite Section Elastic Properties	ye 139.7 mm, Ix 54313 cm⁴, Zs.t 56228 cm³, Zs.b 2113 cm³, Zc.t 38889 cm³
Headed Stud Connector (+1)	41 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 229.77 kN, RH Support 245.62 kN	< 542.79 kN	OK
Check @ 3.516 m (Max. Moment)	M = 548.18 kN.m, Fv = 72.82 kN		
Shear Connection	No of shear connectors from nearest support 21 < 41.4	Partial	
Axial Resistance (kN)	Rc 3858.9 kN, Rs 3614.07 kN, Rq 1831.2 kN	1831.2 kN	
Degree of Shear Connection	Na/Np = 21 / 41.4 > 0.4	0.507	OK
Reduced Concrete Area	Area required to resist 1831.2 kN	57.9x1758mm²	
Moment Capacity	Plastic neutral axis in top flange @ 142.7 mm	651.01 kN.m	OK
Check @ 1.865 m	M = 425.99 kN.m, Fv = 226.98 kN		
Shear Connection	No of shear connectors from nearest support 11 < 41.4	Partial	
Axial Resistance (kN)	Rc 3858.9 kN, Rs 3614.07 kN, Rq 959.2 kN	959.2 kN	
Reduced Concrete Area	Area required to resist 959.2 kN	30.3x1758mm²	
Moment Capacity	Plastic neutral axis in top flange @ 149.1 mm	562.22 kN.m	OK
Check @ 5.503 m	M = 373.88 kN.m, Fv = 243.33 kN		
Shear Connection	No of shear connectors from nearest support 10 < 41.4	Partial	
Axial Resistance (kN)	Rc 3858.9 kN, Rs 3614.07 kN, Rq 872 kN	872 kN	
Reduced Concrete Area	Area required to resist 872 kN	27.6x1758mm²	
Moment Capacity	Plastic neutral axis in top flange @ 149.7 mm	551.72 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 175 mm	5.71 per m	
Vr = fn(Asv,fy,Acv,fcu)	645, 460, 79000, 40	302.49 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	5.71x87.2x0.88/(0.88+0.88)	249.14 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 82.44 kN, RH Support 87.88 kN	< 542.79 kN	OK
Check @ 3.516 m (Max. Moment)	M = 194.47 kN.m, Fv = 25 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK

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Check @ 1.865 m	M = 151.17 kN.m, Fv = 79.65 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK
Check @ 5.503 m	M = 132.65 kN.m, Fv = 85.59 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 1.865 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 151.172, 0.6	90.703 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.865 m, 6.6 cm, 1, 0.848, 0.944	393.366 kN.m	OK
Check between 1.865 and 3.516 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	151.172, 194.468, 0.911	177.15 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.651 m, 6.6 cm, 1, 0.848, 0.955	393.366 kN.m	OK
Check between 3.516 and 5.503 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	194.468, 132.648, 0.873	169.74 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.987 m, 6.6 cm, 1, 0.848, 0.937	393.366 kN.m	OK
Check between 5.503 and 7.032 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	132.648, 0, 0.6	79.589 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.529 m, 6.6 cm, 1, 0.848, 0.961	393.366 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 88.12 kN, RH Support 94.34 kN		
Super Imposed Dead Load	LH Support 12.92 kN, RH Support 13.84 kN		
Dead Load (Self Weight)	LH Support 50.49 kN, RH Support 53.79 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	9.26 (12.14) mm @ 3.516 m < L / 360 = 19.5 mm	12.14 mm	OK
Super Imposed Dead Loads	1.36 (1.78) mm @ 3.516 m	1.78 mm	
Dead Loads (Self Weight)	16.17 mm @ 3.516 m	16.17 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 100.1, Super Dead 14.7, SW 90.4 < 265	205.20 N/mm²	OK
TOTAL (Compression)	Live 3.8, Super Dead 0.6, SW 90.4 < 265	94.72 N/mm²	OK
Maximum Concrete Stress	Live 5.44, Super Dead 0.8, SW 0 < 20	6.24 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	8.21 mm	
Natural Frequency	$18/\sqrt{(8.21/1.1)} = 6.59 > 4$ Hz	6.59 Hz	OK

UNPROPPED COMPOSITE PRIMARY INTERNAL BEAM
Members 115, 124, 127 and 131 (D8-K8) @ Level 2

Summary of Design Data (Integrated Design)

Steel Section (107 kg/m)	254x254 UC 107 [S 275]
Floor Area Supported	6.27 m Span, 1.74 m to LH Beam and 6.705 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+393 mm²/m
Headed Stud Connector	19x95 mm Placed @ 175 mm centre
Transverse Beams	@ 1.568, 3.135 and 5.122 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	122 x 1480 mm², b1= 696 mm and b2= 784 mm
Steel Section Elastic Properties	ye 133.4 mm, A 136.4 cm², Ix 17517 cm⁴, Zt 1314 cm³, Zb 1314 cm³

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Composite Section Elastic Properties	ye 148.1 mm, Ix 51566 cm^4, Zs.t 28511 cm^3, Zs.b 2074 cm^3, Zc.t 34822 cm^3		
Headed Stud Connector	35 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)		

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 192.98 kN, RH Support 209 kN	< 542.79 kN	OK
Check @ 3.135 m (Max. Moment)	M = 398.97 kN.m, Fv = 61.5 kN		
Shear Connection	No of shear connectors from nearest support 17 < 37.2	Partial	
Axial Resistance (kN)	Rc 3248.13 kN, Rs 3614.07 kN, Rq 1482.4 kN	1482.4 kN	
Degree of Shear Connection	Na/Np = 17 / 37.2 > 0.4	0.456	OK
Reduced Concrete Area	Area required to resist 1482.4 kN	55.7x1479.8mm^2	
Moment Capacity	Plastic neutral axis in top flange @ 145.3 mm	612.51 kN.m	OK
Check @ 1.568 m	M = 300.83 kN.m, Fv = 190.63 kN		
Shear Connection	No of shear connectors from nearest support 8 < 37.2	Partial	
Axial Resistance (kN)	Rc 3248.13 kN, Rs 3614.07 kN, Rq 697.6 kN	697.6 kN	
Reduced Concrete Area	Area required to resist 697.6 kN	26.2x1479.8mm^2	
Moment Capacity	Plastic neutral axis in web @ 160.5 mm	528.05 kN.m	OK
Check @ 5.122 m	M = 239.04 kN.m, Fv = 207.28 kN		
Shear Connection	No of shear connectors from nearest support 6 < 37.2	Partial	
Axial Resistance (kN)	Rc 3248.13 kN, Rs 3614.07 kN, Rq 523.2 kN	523.2 kN	
Reduced Concrete Area	Area required to resist 523.2 kN	19.6x1479.8mm^2	
Moment Capacity	Plastic neutral axis in web @ 186.2 mm	501.81 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 175 mm	5.71 per m	
Vr = fn(Asv,fy,Acv,fcu)	645, 460, 79000, 40	302.49 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	5.71x87.2x0.78/(0.7+0.78)	263.92 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 69.53 kN, RH Support 75.07 kN	< 542.79 kN	OK
Check @ 3.135 m (Max. Moment)	M = 142.13 kN.m, Fv = 21.13 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK
Check @ 1.568 m	M = 107.21 kN.m, Fv = 67.18 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK
Check @ 5.122 m	M = 85.23 kN.m, Fv = 73.34 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 1.568 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 107.21, 0.6	64.326 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.568 m, 6.6 cm, 1, 0.848, 0.959	393.366 kN.m	OK
Check between 1.568 and 3.135 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	107.21, 142.131, 0.902	128.163 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.567 m, 6.6 cm, 1, 0.848, 0.959	393.366 kN.m	OK
Check between 3.135 and 5.122 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	142.131, 85.233, 0.84	119.372 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.987 m, 6.6 cm, 1, 0.848, 0.937	393.366 kN.m	OK
Check between 5.122 and 6.27 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	85.233, 0, 0.6	51.14 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.148 m, 6.6 cm, 1, 0.848, 0.977	393.366 kN.m	OK

Serviceability Limit State

Support Reactions (kN)	
Live Loads	LH Support 73.84 kN, RH Support 80.11 kN
Super Imposed Dead Load	LH Support 10.83 kN, RH Support 11.75 kN
Dead Load (Self Weight)	LH Support 42.63 kN, RH Support 45.99 kN
Maximum Deflection (Partial Connection All Loads)	

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Live Loads	5.59 (7.36) mm @ 3.135 m < L / 360 = 17.4 mm	7.36 mm	OK
Super Imposed Dead Loads	0.82 (1.08) mm @ 3.135 m	1.08 mm	
Dead Loads (Self Weight)	9.35 mm @ 3.135 m	9.35 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 74.1, Super Dead 10.9, SW 66.1 < 265	151.07 N/mm²	OK
TOTAL (Compression)	Live 5.4, Super Dead 0.8, SW 66.1 < 265	72.32 N/mm²	OK
Maximum Concrete Stress	Live 4.41, Super Dead 0.65, SW 0 < 20	5.06 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	4.99 mm	
Natural Frequency	18/√(4.99/1.1) = 8.45 > 4 Hz	8.45 Hz	OK

UNPROPPED COMPOSITE PRIMARY INTERNAL BEAM
Members 116, 134 and 145 (E12-K12) @ Level 3

Summary of Design Data (Integrated Design)

Steel Section (86 kg/m)	203x203 UC 86 [S 275]
Floor Area Supported	6.497 m Span, 2.81 m to LH Beam and 4.735 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+503 mm²/m
Headed Stud Connector	19x95 mm Placed @ 150 mm centre
Transverse Beams	@ 2.173 and 4.146 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	122 x 1624 mm², b1= 812 mm and b2= 812 mm
Steel Section Elastic Properties	ye 111.1 mm, A 109.6 cm², Ix 9452 cm⁴, Zt 851 cm³, Zb 851 cm³
Composite Section Elastic Properties	ye 125.2 mm, Ix 34803 cm⁴, Zs.t 71760 cm³, Zs.b 1533 cm³, Zc.t 27809 cm³
Headed Stud Connector	43 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 130.17 kN, RH Support 124.55 kN	< 448.69 kN	OK
Check @ 4.093 m (Max. Moment)	M = 289.3 kN.m, Fv = 3.69 kN		
Shear Connection	No of shear connectors from nearest support 16 < 33.3	Partial	
Axial Resistance (kN)	Rc 3565.31 kN, Rs 2905.2 kN, Rq 1395.2 kN	1395.2 kN	
Degree of Shear Connection	Na/Np = 16 / 33.3 > 0.4	0.48	OK
Reduced Concrete Area	Area required to resist 1395.2 kN	47.7x1624.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 143.4 mm	458.27 kN.m	OK
Check @ 2.173 m	M = 280.02 kN.m, Fv = 127.55 kN		
Shear Connection	No of shear connectors from nearest support 14 < 33.3	Partial	
Axial Resistance (kN)	Rc 3565.31 kN, Rs 2905.2 kN, Rq 1220.8 kN	1220.8 kN	
Reduced Concrete Area	Area required to resist 1220.8 kN	41.8x1624.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 145 mm	440.93 kN.m	OK
Check @ 4.146 m	M = 289.49 kN.m, Fv = 121.72 kN		
Shear Connection	No of shear connectors from nearest support 16 < 33.3	Partial	
Axial Resistance (kN)	Rc 3565.31 kN, Rs 2905.2 kN, Rq 1395.2 kN	1395.2 kN	
Reduced Concrete Area	Area required to resist 1395.2 kN	47.7x1624.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 143.4 mm	458.27 kN.m	OK

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Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 150 mm	6.67 per m	
Vr = fn(Asv,fy,Acv,fcu)	755, 460, 79000, 40	337.91 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	6.67x87.2x0.81/(0.81+0.81)	290.67 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 47.09 kN, RH Support 45.16 kN	< 448.69 kN	OK
Check @ 4.093 m (Max. Moment)	M = 102.79 kN.m, Fv = 0.58 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 2.173 m	M = 99.47 kN.m, Fv = 44.47 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 4.146 m	M = 102.82 kN.m, Fv = 42.32 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.173 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 99.474, 0.6	59.684 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.173 m, 5.34 cm, 1, 0.85, 0.864	258.826 kN.m	OK
Check between 2.173 and 4.146 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	99.474, 102.824, 0.987	101.484 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.973 m, 5.34 cm, 1, 0.85, 0.882	258.826 kN.m	OK
Check between 4.146 and 6.497 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	102.824, 0, 0.6	61.694 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.351 m, 5.34 cm, 1, 0.85, 0.849	258.826 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 49.69 kN, RH Support 47.49 kN		
Super Imposed Dead Load	LH Support 7.29 kN, RH Support 6.96 kN		
Dead Load (Self Weight)	LH Support 28.9 kN, RH Support 27.73 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	6.81 (8.83) mm @ 3.249 m < L / 360 = 18 mm	8.83 mm	OK
Super Imposed Dead Loads	1.00 (1.30) mm @ 3.249 m	1.30 mm	
Dead Loads (Self Weight)	14.20 mm @ 3.249 m	14.20 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 72.8, Super Dead 10.7, SW 73.8 < 265	157.25 N/mm²	OK
TOTAL (Compression)	Live 1.6, Super Dead 0.2, SW 73.8 < 265	75.60 N/mm²	OK
Maximum Concrete Stress	Live 4.01, Super Dead 0.59, SW 0 < 20	4.60 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	6.04 mm	
Natural Frequency	18/√(6.04/1.1) = 7.68 > 4 Hz	7.68 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Members 119, 125, 129, 133 and 138 (D4-P4) @ Level 2

Summary of Design Data (Integrated Design)

Steel Section (86 kg/m)	203x203 UC 86 [S 275]
Floor Area Supported	6.739 m Span, .18 m to LH Beam and 1.79 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 932 mm², b1= 90 mm and b2= 842 mm
Steel Section Elastic Properties	ye 111.1 mm, A 109.6 cm², Ix 9452 cm⁴, Zt 851 cm³, Zb 851 cm³

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Composite Section Elastic Properties	ye 160.1 mm, Ix 27741 cm^4, Zs.t 9221 cm^3, Zs.b 1444 cm^3, Zc.t 17329 cm^3		
Headed Stud Connector	22 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2		

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 186.68 kN, RH Support 190.54 kN	< 448.69 kN	OK
Check @ 3.167 m (Max. Moment)	M = 361.59 kN.m, Fv = 11.05 kN		
Shear Connection	No of shear connectors from nearest support 10 < 15.2	Partial	
Axial Resistance (kN)	Rc 1325.84 kN, Rs 2905.2 kN, Rq 872 kN	872 kN	
Degree of Shear Connection	Na/Np = 10 / 15.2 > 0.4	0.658	OK
Reduced Concrete Area	Area required to resist 872 kN	52x932.4mm^2	
Moment Capacity	Plastic neutral axis in top flange @ 148.1 mm	392.64 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.84/(0.09+0.84)	259.15 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 65.71 kN, RH Support 66.95 kN	< 448.69 kN	OK
Check @ 3.167 m (Max. Moment)	M = 126.7 kN.m, Fv = 3.75 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 72.35 kN, RH Support 73.92 kN		
Super Imposed Dead Load	LH Support 10.61 kN, RH Support 10.84 kN		
Dead Load (Self Weight)	LH Support 40.04 kN, RH Support 40.78 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	11.42 (13.69) mm @ 3.37 m < L / 360 = 18.7 mm	13.69 mm	OK
Super Imposed Dead Loads	1.67 (2.01) mm @ 3.37 m	2.01 mm	
Dead Loads (Self Weight)	18.43 mm @ 3.37 m	18.43 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 97.3, Super Dead 14.3, SW 90.6 < 265	202.19 N/mm^2	OK
TOTAL (Compression)	Live 15.2, Super Dead 2.2, SW 90.6 < 265	108.11 N/mm^2	OK
Maximum Concrete Stress	Live 8.11, Super Dead 1.19, SW 0 < 20	9.29 N/mm^2	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	9.65 mm	
Natural Frequency	18/√(9.65/1.1) = 6.08 > 4 Hz	6.08 Hz	OK

UNPROPPED NON-COMPOSITE SECONDARY INTERNAL BEAM
Members 130 and 143 (H5-M5) @ Level 2

Summary of Design Data (Integrated Design)

Steel Section (107 kg/m)	254x254 UC 107 [S 275]
Floor Area Supported	6.853 m Span, 2.338 m to LH Beam and .376 m to RH Beam
Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m^3 with 252 mm^2/m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties	ye 133.4 mm, A 136.4 cm^2, Ix 17517 cm^4, Zt 1314 cm^3, Zb 1314 cm^3

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 109.57 kN, RH Support 133.34 kN	< 542.79 kN	OK

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Check @ 3.632 m (Max. Moment)	M = 217.01 kN.m, Fv = 0.08 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 39.95 kN, RH Support 47.87 kN	< 542.79 kN	OK
Check @ 3.632 m (Max. Moment)	M = 78.19 kN.m, Fv = 0.23 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 41.64 kN, RH Support 51.12 kN		
Super Imposed Dead Load	LH Support 6.11 kN, RH Support 7.5 kN		
Dead Load (Self Weight)	LH Support 24.57 kN, RH Support 29.32 kN		
Maximum Deflection			
Live Loads	11.23 (11.23) mm @ 3.495 m < L / 360 = 19 mm	11.23 mm	OK
Super Imposed Dead Loads	1.65 mm @ 3.495 m	1.65 mm	
Dead Loads (Self Weight)	6.49 mm @ 3.495 m	6.49 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 63.2, Super Dead 9.3, SW 36.5 < 265	108.98 N/mm²	OK
TOTAL (Compression)	Live 63.2, Super Dead 9.3, SW 36.5 < 265	108.98 N/mm²	OK

Vibration Analysis

Beam Deflection		9.26 mm	
Natural Frequency	$18/\sqrt{(9.26)} = 5.91 > 4$ Hz	5.91 Hz	OK

UNPROPPED NON-COMPOSITE PRIMARY EDGE BEAM
Members 132 and 219 (A8-D8) @ Level 4

Summary of Design Data (Integrated Design)

Steel Section (107 kg/m)	254x254 UC 107 [S 275]
Floor Area Supported	3.78 m Span and 3.592 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m
Transverse Beam	@ 1.04 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties	ye 133.4 mm, A 136.4 cm², Ix 17517 cm⁴, Zt 1314 cm³, Zb 1314 cm³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 123.13 kN, RH Support 46.69 kN	< 542.79 kN	OK
Check @ 1.058 m (Max. Moment)	M = 121.53 kN.m, Fv = 42.61 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK
Check @ 1.04 m	M = 122.33 kN.m, Fv = 112.12 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK

Lateral Torsional Buckling (Final Stage)

Check between 0 and 1.04 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 122.325, 0.6	73.395 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.04 m, 6.6 cm, 1, 0.848, 0.981	393.366 kN.m	OK
Check between 1.04 and 3.78 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	122.325, 0, 0.6	73.395 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.74 m, 6.6 cm, 1, 0.848, 0.895	393.366 kN.m	OK

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Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 34.56 kN, RH Support 14.87 kN	< 542.79 kN	OK
Check @ 1.058 m (Max. Moment)	M = 34.93 kN.m, Fv = 10.79 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK
Check @ 1.04 m	M = 35.13 kN.m, Fv = 33 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 1.04 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 35.132, 0.6	21.079 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.04 m, 6.6 cm, 1, 0.848, 0.981	393.366 kN.m	OK
Check between 1.04 and 3.78 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	35.132, 0, 0.6	21.079 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.74 m, 6.6 cm, 1, 0.848, 0.895	393.366 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 34.86 kN, RH Support 13.23 kN		
Super Imposed Dead Load	LH Support 26.74 kN, RH Support 8.87 kN		
Dead Load (Self Weight)	LH Support 21.37 kN, RH Support 9.36 kN		
Maximum Deflection			
Live Loads	1.13 (1.13) mm @ 1.663 m < L / 360 = 10.5 mm	1.13 mm	OK
Super Imposed Dead Loads	0.76 mm @ 1.663 m	0.76 mm	
Dead Loads (Self Weight)	0.71 mm @ 1.701 m	0.71 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 27.4, Super Dead 18.4, SW 16.4 < 265	62.16 N/mm²	OK
TOTAL (Compression)	Live 27.4, Super Dead 18.4, SW 16.4 < 265	62.16 N/mm²	OK

Vibration Analysis

Beam Deflection		1.59 mm	
Natural Frequency	18/√(1.59) = 14.29 > 4 Hz	14.29 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Members 141 and 144 (H2-M2) @ Level 2

Summary of Design Data (Integrated Design)

Steel Section (107 kg/m)	254x254 UC 107 [S 275]
Floor Area Supported	7.311 m Span, 2.1 m to LH Beam and 2.142 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1828 mm², b1= 914 mm and b2= 914 mm
Steel Section Elastic Properties	ye 133.4 mm, A 136.4 cm², Ix 17517 cm⁴, Zt 1314 cm³, Zb 1314 cm³
Composite Section Elastic Properties	ye 148.2 mm, Ix 53413 cm⁴, Zs.t 29298 cm³, Zs.b 2150 cm³, Zc.t 36033 cm³
Headed Stud Connector	48 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 170.7 kN, RH Support 141.62 kN	< 542.79 kN	OK
Check @ 3.144 m (Max. Moment)	M = 297 kN.m, Fv = 0.17 kN		
Shear Connection	No of shear connectors from nearest support 20 < 29.8	Partial	

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Axial Resistance (kN)	Rc 2599.06 kN, Rs 3614.07 kN, Rq 1744 kN	1744 kN	
Degree of Shear Connection	Na/Np = 20 / 29.8 > 0.4	0.671	OK
Reduced Concrete Area	Area required to resist 1744 kN	53x1827.8mm²	
Moment Capacity	Plastic neutral axis in top flange @ 143.4 mm	645.29 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 152 mm	6.58 per m	
Vp = fn(N.4.D.tp.pyp)	Min(6.58x4x19,1000)x1.0x350	175.00 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 175	392.94 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	6.58x87.2x0.91/(0.91+0.91)	286.84 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear Support Reactions (kN)	LH Support 51.02 kN, RH Support 48.19 kN	< 542.79 kN	OK
Check @ 3.363 m (Max. Moment)	M = 94.79 kN.m, Fv = 0.39 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 53.27 kN, RH Support 50.58 kN		
Super Imposed Dead Load	LH Support 29.68 kN, RH Support 13.75 kN		
Dead Load (Self Weight)	LH Support 31.37 kN, RH Support 29.6 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	5.07 (5.78) mm @ 3.582 m < L / 360 = 20.3 mm	5.78 mm	OK
Super Imposed Dead Loads	2.03 (2.31) mm @ 3.363 m	2.31 mm	
Dead Loads (Self Weight)	9.05 mm @ 3.582 m	9.05 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 46.3, Super Dead 21.2, SW 44.3 < 265	111.78 N/mm²	OK
TOTAL (Compression)	Live 3.4, Super Dead 1.6, SW 44.3 < 265	49.28 N/mm²	OK
Maximum Concrete Stress	Live 2.76, Super Dead 1.26, SW 0 < 20	4.02 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	5.86 mm	
Natural Frequency	18/√(5.86/1.1) = 7.8 > 4 Hz	7.80 Hz	OK

UNPROPPED COMPOSITE PRIMARY INTERNAL BEAM
Members 147, 163, 169 and 177 (E10-K10) @ Level 3

Summary of Design Data (Integrated Design)

Steel Section (86 kg/m)	203x203 UC 86 [S 275]
Floor Area Supported	6.147 m Span, 4.795 m to LH Beam and 2.81 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+785 mm²/m
Headed Stud Connector	19x95 mm Placed @ 135 mm centre
Transverse Beams	@ 0.522, 2.173 and 4.16 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	122 x 1537 mm², b1= 768 mm and b2= 768 mm
Steel Section Elastic Properties	ye 111.1 mm, A 109.6 cm², Ix 9452 cm⁴, Zt 851 cm³, Zb 851 cm³
Composite Section Elastic Properties	ye 127.5 mm, Ix 34216 cm⁴, Zs.t 134470 cm³, Zs.b 1522 cm³, Zc.t 26846 cm³
Headed Stud Connector	45 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)

Ultimate Limit State (Final Stage)

Maximum Shear Support Reactions (kN)	LH Support 171.98 kN, RH Support 125.52 kN	< 448.69 kN	OK

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Check @ 2.213 m (Max. Moment)	M = 262.97 kN.m, Fv = 7.01 kN		
Shear Connection	No of shear connectors from nearest support 16 < 33.3	Partial	
Axial Resistance (kN)	Rc 3373.25 kN, Rs 2905.2 kN, Rq 1395.2 kN	1395.2 kN	
Degree of Shear Connection	Na/Np = 16 / 33.3 > 0.4	0.48	OK
Reduced Concrete Area	Area required to resist 1395.2 kN	50.4x1536.8mm²	
Moment Capacity	Plastic neutral axis in top flange @ 143.4 mm	456.38 kN.m	OK
Check @ 0.522 m	M = 89.71 kN.m, Fv = 171.35 kN		
Shear Connection	No of shear connectors from nearest support 3 < 33.3	Partial	
Axial Resistance (kN)	Rc 3373.25 kN, Rs 2905.2 kN, Rq 261.6 kN	261.6 kN	
Reduced Concrete Area	Area required to resist 261.6 kN	9.5x1536.8mm²	
Moment Capacity	Plastic neutral axis in web @ 202.2 mm	313.49 kN.m	OK
Check @ 2.173 m	M = 263.25 kN.m, Fv = 104.18 kN		
Shear Connection	No of shear connectors from nearest support 16 < 33.3	Partial	
Axial Resistance (kN)	Rc 3373.25 kN, Rs 2905.2 kN, Rq 1395.2 kN	1395.2 kN	
Reduced Concrete Area	Area required to resist 1395.2 kN	50.4x1536.8mm²	
Moment Capacity	Plastic neutral axis in top flange @ 143.4 mm	456.38 kN.m	OK
Check @ 4.16 m	M = 247.05 kN.m, Fv = 123.12 kN		
Shear Connection	No of shear connectors from nearest support 15 < 33.3	Partial	
Axial Resistance (kN)	Rc 3373.25 kN, Rs 2905.2 kN, Rq 1308 kN	1308 kN	
Reduced Concrete Area	Area required to resist 1308 kN	47.3x1536.8mm²	
Moment Capacity	Plastic neutral axis in top flange @ 144.2 mm	448.1 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 135 mm	7.41 per m	
Vr = fn(Asv,fy,Acv,fcu)	1037, 460, 79000, 40	399.71 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	7.41x87.2x0.77/(0.77+0.77)	322.96 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear Support Reactions (kN)	LH Support 61.45 kN, RH Support 45.46 kN	< 448.69 kN	OK
Check @ 2.213 m (Max. Moment)	M = 93.62 kN.m, Fv = 1.73 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 0.522 m	M = 31.94 kN.m, Fv = 60.82 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 2.173 m	M = 93.69 kN.m, Fv = 36.43 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 4.16 m	M = 87.97 kN.m, Fv = 43.07 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 0.522 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 31.943, 0.6	19.166 kN.m	
Mb=fn(L,ry,β_w,u,v)	0.522 m, 5.34 cm, 1, 0.85, 0.989	258.826 kN.m	OK
Check between 0.522 and 2.173 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	31.943, 93.693, 0.736	68.993 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.651 m, 5.34 cm, 1, 0.85, 0.91	258.826 kN.m	OK
Check between 2.173 and 4.16 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	93.693, 87.965, 0.976	91.402 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.987 m, 5.34 cm, 1, 0.85, 0.881	258.826 kN.m	OK
Check between 4.16 and 6.147 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	87.965, 0, 0.6	52.779 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.987 m, 5.34 cm, 1, 0.85, 0.881	258.826 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 66.11 kN, RH Support 47.88 kN		

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Super Imposed Dead Load	LH Support 9.7 kN, RH Support 7.02 kN		
Dead Load (Self Weight)	LH Support 37.59 kN, RH Support 27.91 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	5.68 (7.20) mm @ 3.074 m < L / 360 = 17 mm	7.20 mm	OK
Super Imposed Dead Loads	0.83 (1.06) mm @ 3.074 m	1.06 mm	
Dead Loads (Self Weight)	11.69 mm @ 3.074 m	11.69 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 66.5, Super Dead 9.8, SW 67.3 < 265	143.55 N/mm²	OK
TOTAL (Compression)	Live 0.8, Super Dead 0.1, SW 67.3 < 265	68.13 N/mm²	OK
Maximum Concrete Stress	Live 3.77, Super Dead 0.55, SW 0 < 20	4.33 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	5 mm	
Natural Frequency	18/√(5.00/1.1) = 8.44 > 4 Hz	8.44 Hz	OK

UNPROPPED COMPOSITE PRIMARY INTERNAL BEAM
Members 151, 172, 178 and 182 (D9-K9) @ Level 3

Summary of Design Data (Integrated Design)

Steel Section (107 kg/m)	254x254 UC 107 [S 275]
Floor Area Supported	7.032 m Span, 6.705 m to LH Beam and 4.795 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+393 mm²/m
Headed Stud Connector	19x95 mm Placed @ 175 mm centre
Transverse Beams	@ 1.865, 3.516 and 5.503 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	122 x 1758 mm², b1= 879 mm and b2= 879 mm
Steel Section Elastic Properties	ye 133.4 mm, A 136.4 cm², Ix 17517 cm⁴, Zt 1314 cm³, Zb 1314 cm³
Composite Section Elastic Properties	ye 139.7 mm, Ix 54313 cm⁴, Zs.t 56228 cm³, Zs.b 2113 cm³, Zc.t 38889 cm³
Headed Stud Connector	40 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 229.77 kN, RH Support 245.62 kN	< 542.79 kN	OK
Check @ 3.516 m (Max. Moment)	M = 548.18 kN.m, Fv = 72.82 kN		
Shear Connection	No of shear connectors from nearest support 20 < 41.4	Partial	
Axial Resistance (kN)	Rc 3858.9 kN, Rs 3614.07 kN, Rq 1744 kN	1744 kN	
Degree of Shear Connection	Na/Np = 20 / 41.4 > 0.4	0.483	OK
Reduced Concrete Area	Area required to resist 1744 kN	55.1x1758mm²	
Moment Capacity	Plastic neutral axis in top flange @ 143.4 mm	643.46 kN.m	OK
Check @ 1.865 m	M = 425.99 kN.m, Fv = 226.98 kN		
Shear Connection	No of shear connectors from nearest support 10 < 41.4	Partial	
Axial Resistance (kN)	Rc 3858.9 kN, Rs 3614.07 kN, Rq 872 kN	872 kN	
Reduced Concrete Area	Area required to resist 872 kN	27.6x1758mm²	
Moment Capacity	Plastic neutral axis in top flange @ 149.7 mm	551.72 kN.m	OK
Check @ 5.503 m	M = 373.88 kN.m, Fv = 243.33 kN		
Shear Connection	No of shear connectors from nearest support 9 < 41.4	Partial	
Axial Resistance (kN)	Rc 3858.9 kN, Rs 3614.07 kN, Rq 784.8 kN	784.8 kN	
Reduced Concrete Area	Area required to resist 784.8 kN	24.8x1758mm²	
Moment Capacity	Plastic neutral axis in top flange @ 150.4 mm	540.91 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 175 mm	5.71 per m	
Vr = fn(Asv,fy,Acv,fcu)	645, 460, 79000, 40	302.49 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	5.71x87.2x0.88/(0.88+0.88)	249.14 kN	OK

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Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 82.44 kN, RH Support 87.88 kN	< 542.79 kN	OK
Check @ 3.516 m (Max. Moment)	M = 194.47 kN.m, Fv = 25 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK
Check @ 1.865 m	M = 151.17 kN.m, Fv = 79.65 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK
Check @ 5.503 m	M = 132.65 kN.m, Fv = 85.59 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 1.865 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 151.172, 0.6	90.703 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.865 m, 6.6 cm, 1, 0.848, 0.944	393.366 kN.m	OK
Check between 1.865 and 3.516 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	151.172, 194.468, 0.911	177.15 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.651 m, 6.6 cm, 1, 0.848, 0.955	393.366 kN.m	OK
Check between 3.516 and 5.503 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	194.468, 132.648, 0.873	169.74 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.987 m, 6.6 cm, 1, 0.848, 0.937	393.366 kN.m	OK
Check between 5.503 and 7.032 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	132.648, 0, 0.6	79.589 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.529 m, 6.6 cm, 1, 0.848, 0.961	393.366 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 88.12 kN, RH Support 94.34 kN		
Super Imposed Dead Load	LH Support 12.92 kN, RH Support 13.84 kN		
Dead Load (Self Weight)	LH Support 50.49 kN, RH Support 53.79 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	9.26 (12.28) mm @ 3.516 m < L / 360 = 19.5 mm	12.28 mm	OK
Super Imposed Dead Loads	1.36 (1.80) mm @ 3.516 m	1.80 mm	
Dead Loads (Self Weight)	16.17 mm @ 3.516 m	16.17 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 100.1, Super Dead 14.7, SW 90.4 < 265	205.20 N/mm²	OK
TOTAL (Compression)	Live 3.8, Super Dead 0.6, SW 90.4 < 265	94.72 N/mm²	OK
Maximum Concrete Stress	Live 5.44, Super Dead 0.8, SW 0 < 20	6.24 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	8.24 mm	
Natural Frequency	18/√(8.24/1.1) = 6.58 > 4 Hz	6.58 Hz	OK

UNPROPPED COMPOSITE PRIMARY INTERNAL BEAM
Members 166, 179, 183 and 187 (D8-K8) @ Level 3

Summary of Design Data (Integrated Design)

Steel Section (107 kg/m)	254x254 UC 107 [S 275]
Floor Area Supported	6.27 m Span, 1.74 m to LH Beam and 6.705 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+393 mm²/m
Headed Stud Connector	19x95 mm Placed @ 175 mm centre
Transverse Beams	@ 1.568, 3.135 and 5.122 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

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Section Properties

Concrete Effective Area	122 x 1480 mm², b1= 696 mm and b2= 784 mm		
Steel Section Elastic Properties	ye 133.4 mm, A 136.4 cm², Ix 17517 cm⁴, Zt 1314 cm³, Zb 1314 cm³		
Composite Section Elastic Properties	ye 148.1 mm, Ix 51566 cm⁴, Zs.t 28511 cm³, Zs.b 2074 cm³, Zc.t 34822 cm³		
Headed Stud Connector	35 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)		

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 192.98 kN, RH Support 209 kN	< 542.79 kN	OK
Check @ 3.135 m (Max. Moment)	M = 398.96 kN.m, Fv = 61.5 kN		
Shear Connection	No of shear connectors from nearest support 17 < 37.2	Partial	
Axial Resistance (kN)	Rc 3248.13 kN, Rs 3614.07 kN, Rq 1482.4 kN	1482.4 kN	
Degree of Shear Connection	Na/Np = 17 / 37.2 > 0.4	0.456	OK
Reduced Concrete Area	Area required to resist 1482.4 kN	55.7x1479.8mm²	
Moment Capacity	Plastic neutral axis in top flange @ 145.3 mm	612.51 kN.m	OK
Check @ 1.568 m	M = 300.82 kN.m, Fv = 190.63 kN		
Shear Connection	No of shear connectors from nearest support 8 < 37.2	Partial	
Axial Resistance (kN)	Rc 3248.13 kN, Rs 3614.07 kN, Rq 697.6 kN	697.6 kN	
Reduced Concrete Area	Area required to resist 697.6 kN	26.2x1479.8mm²	
Moment Capacity	Plastic neutral axis in web @ 160.5 mm	528.05 kN.m	OK
Check @ 5.122 m	M = 239.03 kN.m, Fv = 207.28 kN		
Shear Connection	No of shear connectors from nearest support 6 < 37.2	Partial	
Axial Resistance (kN)	Rc 3248.13 kN, Rs 3614.07 kN, Rq 523.2 kN	523.2 kN	
Reduced Concrete Area	Area required to resist 523.2 kN	19.6x1479.8mm²	
Moment Capacity	Plastic neutral axis in web @ 186.2 mm	501.81 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 175 mm	5.71 per m	
Vr = fn(Asv,fy,Acv,fcu)	645, 460, 79000, 40	302.49 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	5.71x87.2x0.78/(0.7+0.78)	263.92 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 69.53 kN, RH Support 75.07 kN	< 542.79 kN	OK
Check @ 3.135 m (Max. Moment)	M = 142.12 kN.m, Fv = 21.13 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK
Check @ 1.568 m	M = 107.2 kN.m, Fv = 67.18 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK
Check @ 5.122 m	M = 85.22 kN.m, Fv = 73.34 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 1.568 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 107.199, 0.6	64.319 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.568 m, 6.6 cm, 1, 0.848, 0.959	393.366 kN.m	OK
Check between 1.568 and 3.135 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	107.199, 142.12, 0.902	128.152 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.567 m, 6.6 cm, 1, 0.848, 0.959	393.366 kN.m	OK
Check between 3.135 and 5.122 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	142.12, 85.221, 0.84	119.36 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.987 m, 6.6 cm, 1, 0.848, 0.937	393.366 kN.m	OK
Check between 5.122 and 6.27 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	85.221, 0, 0.6	51.133 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.148 m, 6.6 cm, 1, 0.848, 0.977	393.366 kN.m	OK

Serviceability Limit State

Support Reactions (kN)	
Live Loads	LH Support 73.84 kN, RH Support 80.11 kN

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Super Imposed Dead Load	LH Support 10.83 kN, RH Support 11.75 kN		
Dead Load (Self Weight)	LH Support 42.63 kN, RH Support 45.99 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	5.59 (7.36) mm @ 3.135 m < L / 360 = 17.4 mm	7.36 mm	OK
Super Imposed Dead Loads	0.82 (1.08) mm @ 3.135 m	1.08 mm	
Dead Loads (Self Weight)	9.35 mm @ 3.135 m	9.35 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 74.1, Super Dead 10.9, SW 66.1 < 265	151.06 N/mm²	OK
TOTAL (Compression)	Live 5.4, Super Dead 0.8, SW 66.1 < 265	72.32 N/mm²	OK
Maximum Concrete Stress	Live 4.41, Super Dead 0.65, SW 0 < 20	5.06 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	4.99 mm	
Natural Frequency	18/√(4.99/1.1) = 8.45 > 4 Hz	8.45 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Members 174, 180, 184, 188 and 192 (D4-P4) @ Level 3

Summary of Design Data (Integrated Design)

Steel Section (107 kg/m)	254x254 UC 107 [S 275]
Floor Area Supported	6.739 m Span, .18 m to LH Beam and 1.79 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+393 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 932 mm², b1= 90 mm and b2= 842 mm
Steel Section Elastic Properties	ye 133.4 mm, A 136.4 cm², Ix 17517 cm⁴, Zt 1314 cm³, Zb 1314 cm³
Composite Section Elastic Properties	ye 184.8 mm, Ix 41866 cm⁴, Zs.t 7633 cm³, Zs.b 1976 cm³, Zc.t 22649 cm³
Headed Stud Connector	22 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 166.74 kN, RH Support 190.22 kN	< 542.79 kN	OK
Check @ 3.167 m (Max. Moment)	M = 358.56 kN.m, Fv = 9.68 kN		
Shear Connection	No of shear connectors from nearest support 10 < 15.2	Partial	
Axial Resistance (kN)	Rc 1325.84 kN, Rs 3614.07 kN, Rq 872 kN	872 kN	
Degree of Shear Connection	Na/Np = 10 / 15.2 > 0.4	0.658	OK
Reduced Concrete Area	Area required to resist 872 kN	52x932.4mm²	
Moment Capacity	Plastic neutral axis in top flange @ 149.7 mm	541.08 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	645, 460, 114000, 40, 87.5	431.99 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.84/(0.09+0.84)	259.15 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 59.73 kN, RH Support 67.51 kN	< 542.79 kN	OK
Check @ 3.167 m (Max. Moment)	M = 126.8 kN.m, Fv = 3.26 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK

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Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 64.01 kN, RH Support 73.39 kN		
Super Imposed Dead Load	LH Support 9.39 kN, RH Support 10.76 kN		
Dead Load (Self Weight)	LH Support 36.56 kN, RH Support 41.23 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	7.45 (8.52) mm @ 3.37 m < L / 360 = 18.7 mm	8.52 mm	OK
Super Imposed Dead Loads	1.09 (1.25) mm @ 3.37 m	1.25 mm	
Dead Loads (Self Weight)	9.96 mm @ 3.37 m	9.96 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 70.1, Super Dead 10.3, SW 58.9 < 265	139.32 N/mm²	OK
TOTAL (Compression)	Live 18.2, Super Dead 2.7, SW 58.9 < 265	79.72 N/mm²	OK
Maximum Concrete Stress	Live 6.12, Super Dead 0.9, SW 0 < 20	7.02 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	6.27 mm	
Natural Frequency	$18/\sqrt{(6.27/1.1)} = 7.54 > 4$ Hz	7.54 Hz	OK

UNPROPPED NON-COMPOSITE SECONDARY INTERNAL BEAM
Members 185 and 198 (H5-M5) @ Level 3

Summary of Design Data (Integrated Design)

Steel Section (107 kg/m)	254x254 UC 107 [S 275]
Floor Area Supported	6.853 m Span, 2.338 m to LH Beam and .376 m to RH Beam
Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties	ye 133.4 mm, A 136.4 cm², Ix 17517 cm⁴, Zt 1314 cm³, Zb 1314 cm³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 109.57 kN, RH Support 133.34 kN	< 542.79 kN	OK
Check @ 3.632 m (Max. Moment)	M = 217.01 kN.m, Fv = 0.08 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 39.95 kN, RH Support 47.87 kN	< 542.79 kN	OK
Check @ 3.632 m (Max. Moment)	M = 78.19 kN.m, Fv = 0.23 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 41.64 kN, RH Support 51.12 kN		
Super Imposed Dead Load	LH Support 6.11 kN, RH Support 7.5 kN		
Dead Load (Self Weight)	LH Support 24.57 kN, RH Support 29.32 kN		
Maximum Deflection			
Live Loads	11.23 (11.23) mm @ 3.495 m < L / 360 = 19 mm	11.23 mm	OK
Super Imposed Dead Loads	1.65 mm @ 3.495 m	1.65 mm	
Dead Loads (Self Weight)	6.49 mm @ 3.495 m	6.49 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 63.2, Super Dead 9.3, SW 36.5 < 265	108.98 N/mm²	OK
TOTAL (Compression)	Live 63.2, Super Dead 9.3, SW 36.5 < 265	108.98 N/mm²	OK

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REVISED STRUCTURAL CALCULATIONS FOR SUPERSTRUCTURE (PAGES 2-199)

PROPOSED OFFICE DEVELOPMENT AT 18 ORCHARD STREET NEATH

PART I

THOMAS PARRY DESIGN PARTNERSHIP
THE OLD SKETTY COACH HOUSE
GOWER ROAD
SWANSEA

STRUCTURAL ENGINEERS
SLOWIKOWSKI, BLACKSHAW AND PARTNERS

The Maltings, East Tyndall Street
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PROJECT NO: GOA/A/1511

JULY 2007

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LOADING

ROOF (On Plan)

Dead Loads.

Welsh slates	0.48kN/m^2
Felt and battens	0.15
Trussed rafters	0.25
Ceilings and insulation	0.22
	1.10 kN/m^2

Imposed load 0.60 kN/m^2

Floors [Richard Lees Holorib Z35]

Internal floors [1 hr fire resistance]

130mm normal concrete	2.99 kN/m^2
steel deck	0.15
reinforcement	0.04
steel beam	0.20
	3.38 kN/m^2

Imposed load [5+1 kN/m^2] 6.0 kN/m^2

–

External cavity walls

19 mm render	
100mm medium blockwork rendered, celotex insulation	
100mm medium blockwork	
12.5mm plaster	3.02 kN/m^2

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WIND LOADING TO BS 6399 - PART 2
Results for site at SS752975 - Altitude 24 m
Wind Reference 1
Using the Standard Method

Site Basic Data

Location and Base wind speed	BreVe 1km resolution site data for SS752975 - Base wind speed, Vb 22 m/s
Altitude and Obstructions	Site altitude 24 m - Shelter effect from obstructions is included
Seasonal factor, Ss	Season length is All year - Seasonal factor, Ss 1.000
Annual risk and probability factor	Design annual risk 0.02 - Probability factor, Sp 1.000
Topographic Increments	Site altitude only - Topography not significant - assumed to be flat
Heights and Diagonals (m)	Heights above ground 10 and 15, Diagonals 20

Direction Factors - Using UK direction Factors

Direction (°N)	0	30	60	90	120	150	180	210	240	270	300	330
Direction factor, Sd	0.780	0.730	0.730	0.740	0.730	0.800	0.850	0.930	1.000	0.990	0.910	0.820

Standard Method

Site description: Site is in country, nearest distance to sea = 6.98km.

Height Above Ground = 10.0 m - Ve 34.3 m/s - q 720.2 N/m²

He 4.000 a 20.0
Sa 1.024, Sb 1.521 Ca 0.895

Height Above Ground = 15.0 m - Ve 36.5 m/s - q 815.6 N/m²

He 6.000 a 20.0
Sa 1.024, Sb 1.619 Ca 0.895

Ground investigation by Soil Mechanics July 2007

0.00 – 1,200m made ground
1.20 – 1.90m glacial till
1.90 – 4.30m fluvio glacial deposits
Allowable bearing pressure 300-400kN/m^2

Aggressive chemical environment classification class AC-3

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FRAME DATA FILE

LOADING CASES AND LOAD COMBINATION

Load Group Labels

Load Group UT	Unity Load Factor (All Cases)
Load Group D0	Dead Load (Columns Self Weight)
Load Group D1	Super Imposed Dead Load
Load Group L1	Live Load
Load Group W1	Wind Direction 0 Degrees from X Axis (Fetches 225 to 315 Degrees)
Load Group A1	Dead Load (Self Weight)
Load Group G1	Construction Load

Density for Self Weight

Density for Self Weight D0 D 78.00

Load Case 001 : Ultimate Limit State (Final Stage)

Load Combination + 1.00 UT + 1.40 D0 + 1.40 D1 + 1.60 L1 + 1.40 A1
Notional Loads FIND +0.5 (Determine notional load equal to the specified percentage)

Load Case 002 : Ultimate Limit State (Construction Stage)

Load Combination + 1.00 UT + 1.40 D0 + 1.40 A1 + 1.60 G1

Load Case 003 : Live Load (Serviceability)

Load Combination + 1.00 UT + 1.00 L1

Load Case 004 : Super Imposed Load (Serviceability)

Load Combination + 1.00 UT + 1.00 D1

Load Case 005 : Dead Load - Selfweight (Serviceability)

Load Combination + 1.00 UT + 1.00 D0 + 1.00 A1

Load Case 006 : Dead plus Wind (1.0 D0 + 1.0 A1 + 1.0 D1 + 1.4 W1) (a=5)

Load Combination + 1.00 UT + 1.00 D0 + 1.00 D1 + 1.40 W1 + 1.00 A1

Load Case 007 : Dead plus Wind (1.4 D0 + 1.4 A1 + 1.4 D1 + 1.4 W1) (a=5)

Load Combination + 1.00 UT + 1.40 D0 + 1.40 D1 + 1.40 W1 + 1.40 A1

Load Case 008 : Dead plus Wind (1.0 D0 + 1.0 A1 + 1.0 D1 + 1.0 W1) (a=5)

Load Combination + 1.00 UT + 1.00 D0 + 1.00 D1 + 1.00 W1 + 1.00 A1

Load Case 009 : Dead plus Live plus Wind (1.2D0+1.2A1+1.2D1+1.2L1+1.2 W1) (a=5)

Load Combination + 1.00 UT + 1.20 D0 + 1.20 D1 + 1.20 L1 + 1.20 W1 + 1.20 A1

Load Case 010 : Dead plus Live plus Wind (1.0D0+1.0A1+1.0D1+0.8L1+0.8 W1) (a=5)

Load Combination + 1.00 UT + 1.00 D0 + 1.00 D1 + 0.80 L1 + 0.80 W1 + 1.00 A1

THE NODAL CO-ORDINATES

Node	X (m)	Y (m)	Z (m)	Node	X (m)	Y (m)	Z (m)
1	1.040	0.000	6.080	2	1.040	1.000	6.080
3	1.040	0.000	10.815	4	15.944	0.000	32.957
5	20.058	0.000	35.110	6	18.946	0.000	37.328
7	18.946	0.500	37.328	8	1.040	0.000	0.000
9	1.040	3.000	0.000	10	8.370	0.000	0.000
11	1.040	0.000	1.910	12	1.040	3.000	1.910
13	8.580	0.000	1.910	14	7.560	0.000	6.080
15	12.262	0.000	6.080	16	5.190	0.000	10.815
17	11.687	0.000	10.815	18	5.190	0.000	13.625
19	11.337	0.000	13.625	20	1.040	0.000	18.420

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21	3.780	0.000	18.420	22	10.812	0.000	18.420
23	0.000	0.000	25.125	24	0.000	3.000	25.125
25	3.780	0.000	25.125	26	10.050	0.000	25.125
27	0.000	0.000	28.717	28	0.000	2.900	28.717
29	3.875	0.000	28.717	30	3.875	2.900	28.717
31	10.614	0.000	28.717	32	10.614	2.900	28.717
33	9.790	0.000	26.865	34	4.531	0.000	29.076
35	1.040	3.000	6.080	36	1.040	1.000	10.815
37	11.438	0.000	30.600	38	10.525	0.000	32.397
39	0.000	0.000	34.725	40	0.950	0.000	35.110
41	14.823	0.000	35.190	42	7.389	0.000	38.572
43	0.950	0.000	39.965	44	11.942	0.000	40.933
45	5.487	0.000	42.317	46	16.066	0.000	43.071
47	10.059	0.000	44.687	48	14.183	0.000	46.825
49	3.483	3.000	0.000	50	5.927	3.000	0.000
51	8.370	3.000	0.000	52	3.407	3.000	1.910
53	5.773	3.000	1.910	54	8.140	3.000	1.910
55	8.580	3.000	1.910	56	3.483	3.000	6.080
57	5.387	3.000	6.080	58	7.560	3.000	6.080
59	8.488	3.000	6.080	60	9.911	3.000	6.080
61	12.262	3.000	6.080	62	0.000	3.000	28.717
63	0.000	3.000	30.600	64	0.000	3.000	34.725
65	1.040	5.900	0.000	66	1.040	5.900	1.910
67	1.040	5.900	6.080	68	1.040	3.000	10.815
69	3.325	0.000	10.815	70	1.040	3.000	13.625
71	1.040	3.000	18.420	72	0.000	5.900	25.125
73	1.040	3.000	25.125	74	0.000	5.900	28.717
75	1.040	3.000	28.717	76	3.483	5.900	0.000
77	5.927	5.900	0.000	78	8.370	5.900	0.000
79	3.407	5.900	1.910	80	5.773	5.900	1.910
81	8.140	5.900	1.910	82	8.580	5.900	1.910
83	3.483	5.900	6.080	84	5.387	5.900	6.080
85	7.560	5.900	6.080	86	8.488	5.900	6.080
87	9.911	5.900	6.080	88	12.262	5.900	6.080
89	0.000	5.900	30.600	90	0.000	5.900	34.725
91	1.040	8.800	1.910	92	1.040	8.800	6.080
93	1.040	5.900	10.815	94	3.325	3.000	10.815
95	5.190	3.000	10.815	96	3.325	3.000	13.625
97	1.040	5.900	13.625	98	7.363	3.000	10.815
99	3.785	3.000	13.625	100	1.040	5.900	18.420
101	9.336	3.000	10.815	102	5.190	3.000	13.625
103	3.780	3.000	18.420	104	0.000	8.800	25.125
105	11.687	3.000	10.815	106	5.712	3.000	13.625
107	3.780	3.000	25.125	108	1.040	5.900	25.125
109	7.363	3.000	13.625	110	5.645	3.000	18.420
111	3.875	3.000	28.717	112	0.000	8.800	28.717
113	9.350	3.000	13.625	114	7.296	3.000	18.420
115	5.348	3.000	25.125	116	4.659	3.000	28.717
117	11.337	3.000	13.625	118	9.283	3.000	18.420
119	6.915	3.000	25.125	120	5.443	3.000	28.717
121	4.531	3.000	29.076	122	10.812	3.000	18.420
123	8.902	3.000	25.125	124	7.011	3.000	28.717
125	3.508	3.000	30.800	126	1.040	5.900	28.717
127	10.050	3.000	25.125	128	8.950	3.000	26.927
129	3.337	3.000	31.087	130	9.790	3.000	26.865
131	8.998	3.000	28.717	132	2.144	3.000	33.099
133	10.614	3.000	28.717	134	0.950	3.000	35.110

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Slowikowski, Blackshaw and Partners

The Maltings, East Tyndall Street
Cardiff Bay, Cardiff CF24 5EA
Tel : 029 2045 1331 Fax : 029 2045 1344

Job ref : GOA/A/1511
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Made By
Date : JULY 2007
Checked :
Approved :

135	3.407	8.800	1.910	136	11.438	3.000	30.600
137	9.027	3.000	31.567	138	2.888	3.000	36.152
139	10.525	3.000	32.397	140	1.919	3.000	38.059
141	10.299	3.000	32.843	142	0.950	3.000	39.965
143	9.329	3.000	34.753	144	5.773	8.800	1.910
145	8.359	3.000	36.662	146	7.389	3.000	38.572
147	6.438	3.000	40.445	148	5.487	3.000	42.317
149	8.140	8.800	1.910	150	8.580	8.800	1.910
151	3.483	8.800	6.080	152	5.387	8.800	6.080
153	7.560	8.800	6.080	154	8.488	8.800	6.080
155	9.911	8.800	6.080	156	12.262	8.800	6.080
157	0.000	8.800	30.600	158	0.000	8.800	34.725
159	1.040	11.700	1.910	160	1.040	11.700	6.080
161	1.040	8.800	10.815	162	3.325	5.900	10.815
163	5.190	5.900	10.815	164	1.040	11.700	10.815
165	3.325	5.900	13.625	166	7.363	5.900	10.815
167	3.785	5.900	13.625	168	1.040	8.800	13.625
169	9.336	5.900	10.815	170	3.325	8.800	10.815
171	5.190	5.900	13.625	172	3.780	5.900	18.420
173	11.687	5.900	10.815	174	5.712	5.900	13.625
175	1.040	8.800	18.420	176	3.780	5.900	25.125
177	5.190	8.800	10.815	178	7.363	5.900	13.625
179	5.645	5.900	18.420	180	3.875	5.900	28.717
181	9.350	5.900	13.625	182	3.325	8.800	13.625
183	7.296	5.900	18.420	184	5.348	5.900	25.125
185	4.659	5.900	28.717	186	11.337	5.900	13.625
187	9.283	5.900	18.420	188	6.915	5.900	25.125
189	1.040	8.800	25.125	190	5.443	5.900	28.717
191	4.531	5.900	29.076	192	10.812	5.900	18.420
193	8.902	5.900	25.125	194	0.000	11.700	25.125
195	7.011	5.900	28.717	196	3.508	5.900	30.800
197	7.363	8.800	10.815	198	10.050	5.900	25.125
199	8.950	5.900	26.927	200	3.337	5.900	31.087
201	3.785	8.800	13.625	202	9.790	5.900	26.865
203	8.998	5.900	28.717	204	2.144	5.900	33.099
205	10.614	5.900	28.717	206	1.040	8.800	28.717
207	0.950	5.900	35.110	208	0.000	11.600	28.717
209	11.438	5.900	30.600	210	9.027	5.900	31.567
211	2.888	5.900	36.152	212	9.336	8.800	10.815
213	10.525	5.900	32.397	214	1.919	5.900	38.059
215	5.190	8.800	13.625	216	10.299	5.900	32.843
217	0.950	5.900	39.965	218	15.944	0.500	32.957
219	15.944	3.000	32.957	220	3.780	8.800	18.420
221	20.058	0.500	35.110	222	14.823	3.000	35.190
223	15.944	5.900	32.957	224	9.329	5.900	34.753
225	13.863	3.000	37.104	226	20.058	3.000	35.110
227	14.823	5.900	35.190	228	12.902	3.000	39.019
229	18.946	3.000	37.328	230	11.687	8.800	10.815
231	11.942	3.000	40.933	232	17.986	3.000	39.242
233	8.359	5.900	36.662	234	11.000	3.000	42.810
235	17.026	3.000	41.157	236	13.863	5.900	37.104
237	10.059	3.000	44.687	238	16.066	3.000	43.071
239	5.712	8.800	13.625	240	15.125	3.000	44.948
241	7.389	5.900	38.572	242	14.183	3.000	46.825
243	12.902	5.900	39.019	244	3.780	8.800	25.125
245	6.438	5.900	40.445	246	11.942	5.900	40.933
247	7.363	8.800	13.625	248	5.487	5.900	42.317

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The Maltings, East Tyndall Street
Cardiff Bay, Cardiff CF24 5EA
Tel . 029 2045 1331 Fax : 029 2045 1344

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Made By :
Date JULY 2007
Checked :
Approved :

249	11.000	5.900	42.810	250	5.645	8.800	18.420
251	10.059	5.900	44.687	252	3.875	8.800	28.717
253	3.407	11.700	1.910	254	9.350	8.800	13.625
255	7.296	8.800	18.420	256	5.348	8.800	25.125
257	4.659	8.800	28.717	258	3.875	11.600	28.717
259	5.773	11.700	1.910	260	11.337	8.800	13.625
261	9.283	8.800	18.420	262	6.915	8.800	25.125
263	5.443	8.800	28.717	264	4.531	8.800	29.076
265	8.140	11.700	1.910	266	10.812	8.800	18.420
267	8.902	8.800	25.125	268	7.011	8.800	28.717
269	3.508	8.800	30.800	270	8.580	11.700	1.910
271	10.050	8.800	25.125	272	8.950	8.800	26.927
273	3.337	8.800	31.087	274	3.483	11.700	6.080
275	9.790	8.800	26.865	276	8.998	8.800	28.717
277	2.144	8.800	33.099	278	5.387	11.700	6.080
279	10.614	8.800	28.717	280	0.950	8.800	35.110
281	7.560	11.700	6.080	282	11.438	8.800	30.600
283	9.027	8.800	31.567	284	2.888	8.800	36.152
285	10.525	8.800	32.397	286	15.944	8.800	32.957
287	8.488	11.700	6.080	288	20.058	5.900	35.110
289	18.946	5.900	37.328	290	1.919	8.800	38.059
291	10.299	8.800	32.843	292	17.986	5.900	39.242
293	9.911	11.700	6.080	294	17.026	5.900	41.157
295	16.066	5.900	43.071	296	0.950	8.800	39.965
297	9.329	8.800	34.753	298	15.125	5.900	44.948
299	14.823	8.800	35.190	300	14.183	5.900	46.825
301	12.262	11.700	6.080	302	8.359	8.800	36.662
303	13.863	8.800	37.104	304	7.389	8.800	38.572
305	12.902	8.800	39.019	306	11.942	8.800	40.933
307	6.438	8.800	40.445	308	1.040	11.700	13.625
309	11.000	8.800	42.810	310	5.487	8.800	42.317
311	1.040	11.700	18.420	312	10.059	8.800	44.687
313	1.040	11.700	25.125	314	0.000	11.700	28.717
315	1.040	11.700	28.717	316	0.000	11.700	30.600
317	0.000	11.700	34.725	318	1.040	14.600	10.815
319	3.325	11.700	10.815	320	5.190	11.700	10.815
321	3.325	11.700	13.625	322	7.363	11.700	10.815
323	3.785	11.700	13.625	324	0.000	14.600	25.125
325	9.336	11.700	10.815	326	5.190	11.700	13.625
327	3.780	11.700	18.420	328	0.000	14.500	28.717
329	11.687	11.700	10.815	330	5.712	11.700	13.625
331	3.780	11.700	25.125	332	7.363	11.700	13.625
333	5.645	11.700	18.420	334	3.875	11.700	28.717
335	9.350	11.700	13.625	336	7.296	11.700	18.420
337	5.348	11.700	25.125	338	4.659	11.700	28.717
339	3.875	14.500	28.717	340	11.337	11.700	13.625
341	9.283	11.700	18.420	342	6.915	11.700	25.125
343	5.443	11.700	28.717	344	4.531	11.700	29.076
345	10.812	11.700	18.420	346	8.902	11.700	25.125
347	7.011	11.700	28.717	348	3.508	11.700	30.800
349	10.050	11.700	25.125	350	8.950	11.700	26.927
351	3.337	11.700	31.087	352	9.790	11.700	26.865
353	8.998	11.700	28.717	354	2.144	11.700	33.099
355	1.040	14.600	13.625	356	10.614	11.700	28.717
357	0.950	11.700	35.110	358	1.040	14.600	18.420
359	10.614	14.500	28.717	360	11.438	11.700	30.600
361	9.027	11.700	31.567	362	10.525	11.700	32.397

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Cardiff Bay, Cardiff CF24 5EA
Tel : 029 2045 1331 Fax · 029 2045 1344

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Made By ·
Date : JULY 2007
Checked :
Approved .

363	15.944	11.700	32.957	364	10.299	11.700	32.843
365	20.058	8.800	35.110	366	9.329	11.700	34.753
367	18.946	8.800	37.328	368	14.823	11.700	35.190
369	17.986	8.800	39.242	370	8.359	11.700	36.662
371	17.026	8.800	41.157	372	13.863	11.700	37.104
373	16.066	8.800	43.071	374	7.389	11.700	38.572
375	15.125	8.800	44.948	376	12.902	11.700	39.019
377	14.183	8.800	46.825	378	11.942	11.700	40.933
379	1.040	14.600	25.125	380	0.000	14.600	28.717
381	1.040	14.600	28.717	382	0.000	14.600	30.600
383	0.000	14.600	34.725	384	1.040	17.500	10.815
385	3.325	14.600	10.815	386	5.190	14.600	10.815
387	3.325	17.500	10.815	388	3.325	14.600	13.625
389	7.363	14.600	10.815	390	5.190	17.500	10.815
391	3.785	14.600	13.625	392	9.336	14.600	10.815
393	5.190	14.600	13.625	394	3.780	14.600	18.420
395	0.000	17.500	25.125	396	11.687	14.600	10.815
397	5.712	14.600	13.625	398	3.780	14.600	25.125
399	0.000	17.400	28.717	400	7.363	14.600	13.625
401	5.645	14.600	18.420	402	3.875	14.600	28.717
403	9.350	14.600	13.625	404	7.296	14.600	18.420
405	5.348	14.600	25.125	406	4.659	14.600	28.717
407	3.875	17.400	28.717	408	11.337	14.600	13.625
409	9.283	14.600	18.420	410	6.915	14.600	25.125
411	5.443	14.600	28.717	412	4.531	14.600	29.076
413	11.075	14.600	16.023	414	8.902	14.600	25.125
415	7.011	14.600	28.717	416	3.508	14.600	30.800
417	7.363	17.500	10.815	418	10.812	14.600	18.420
419	8.950	14.600	26.927	420	3.337	14.600	31.087
421	9.336	17.500	10.815	422	10.559	14.600	20.646
423	8.998	14.600	28.717	424	2.144	14.600	33.099
425	11.687	17.500	10.815	426	10.050	14.600	25.125
427	0.950	14.600	35.110	428	1.040	17.500	13.625
429	9.790	14.600	26.865	430	3.325	17.500	13.625
431	10.614	14.600	28.717	432	1.040	17.500	18.420
433	10.614	17.400	28.717	434	11.438	14.600	30.600
435	9.027	14.600	31.567	436	3.785	17.500	13.625
437	10.525	14.600	32.397	438	15.944	14.600	32.957
439	5.190	17.500	13.625	440	20.058	11.700	35.110
441	10.299	14.600	32.843	442	18.946	11.700	37.328
443	3.780	17.500	18.420	444	17.986	11.700	39.242
445	9.329	14.600	34.753	446	17.026	11.700	41.157
447	14.823	14.600	35.190	448	16.066	11.700	43.071
449	5.712	17.500	13.625	450	8.359	14.600	36.662
451	13.863	14.600	37.104	452	7.363	17.500	13.625
453	7.389	14.600	38.572	454	12.902	14.600	39.019
455	9.350	17.500	13.625	456	11.942	14.600	40.933
457	11.337	17.500	13.625	458	9.316	17.500	16.037
459	11.075	17.500	16.023	460	5.645	17.500	18.420
461	7.296	17.500	18.420	462	9.283	17.500	18.420
463	10.812	17.500	18.420	464	9.156	17.500	20.656
465	10.559	17.500	20.646	466	1.040	17.500	25.125
467	3.780	17.500	25.125	468	5.348	17.500	25.125
469	6.915	17.500	25.125	470	8.902	17.500	25.125
471	10.050	17.500	25.125	472	8.950	17.500	26.927
473	9.790	17.500	26.865	474	0.000	17.500	28.717
475	1.040	17.500	28.717	476	3.875	17.500	28.717

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The Maltings, East Tyndall Street
Cardiff Bay, Cardiff CF24 5EA
Tel : 029 2045 1331 Fax : 029 2045 1344

Job ref : GOA/A/1511
Sheet : /9-
Made By :
Date : JULY 2007
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477	4.659	17.500	28.717	478	5.443	17.500	28.717
479	4.531	17.500	29.076	480	7.011	17.500	28.717
481	8.998	17.500	28.717	482	10.614	17.500	28.717
483	11.438	17.500	30.600	484	15.944	17.500	32.957
485	0.000	17.500	30.600	486	20.058	14.600	35.110
487	20.058	17.500	35.110	488	18.946	14.600	37.328
489	3.508	17.500	30.800	490	17.986	14.600	39.242
491	0.000	17.500	34.725	492	17.026	14.600	41.157
493	9.027	17.500	31.567	494	16.066	14.600	43.071
495	3.337	17.500	31.087	496	10.525	17.500	32.397
497	2.144	17.500	33.099	498	0.950	17.500	35.110
499	10.299	17.500	32.843	500	9.329	17.500	34.753
501	14.823	17.500	35.190	502	18.946	17.500	37.328
503	8.359	17.500	36.662	504	13.863	17.500	37.104
505	7.389	17.500	38.572	506	12.902	17.500	39.019
507	17.986	17.500	39.242	508	11.942	17.500	40.933
509	17.026	17.500	41.157	510	16.066	17.500	43.071

NODAL LOADING AND SUPPORT CONDITIONS

NODES 1, 3, 5, 7-8, 10-11, 13-23, 25-27, 30-31, 33-34, 37-48, 69 and 218
UT Rs 1 1 1 0 0 0

COMPOSITE SECTION PROPERTIES

Composite Section Properties for the following members are used in the frame analysis in all but loading cases 2 to 5.
Members 1-2, 4-14, 18-20, 29-32, 34-35, 40-41, 44, 47, 50-52, 54-55, 57-59,
63-72, 75-91, 93-97, 99-100, 103, 106, 109, 111-113, 115-119, 121, 123-127,
129, 131, 133-134, 136, 138-139, 141-142, 144-174, 176-184, 187-188, 190-197,
199-213, 215-216, 218, 226, 228, 230-238, 240-246, 248-249, 251-254, 257,
259-268, 275, 277-278, 280-283, 285-289, 291-297, 299-300, 303, 305-307, 311,
314, 316, 318-319, 321-322, 324-325, 327, 366-367, 372-374, 376-382, 386-389,
392, 396-397, 400-405, 408-409, 412, 414-415, 417, 420-421, 423-427, 430-431,
433-434, 436, 439, 441, 447-451, 453-455, 458-463, 466-467, 470, 472-473, 476,
478-480, 482-485, 488-489, 492-493, 496, 500-501, 503, 508, 510-512, 514-515,
517-518, 520-522, 525-526, 528-536, 538, 540, 542-543, 547-548, 550, 552, 554,
558-559, 561-562, 566, 569, 572, 574-584, 586, 589, 591, 593-594, 596, 600,
603, 605-610, 613-614, 616-617, 619, 622, 624-625, 628, 630, 632, 634-640,
643, 654, 656, 659-664, 668, 670, 673, 677, 680, 690, 693-694, 696-699,
701-702, 704, 734 and 736-737

MEMBER PROPERTIES

Members 1-2, 4-11, 18-20, 22, 29-35, 40-41, 44-48, 50-51, 54, 57, 63, 79, 87,
92-94, 99-100, 103, 105-109, 111, 113, 116-117, 119, 121-122, 125, 129,
133-134, 137-138, 145, 147, 163, 169, 176-177, 181, 186, 191, 194, 214, 224,
226-229, 231-232, 234, 236, 238, 240, 243, 246, 249, 252, 254, 273-282,
284-285, 287, 291, 301, 304, 307-311, 313-315, 317, 320, 323, 326-327,
329-331, 333-337, 339, 341-348, 352, 371, 375, 387-388, 409, 412, 414, 431,
433, 436, 439, 441, 457, 467, 470, 472-473, 501, 555, 589, 596, 600-601, 625,
628, 654, 658, 667, 671, 675, 679, 682, 684, 723, 725, 728-730 and 732-749

M ... ... 203x203 UC 86 [S 275]
A 109.63E-4 Ix 9451.7E-8 Iy 3130.3E-8 J 136.8E-8
E 205E6 G 78.84615E6

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Members 3, 24-25, 52-53, 55-56, 58-59, 64-72, 76, 78, 81-82, 112, 115, 118, 123-124, 126-128, 130-132, 141, 143-144, 151, 166, 172, 174, 178-180, 182-185, 187-188, 192, 195, 198-199, 219, 233, 235, 237, 241-242, 244-245, 247-248, 255, 258, 283, 286, 288-289, 292-300, 305, 312, 519, 522, 525, 528, 530, 532, 571-572, 575, 577-578, 580, 633, 635, 637, 639, 641-642, 645-646, 692, 694, 696, 698, 786-789, 803-804, 807, 816, 822, 840, 851, 855, 858, 862-863, 867, 878, 881, 883, 886, 890-891, 896, 902-905, 907-908, 910, 917, 924-925, 929, 932-934, 944, 948, 951, 955-956, 960, 965-967 and 995-996

M ... ... 254x254 UC 107 [S 275]
A 136.38E-4 Ix 17517.3E-8 Iy 5934.5E-8 J 172.43E-8
E 205E6 G 78.84615E6

Members 12-14, 17, 21, 23, 39, 42-43, 49, 60, 80, 84-85, 89, 91, 95-98, 101-102, 104, 110, 114, 120, 142, 148-150, 152-153, 156, 158, 162, 164, 168, 170, 173, 175, 196-197, 200-201, 203-205, 207, 210, 212, 216-218, 220, 222-223, 225, 230, 239, 256-257, 259-260, 262, 265, 267-268, 272, 290, 316, 319, 324, 364-367, 380-382, 384-386, 390, 392, 398, 404-405, 407-408, 418-419, 425, 430, 434, 437, 440, 442, 444, 462-463, 465-466, 477, 488, 493, 495, 498, 502, 504, 506, 523, 547, 552, 556, 560, 563, 565, 582, 593-594, 604, 613, 617, 620, 623, 626, 685, 706, 767, 897, 922, 943, 946, 949, 961-962, 972-979, 981, 983-984, 986-994, 997 and 999-1003

M ... ... 152x152 UC 30 [S 275]
A 38.26E-4 Ix 1748.9E-8 Iy 561.4E-8 J 10.51E-8
E 205E6 G 78.84615E6

Members 15-16, 26-28, 61-62, 73, 83, 86, 88, 90, 140, 146, 154-155, 157, 159-161, 165, 167, 171, 202, 206, 208-209, 211, 213, 215, 221, 261, 263-264, 266, 269, 271, 318, 321-322, 325, 328, 332, 340, 349-351, 353-363, 368-369, 372-374, 376-379, 383, 391, 393-397, 400-403, 406, 410-411, 413, 416, 420-424, 426-428, 432, 435, 438, 445, 447, 449, 452, 456, 458-461, 464, 468-469, 471, 474-475, 478, 480-486, 489-491, 494, 497, 499, 508-509, 511, 531, 535, 538, 540-544, 546, 548-549, 551, 553, 557, 559, 562, 566, 568, 573, 576, 592, 595, 597-599, 602, 605-607, 609-611, 614-615, 618, 621, 644, 647-653, 655, 657, 659-665, 668-669, 672, 674, 676, 678, 681, 683, 687, 689, 695, 700, 703, 705, 707-722, 726 and 731

M ... ... 203x133 UB 30 [S 275]
A 38.21E-4 Ix 2896.5E-8 Iy 385.5E-8 J 10.3E-8
E 205E6 G 78.84615E6

Members 36-38

M ... ... 305x305 UC 198 [S 275]
A 252.41E-4 Ix 50918.3E-8 Iy 16313.3E-8 J 734.01E-8
E 205E6 G 78.84615E6

Members 74, 135, 189, 250, 270, 302, 338, 370, 429, 443, 487, 505, 545, 564, 612, 627, 666, 686, 724 and 727

M ... ... 10 Round Bar
A .7853982E-4 Ix 4.90873865783215EIy 4.90873865783215EJ .09E-8
E 205E6 G 78.84615E6

Members 75, 77, 136, 139, 190, 193, 251, 253, 303, 306 and 608

M ... ... 254x146 UB 43 [S 275]
A 54.77E-4 Ix 6544.6E-8 Iy 678.3E-8 J 23.88E-8
E 205E6 G 78.84615E6Members 389, 415, 417, 476, 479, 514, 591, 603, 656, 810, 812 and 81

M ... ... 203x203 UC 60 [S 275]

A 76.37E-4 Ix 6127.4E-8 Iy 2067.5E-8 J 47.23E-8

E 205E6 G 78.84615E6Members 399, 446, 448, 450-451, 453-455, 507, 510, 512, 517, 526, 533, 536, 567 569, 574, 579, 583, 585, 588, 629-630, 632, 634, 638, 688, 690, 693, 697, 70 820, 824, 869, 871, 899, 915, 931, 938, 964 and 97

M ... ... 254x254 UC 132 [S 275]

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A 168.13E-4 Ix 22535.6E-8 Iy 7538.2E-8 J 318.57E-8

E 205E6 G 78.84615E6Members 492, 496, 500, 503, 550, 554, 558, 561, 616, 619, 622, 624, 670, 67 677 and 68

M ... ... 254x254 UC 167 [S 275]

A 212.85E-4 Ix 30004.6E-8 Iy 9876.8E-8 J 626.39E-8

E 205E6 G 78.84615E6Members 513, 515-516, 518, 520-521, 524, 527, 529, 534, 537, 539, 570, 581, 584 586-587, 590, 631, 636, 640, 643, 691, 699, 702, 704, 783-785, 790-802 805-806, 808-809, 811, 813, 815, 817-819, 821, 823, 825-839, 841-850, 852-854 856-857, 859-861, 864-866, 868, 870, 872-877, 879-880, 882, 884-885, 887-889 892-895, 898, 900-901, 906, 909, 911-914, 916, 918-921, 923, 926-928, 93 935-937, 939-942, 945, 947, 950, 952, 954, 957-959, 963, 968-969, 971 and 99

M ... ... 254x254 UC 73 [S 275]

A 93.1E-4 Ix 11414.2E-8 Iy 3914.7E-8 J 57.62E-8

E 205E6 G 78.84615E6Members 750-766, 768-782, 953, 980, 982 and 98

M ... ... 150x20 Flat

A 30E-4 Ix 562.5E-8 Iy 10E-8 J 40E-8

E 205E6 G 78.84615E6

NOTE : The active density D (automatic self-weight) applies to current and all subsequent members till redefined

COMPOSITE SECTION PROPERTIES

COMPOSITE SECTION PROPERTIES FOR THE FOLLOWING MEMBERS ARE USED IN THE FRAME ANALYSIS IN ALL BUT LOADING CASES 2 TO 5

Members 1-2, 4-14, 18-20, 29-32, 34-35, 40-41, 44, 47, 50-52, 54-55, 57-59, 63-72, 75-91, 93-97, 99-100, 103, 106, 109, 111-113, 115-119, 121, 123-127, 129, 131, 133-134, 136, 138-139, 141-142, 144-174, 176-184, 187-188, 190-197, 199-213, 215-216, 218, 226, 228, 230-238, 240-246, 248-249, 251-254, 257, 259-268, 275, 277-278, 280-283, 285-289, 291-297, 299-300, 303, 305-307, 311, 314, 316, 318-319, 321-322, 324-325, 327, 366-367, 372-374, 376-382, 386-389, 392, 396-397, 400-405, 408-409, 412, 414-415, 417, 420-421, 423-427, 430-431, 433-434, 436, 439, 441, 447-451, 453-455, 458-463, 466-467, 470, 472-473, 476,

478-480, 482-485, 488-489, 492-493, 496, 500-501, 503, 508, 510-512, 514-515, 517-518, 520-522, 525-526, 528-536, 538, 540, 542-543, 547-548, 550, 552, 554, 558-559, 561-562, 566, 569, 572, 574-584, 586, 589, 591, 593-594, 596, 600, 603, 605-610, 613-614, 616-617, 619, 622, 624-625, 628, 630, 632, 634-640, 643, 654, 656, 659-664, 668, 670, 673, 677, 680, 690, 693-694, 696-699, 701-702, 704, 734 and 736-737

WIND PRESSURE VALUES USING THE STANDARD METHOD

Dynamic Pressure Values, q (N/m²) for a = 5

Wind Direction to X Axis	0	90	180	270
q (N/m²) for H = 3	570.2	531.7	334.4	427.8
q (N/m²) for H = 5.9	604.5	563.7	354.5	453.5
q (N/m²) for H = 8.8	691.3	644.6	405.4	518.6
q (N/m²) for H = 11.7	756.5	705.4	443.6	567.5
q (N/m²) for H = 14.6	823.6	767.9	483.0	617.9
q (N/m²) for H = 17.5	919.1	857.0	539.0	689.5

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Notes

Member loads denoted by 'Co' will be obtained by multiplying the shown coefficient by the appropriate value from the table above. W1 to W8 loads will be further multiplied by 0.85(1+0.25) where 0.25 is the Augmentation Factor

MEMBER LOADING

Member 1

D1 UDLY -006.500	(kN/m)	A1 D 078.500	(kN/m³)
W1 UDLZ -003.835	(Co/m)	P1 UDLZ -004.720	(Co/m)
S1 UDLZ -003.245	(Co/m)	W2 UDLZ +001.735	(Co/m)
W3 UDLZ -003.540	(Co/m)	W4 UDLZ -000.723	(Co/m)
W1 UDLZ -003.835	(Co/m)	P1 UDLZ -004.720	(Co/m)
S1 UDLZ -003.245	(Co/m)	W2 UDLZ +001.735	(Co/m)
W3 UDLZ -003.540	(Co/m)	W4 UDLZ -000.723	(Co/m)
UT Stiff-Deck -+-	(Mt My Mz)		

Members 2, 7-9, 15, 19, 21-23, 25-26, 28, 31-32, 42-52, 54-59, 61, 63-65, 67-68, 71, 73, 101-118, 121-124, 126-128, 131, 134, 137, 140, 145, 147, 151, 163, 166, 169, 172, 174, 177-179, 182-183, 187, 214, 217, 219-220, 222, 225-229, 231-238, 240-242, 244-245, 248, 254, 256, 268-269, 271, 273, 276-277, 279-280, 282-283, 285-289, 291-293, 295-296, 299, 301, 304, 308-310, 313, 315, 317, 320, 323, 326, 329-331, 333-337, 339, 341-342, 433, 436, 439, 441, 446, 448, 450-451, 453-455, 492, 496, 500, 503, 507, 510, 512-513, 515-518, 520-521, 524, 526-527, 529, 533-534, 536-537, 539, 550, 554, 558, 561, 567, 569-570, 574, 579, 581, 583-584, 586, 616, 619, 622, 624, 629-632, 634, 636, 638, 640, 643, 670, 673, 677, 680, 688, 690-691, 693, 697, 699, 701-702, 704, 725, 728-729, 735, 738-743 and 745-747

A1 D 078.500	(kN/m³)	UT Stiff-Deck -+-	(Mt My Mz)

Member 3

D1 UDLY -006.500	(kN/m)	A1 D 078.500	(kN/m³)
W1 UDLZ -001.885	(Co/m)	P1 UDLZ -002.320	(Co/m)
S1 UDLZ -001.595	(Co/m)	W2 UDLZ +000.853	(Co/m)
W3 UDLZ -000.290	(Co/m)	W4 UDLZ -000.355	(Co/m)
UT Stiff-Deck -+-	(Mt My Mz)		

Member 4

A1 D 078.500	(kN/m³)	W1 UDLZ -003.835	(Co/m)
P1 UDLZ -004.720	(Co/m)	S1 UDLZ -003.245	(Co/m)
W2 UDLZ +001.735	(Co/m)	W3 UDLZ -002.360	(Co/m)
W4 UDLZ -000.723	(Co/m)	UT Stiff-Deck -+-	(Mt My Mz)

Member 5

D1 UDLY -006.500	(kN/m)	A1 D 078.500	(kN/m³)
W1 UDLZ -003.835	(Co/m)	P1 UDLZ -004.720	(Co/m)
S1 UDLZ -003.245	(Co/m)	W2 UDLZ +001.735	(Co/m)
W3 UDLZ -003.835	(Co/m)	W4 UDLZ -000.723	(Co/m)
W1 UDLZ -003.835	(Co/m)	P1 UDLZ -004.720	(Co/m)
S1 UDLZ -003.245	(Co/m)	W2 UDLZ +001.735	(Co/m)
W3 UDLZ -003.835	(Co/m)	W4 UDLZ -000.723	(Co/m)
UT Stiff-Deck -+-	(Mt My Mz)		

Member

D1 UDLY -006.500	(kN/m)	A1 D 078.500	(kN/m³)
W1 UDLZ -003.540	(Co/m)	P1 UDLZ -004.425	(Co/m)
S1 UDLZ -002.950	(Co/m)	W2 UDLZ +001.735	(Co/m)
W3 UDLZ -003.835	(Co/m)	W4 UDLZ -000.723	(Co/m)
W1 UDLZ -003.540	(Co/m)	P1 UDLZ -004.425	(Co/m)
S1 UDLZ -002.950	(Co/m)	W2 UDLZ +001.735	(Co/m)
W3 UDLZ -003.835	(Co/m)	W4 UDLZ -000.723	(Co/m)
UT Stiff-Deck -+-	(Mt My Mz)		

Member 1

A1 D 078.500	(kN/m³)	W1 UDLZ -003.835	(Co/m)
P1 UDLZ -004.720	(Co/m)	S1 UDLZ -003.245	(Co/m)

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W2 UDLZ +001.799			(Co/m)	W3 UDLZ -002.360			(Co/m)
W4 UDLZ -000.690			(Co/m)	UT Stiff-Deck		-+-	(Mt My Mz)
Member 1							
A1 D 078.500			(kN/m³)	W1 UDLZ -003.835			(Co/m)
P1 UDLZ -004.720			(Co/m)	S1 UDLZ -003.245			(Co/m)
W2 UDLZ +002.053			(Co/m)	W3 UDLZ -003.835			(Co/m)
W4 UDLZ -000.560			(Co/m)	UT Stiff-Deck		-+-	(Mt My Mz)
Member 1							
D1 UDLY -006.500			(kN/m)	A1 D 078.500			(kN/m³)
W1 UDLZ -003.245			(Co/m)	P1 UDLZ -004.130			(Co/m)
S1 UDLZ -002.655			(Co/m)	W2 UDLZ +001.990			(Co/m)
W3 UDLZ -003.835			(Co/m)	W4 UDLZ -000.592			(Co/m)
UT Stiff-Deck		-+-	(Mt My Mz)				
Members 13-1							
D1 UDLY -006.500			(kN/m)	A1 D 078.500			(kN/m³)
W1 UDLZ -002.360			(Co/m)	P1 UDLZ -003.245			(Co/m)
S1 UDLZ -001.770			(Co/m)	W2 UDLZ +001.735			(Co/m)
W3 UDLZ -003.835			(Co/m)	W4 UDLZ -000.723			(Co/m)
UT Stiff-Deck		-+-	(Mt My Mz)				
Members 16, 27, 62, 221 and 27							
D1 PTRY -001.583	0.000	4.080	-002.058	A1 PTRY -005.417	0.000	4.080	-007.043
L1 PTRY -010.792	0.000	4.080	-014.034	G1 PTRY -000.900	0.000	4.080	-001.169
A1 D 078.500			(kN/m³)	UT De-activate			(Ignor Member)
Member 1							
D1 PTRY -001.682	0.000	1.025	-001.017	A1 PTRY -005.756	0.000	1.025	-003.481
L1 PTRY -011.469	0.000	1.025	-006.937	G1 PTRY -000.956	0.000	1.025	-000.578
D1 UDLY -006.500			(kN/m)	A1 D 078.500			(kN/m³)
W1 UDLX +002.501			(Co/m)	W1 UDLZ -002.501			(Co/m)
P1 UDLX +001.616			(Co/m)	P1 UDLZ -001.616			(Co/m)
S1 UDLX +003.091			(Co/m)	S1 UDLZ -003.091			(Co/m)
W2 UDLX -000.853			(Co/m)	W2 UDLZ +000.853			(Co/m)
W3 UDLX -000.808			(Co/m)	W3 UDLZ +000.808			(Co/m)
W4 UDLX +001.467			(Co/m)	W4 UDLZ -001.467			(Co/m)
UT Stiff-Deck		-+-	(Mt My Mz)				
Member 1							
D1 UDLY -006.500			(kN/m)	A1 D 078.500			(kN/m³)
W1 UDLZ -001.885			(Co/m)	P1 UDLZ -002.320			(Co/m)
S1 UDLZ -001.595			(Co/m)	W2 UDLZ +000.853			(Co/m)
W3 UDLZ -001.740			(Co/m)	W4 UDLZ -000.355			(Co/m)
W1 UDLZ -001.885			(Co/m)	P1 UDLZ -002.320			(Co/m)
S1 UDLZ -001.595			(Co/m)	W2 UDLZ +000.853			(Co/m)
W3 UDLZ -001.740			(Co/m)	W4 UDLZ -000.355			(Co/m)
UT Stiff-Deck		-+-	(Mt My Mz)				
Members 20 and 4							
A1 D 078.500			(kN/m³)	W1 UDLZ -003.770			(Co/m)
P1 UDLZ -004.640			(Co/m)	S1 UDLZ -003.190			(Co/m)
W2 UDLZ +001.706			(Co/m)	W3 UDLZ -002.320			(Co/m)
W4 UDLZ -000.710			(Co/m)	UT Stiff-Deck		-+-	(Mt My Mz)
Members 24, 53, 132 and 23							
D1 UDLY -006.500			(kN/m)	A1 D 078.500			(kN/m³)
W1 UDLZ -003.770			(Co/m)	P1 UDLZ -004.640			(Co/m)
S1 UDLZ -003.190			(Co/m)	W2 UDLZ +001.706			(Co/m)
W3 UDLZ -000.580			(Co/m)	W4 UDLZ -000.710			(Co/m)
UT Stiff-Deck		-+-	(Mt My Mz)				
Member 2							
D1 UDLY -006.500			(kN/m)	A1 D 078.500			(kN/m³)
W1 UDLZ -001.885			(Co/m)	P1 UDLZ -002.320			(Co/m)

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S1 UDLZ -001.595 (Co/m) W2 UDLZ +000.853 (Co/m)
W3 UDLZ -001.885 (Co/m) W4 UDLZ -000.355 (Co/m)
W1 UDLZ -001.885 (Co/m) P1 UDLZ -002.320 (Co/m)
S1 UDLZ -001.595 (Co/m) W2 UDLZ +000.853 (Co/m)
W3 UDLZ -001.885 (Co/m) W4 UDLZ -000.355 (Co/m)
UT Stiff-Deck -+- (Mt My Mz)

Member 3

D1 UDLY -006.500 (kN/m) A1 D 078.500 (kN/m³)
W1 UDLZ -001.740 (Co/m) P1 UDLZ -002.175 (Co/m)
S1 UDLZ -001.450 (Co/m) W2 UDLZ +000.853 (Co/m)
W3 UDLZ -001.885 (Co/m) W4 UDLZ -000.355 (Co/m)
W1 UDLZ -001.740 (Co/m) P1 UDLZ -002.175 (Co/m)
S1 UDLZ -001.450 (Co/m) W2 UDLZ +000.853 (Co/m)
W3 UDLZ -001.885 (Co/m) W4 UDLZ -000.355 (Co/m)
UT Stiff-Deck -+- (Mt My Mz)

Members 34 and 9

A1 D 078.500 (kN/m³) W1 UDLZ -003.770 (Co/m)
P1 UDLZ -004.640 (Co/m) S1 UDLZ -003.190 (Co/m)
W2 UDLZ +001.768 (Co/m) W3 UDLZ -002.320 (Co/m)
W4 UDLZ -000.678 (Co/m) UT Stiff-Deck -+- (Mt My Mz)

Members 35 and 9

A1 D 078.500 (kN/m³) W1 UDLZ -003.770 (Co/m)
P1 UDLZ -004.640 (Co/m) S1 UDLZ -003.190 (Co/m)
W2 UDLZ +002.018 (Co/m) W3 UDLZ -003.770 (Co/m)
W4 UDLZ -000.550 (Co/m) UT Stiff-Deck -+- (Mt My Mz)

Member 3

D1 UDLY -006.500 (kN/m) A1 D 078.500 (kN/m³)
W1 UDLZ -003.190 (Co/m) P1 UDLZ -004.060 (Co/m)
S1 UDLZ -002.610 (Co/m) W2 UDLZ +001.956 (Co/m)
W3 UDLZ -003.770 (Co/m) W4 UDLZ -000.582 (Co/m)
UT Stiff-Deck -+- (Mt My Mz)

Members 37-38 and 96-9

D1 UDLY -006.500 (kN/m) A1 D 078.500 (kN/m³)
W1 UDLZ -002.320 (Co/m) P1 UDLZ -003.190 (Co/m)
S1 UDLZ -001.740 (Co/m) W2 UDLZ +001.706 (Co/m)
W3 UDLZ -003.770 (Co/m) W4 UDLZ -000.710 (Co/m)
UT Stiff-Deck -+- (Mt My Mz)

Members 39, 98, 223 and 27

D1 PTRY -001.682 0.000 1.025 -001.017 A1 PTRY -005.756 0.000 1.025 -003.481
L1 PTRY -011.469 0.000 1.025 -006.937 G1 PTRY -000.956 0.000 1.025 -000.578
D1 UDLY -006.500 (kN/m) A1 D 078.500 (kN/m³)
W1 UDLX +002.458 (Co/m) W1 UDLZ -002.458 (Co/m)
P1 UDLX +001.588 (Co/m) P1 UDLZ -001.588 (Co/m)
S1 UDLX +003.038 (Co/m) S1 UDLZ -003.038 (Co/m)
W2 UDLX -000.838 (Co/m) W2 UDLZ +000.838 (Co/m)
W3 UDLX -000.794 (Co/m) W3 UDLZ +000.794 (Co/m)
W4 UDLX +001.442 (Co/m) W4 UDLZ -001.442 (Co/m)
UT Stiff-Deck -+- (Mt My Mz)

Members 40, 79, 87, 99, 176, 181, 224, 274-275, 278, 281, 447, 449, 508 and 51

D1 UDLY -006.500 (kN/m) A1 D 078.500 (kN/m³)
UT Stiff-Deck -+- (Mt My Mz)

Members 60, 175, 239 and 29

D1 PTRY -000.819 0.000 0.748 -000.882 A1 PTRY -002.801 0.000 0.748 -003.016
L1 PTRY -005.581 0.000 0.748 -006.010 G1 PTRY -000.465 0.000 0.748 -000.501
D1 UDLY -000.166 (kN/m) A1 UDLY -000.567 (kN/m)
L1 UDLY -001.129 (kN/m) G1 UDLY -000.094 (kN/m)
A1 D 078.500 (kN/m³) UT Stiff-Deck -+- (Mt My Mz)

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Members 66, 125, 180, 243 and 29

```
   D1 PTRY -000.158 0.000 0.784 -000.302   A1 PTRY -000.541 0.000 0.784 -001.034
   L1 PTRY -001.077 0.000 0.784 -002.061   G1 PTRY -000.090 0.000 0.784 -000.172
   D1 UDLY -001.580             ( kN/m )   A1 UDLY -005.408             ( kN/m )
   L1 UDLY -010.776             ( kN/m )   G1 UDLY -000.898             ( kN/m )
   A1 D     078.500             ( kN/m³)   UT Stiff-Deck     -+-      (Mt My Mz)
```

Members 69, 129, 184, 246 and 29

```
   D1 PTRY -000.302 0.000 1.568 -000.591   A1 PTRY -001.034 0.000 1.568 -002.022
   L1 PTRY -002.061 0.000 1.568 -004.029   G1 PTRY -000.172 0.000 1.568 -000.336
   D1 UDLY -001.580             ( kN/m )   A1 UDLY -005.408             ( kN/m )
   L1 UDLY -010.776             ( kN/m )   G1 UDLY -000.898             ( kN/m )
   A1 D     078.500             ( kN/m³)   UT Stiff-Deck     -+-      (Mt My Mz)
```

Members 70, 130, 185, 247 and 29

```
   D1 PTRY -001.194 0.000 5.140 -002.563   A1 PTRY -004.086 0.000 5.140 -008.773
   L1 PTRY -008.141 0.000 5.140 -017.480   G1 PTRY -000.678 0.000 5.140 -001.457
   A1 D     078.500             ( kN/m³)   UT Stiff-Deck     -+-      (Mt My Mz)
```

Members 72, 133, 188, 249 and 30

```
   D1 PTRY -000.591 0.000 1.987 -000.957   A1 PTRY -002.022 0.000 1.987 -003.273
   L1 PTRY -004.029 0.000 1.987 -006.522   G1 PTRY -000.336 0.000 1.987 -000.544
   D1 UDLY -001.580             ( kN/m )   A1 UDLY -005.408             ( kN/m )
   L1 UDLY -010.776             ( kN/m )   G1 UDLY -000.898             ( kN/m )
   A1 D     078.500             ( kN/m³)   UT Stiff-Deck     -+-      (Mt My Mz)
```

Members 74, 135, 189, 250, 302, 338, 429, 443, 487, 505, 545, 564, 612, 627, 666, 686, 724 and 72

```
   A1 D     078.500             ( kN/m³)   UT De-activate          (Ignor Member)
```

Members 75, 136, 190, 251 and 30

```
   D1 PTRY -002.058 0.000 7.024 -002.098   A1 PTRY -007.042 0.000 7.024 -007.180
   L1 PTRY -014.033 0.000 7.024 -014.306   G1 PTRY -001.170 0.000 7.024 -001.192
   A1 D     078.500             ( kN/m³)   UT Stiff-Deck     -+-      (Mt My Mz)
```

Members 76, 138, 192, 252 and 30

```
   D1 PTRY -001.745 0.000 1.616 -002.069   A1 PTRY -005.968 0.000 1.616 -007.079
   L1 PTRY -011.892 0.000 1.616 -014.106   G1 PTRY -000.991 0.000 1.616 -001.176
   A1 D     078.500             ( kN/m³)   UT Stiff-Deck     -+-      (Mt My Mz)
```

Members 77, 139, 193, 253 and 30

```
   D1 PTRY -002.058 0.000 7.164 -001.882   A1 PTRY -007.042 0.000 7.164 -006.441
   L1 PTRY -014.032 0.000 7.164 -012.834   G1 PTRY -001.170 0.000 7.164 -001.070
   A1 D     078.500             ( kN/m³)   UT Stiff-Deck     -+-      (Mt My Mz)
```

Member 7

```
   D1 TY2  -002.070             (  kN  )   A1 TY2  -007.083             (  kN  )
   L1 TY2  -014.113             (  kN  )   G1 TY2  -001.176             (  kN  )
   D1 PTRY -001.028 0.000 2.200 -001.002   A1 PTRY -003.518 0.000 2.200 -003.430
   L1 PTRY -007.010 0.000 2.200 -006.834   G1 PTRY -000.584 0.000 2.200 -000.569
   D1 UDLY -006.500             ( kN/m )   A1 D     078.500             ( kN/m³)
   W1 UDLX +000.645             ( Co/m )   W1 UDLZ -000.645             ( Co/m )
   P1 UDLX -000.240             ( Co/m )   P1 UDLZ +000.240             ( Co/m )
   S1 UDLX +001.235             ( Co/m )   S1 UDLZ -001.235             ( Co/m )
   W2 UDLX -000.911             ( Co/m )   W2 UDLZ +000.911             ( Co/m )
   W3 UDLX -001.912             ( Co/m )   W3 UDLZ +001.912             ( Co/m )
   W4 UDLX +002.126             ( Co/m )   W4 UDLZ -002.126             ( Co/m )
   UT Stiff-Deck     -+-      (Mt My Mz)
```

Member 8

```
   D1 PTRY -001.107 0.000 5.085 -001.099   A1 PTRY -003.787 0.000 5.085 -003.761
   L1 PTRY -007.546 0.000 5.085 -007.495   G1 PTRY -000.629 0.000 5.085 -000.625
   D1 UDLY -006.500             ( kN/m )   A1 D     078.500             ( kN/m³)
   W1 UDLX +000.956             ( Co/m )   W1 UDLZ -000.956             ( Co/m )
   P1 UDLX +001.841             ( Co/m )   P1 UDLZ -001.841             ( Co/m )
   S1 UDLX +000.366             ( Co/m )   S1 UDLZ -000.366             ( Co/m )
   W2 UDLX -001.290             ( Co/m )   W2 UDLZ +001.290             ( Co/m )
```

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W3	UDLX	-002.409		(Co/m)	W3	UDLZ	+002.409		(Co/m)
W4	UDLX	+000.950		(Co/m)	W4	UDLZ	-000.950		(Co/m)
UT	Stiff-Deck	-+-		(Mt My Mz)					

Members 81, 143, 198, 258 and 31

D1	PTRY	-002.563	0.000 1.712	-002.048	A1	PTRY	-008.773	0.000 1.712	-007.008
L1	PTRY	-017.480	0.000 1.712	-013.964	G1	PTRY	-001.457	0.000 1.712	-001.164
A1	D	078.500		(kN/m³)	UT	Stiff-Deck	-+-		(Mt My Mz)

Member 8

D1	PTRY	-001.943	0.000 5.110	-001.866	A1	PTRY	-006.650	0.000 5.110	-006.386
L1	PTRY	-013.249	0.000 5.110	-012.725	G1	PTRY	-001.104	0.000 5.110	-001.060
A1	D	078.500		(kN/m³)	W1	UDLX	+000.645		(Co/m)
W1	UDLZ	-000.645		(Co/m)	P1	UDLX	-000.240		(Co/m)
P1	UDLZ	+000.240		(Co/m)	S1	UDLX	+001.235		(Co/m)
S1	UDLZ	-001.235		(Co/m)	W2	UDLX	-000.911		(Co/m)
W2	UDLZ	+000.911		(Co/m)	W3	UDLX	-001.916		(Co/m)
W3	UDLZ	+001.916		(Co/m)	W4	UDLX	+002.126		(Co/m)
W4	UDLZ	-002.126		(Co/m)	UT	Stiff-Deck	-+-		(Mt My Mz)

Member 8

D1	PTRY	-001.882	0.000 5.110	-001.848	A1	PTRY	-006.439	0.000 5.110	-006.323
L1	PTRY	-012.830	0.000 5.110	-012.599	G1	PTRY	-001.069	0.000 5.110	-001.050
A1	D	078.500		(kN/m³)	UT	Stiff-Deck	-+-		(Mt My Mz)

Members 84, 148, 203, 260 and 31

D1	UDLY	-000.943		(kN/m)	A1	UDLY	-003.225		(kN/m)
L1	UDLY	-006.426		(kN/m)	G1	UDLY	-000.536		(kN/m)
D1	PTRY	-001.107	0.000 5.096	-001.099	A1	PTRY	-003.787	0.000 5.096	-003.762
L1	PTRY	-007.547	0.000 5.096	-007.495	G1	PTRY	-000.629	0.000 5.096	-000.625
A1	D	078.500		(kN/m³)	UT	Stiff-Deck	-+-		(Mt My Mz)

Member 8

D1	PTRY	-000.941	0.000 5.110	-000.924	A1	PTRY	-003.219	0.000 5.110	-003.161
L1	PTRY	-006.414	0.000 5.110	-006.299	G1	PTRY	-000.535	0.000 5.110	-000.525
D1	UDLY	-006.500		(kN/m)	A1	D	078.500		(kN/m³)
W1	UDLX	-000.590		(Co/m)	W1	UDLZ	+000.590		(Co/m)
P1	UDLX	-001.475		(Co/m)	P1	UDLZ	+001.475		(Co/m)
W2	UDLX	-000.952		(Co/m)	W2	UDLZ	+000.952		(Co/m)
W3	UDLX	-001.910		(Co/m)	W3	UDLZ	+001.910		(Co/m)
W4	UDLX	+002.014		(Co/m)	W4	UDLZ	-002.014		(Co/m)
UT	Stiff-Deck	-+-		(Mt My Mz)					

Members 86, 88, 154, 159, 206, 208, 261, 263, 318 and 32

D1	UDLY	-001.885		(kN/m)	A1	UDLY	-006.449		(kN/m)
L1	UDLY	-012.850		(kN/m)	G1	UDLY	-001.071		(kN/m)
A1	D	078.500		(kN/m³)	UT	Stiff-Deck	-+-		(Mt My Mz)

Member 8

D1	UDLY	-001.867		(kN/m)	A1	UDLY	-006.388		(kN/m)
L1	UDLY	-012.728		(kN/m)	G1	UDLY	-001.061		(kN/m)
A1	D	078.500		(kN/m³)	W1	UDLX	-000.590		(Co/m)
W1	UDLZ	+000.590		(Co/m)	P1	UDLX	-001.475		(Co/m)
P1	UDLZ	+001.475		(Co/m)	W2	UDLX	-000.952		(Co/m)
W2	UDLZ	+000.952		(Co/m)	W3	UDLX	-001.924		(Co/m)
W3	UDLZ	+001.924		(Co/m)	W4	UDLX	+002.014		(Co/m)
W4	UDLZ	-002.014		(Co/m)	UT	Stiff-Deck	-+-		(Mt My Mz)

Members 90 and 16

D1	UDLY	-001.848		(kN/m)	A1	UDLY	-006.324		(kN/m)
L1	UDLY	-012.601		(kN/m)	G1	UDLY	-001.050		(kN/m)
A1	D	078.500		(kN/m³)	UT	Stiff-Deck	-+-		(Mt My Mz)

Member 9

D1	UDLY	-007.424		(kN/m)	A1	UDLY	-003.161		(kN/m)
L1	UDLY	-006.299		(kN/m)	G1	UDLY	-000.525		(kN/m)

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   A1 D     078.500                ( kN/m³)    W1 UDLX +000.276                ( Co/m )
   W1 UDLZ -000.276                ( Co/m )    P1 UDLX -000.609                ( Co/m )
   P1 UDLZ +000.609                ( Co/m )    S1 UDLX +000.866                ( Co/m )
   S1 UDLZ -000.866                ( Co/m )    W2 UDLX -000.946                ( Co/m )
   W2 UDLZ +000.946                ( Co/m )    W3 UDLX -001.916                ( Co/m )
   W3 UDLZ +001.916                ( Co/m )    W4 UDLX +002.014                ( Co/m )
   W4 UDLZ -002.014                ( Co/m )    UT Stiff-Deck      -+-       (Mt My Mz)
Member 9
   A1 D     078.500                ( kN/m³)    W1 UDLZ -003.190                ( Co/m )
   P1 UDLZ -004.060                ( Co/m )    S1 UDLZ -002.610                ( Co/m )
   W2 UDLZ +001.956                ( Co/m )    W3 UDLZ -003.770                ( Co/m )
   W4 UDLZ -000.582                ( Co/m )    UT Stiff-Deck      -+-       (Mt My Mz)
Member 10
   A1 D     078.500                ( kN/m³)    W1 UDLZ -001.885                ( Co/m )
   P1 UDLZ -002.320                ( Co/m )    S1 UDLZ -001.595                ( Co/m )
   W2 UDLZ +000.853                ( Co/m )    W3 UDLZ -001.160                ( Co/m )
   W4 UDLZ -000.355                ( Co/m )    UT Stiff-Deck      -+-       (Mt My Mz)
Member 11
   D1 TY2  -000.062                (  kN  )    A1 TY2  -000.212                (  kN  )
   L1 TY2  -000.422                (  kN  )    G1 TY2  -000.035                (  kN  )
   D1 UDLY -001.580                ( kN/m )    A1 UDLY -005.408                ( kN/m )
   L1 UDLY -010.776                ( kN/m )    G1 UDLY -000.898                ( kN/m )
   A1 D     078.500                ( kN/m³)    UT Stiff-Deck      -+-       (Mt My Mz)
Member 12
   D1 PTRY -000.819 0.000 0.748 -000.882   A1 PTRY -002.801 0.000 0.748 -003.016
   L1 PTRY -005.581 0.000 0.748 -006.010   G1 PTRY -000.465 0.000 0.748 -000.501
   D1 TY2  -000.062                (  kN  )    A1 TY2  -000.212                (  kN  )
   L1 TY2  -000.422                (  kN  )    G1 TY2  -000.035                (  kN  )
   A1 D     078.500                ( kN/m³)    UT Stiff-Deck      -+-       (Mt My Mz)
Member 14
   D1 TY2  -002.070                (  kN  )    A1 TY2  -007.083                (  kN  )
   L1 TY2  -014.113                (  kN  )    G1 TY2  -001.176                (  kN  )
   D1 PTRY -001.028 0.000 2.200 -001.002   A1 PTRY -003.518 0.000 2.200 -003.430
   L1 PTRY -007.010 0.000 2.200 -006.834   G1 PTRY -000.584 0.000 2.200 -000.569
   D1 UDLY -006.500                ( kN/m )    A1 D     078.500                ( kN/m³)
   W1 UDLX +000.634                ( Co/m )    W1 UDLZ -000.634                ( Co/m )
   P1 UDLX -000.236                ( Co/m )    P1 UDLZ +000.236                ( Co/m )
   S1 UDLX +001.214                ( Co/m )    S1 UDLZ -001.214                ( Co/m )
   W2 UDLX -000.896                ( Co/m )    W2 UDLZ +000.896                ( Co/m )
   W3 UDLX -001.880                ( Co/m )    W3 UDLZ +001.880                ( Co/m )
   W4 UDLX +002.090                ( Co/m )    W4 UDLZ -002.090                ( Co/m )
   UT Stiff-Deck      -+-       (Mt My Mz)
Members 142, 197, 257 and 31
   D1 PTRY -001.107 0.000 5.085 -001.099   A1 PTRY -003.787 0.000 5.085 -003.761
   L1 PTRY -007.546 0.000 5.085 -007.495   G1 PTRY -000.629 0.000 5.085 -000.625
   D1 UDLY -006.500                ( kN/m )    A1 D     078.500                ( kN/m³)
   W1 UDLX +000.940                ( Co/m )    W1 UDLZ -000.940                ( Co/m )
   P1 UDLX +001.810                ( Co/m )    P1 UDLZ -001.810                ( Co/m )
   S1 UDLX +000.360                ( Co/m )    S1 UDLZ -000.360                ( Co/m )
   W2 UDLX -001.268                ( Co/m )    W2 UDLZ +001.268                ( Co/m )
   W3 UDLX -002.368                ( Co/m )    W3 UDLZ +002.368                ( Co/m )
   W4 UDLX +000.934                ( Co/m )    W4 UDLZ -000.934                ( Co/m )
   UT Stiff-Deck      -+-       (Mt My Mz)
Member 14
   D1 PTRY -001.943 0.000 5.110 -001.866   A1 PTRY -006.650 0.000 5.110 -006.386
   L1 PTRY -013.249 0.000 5.110 -012.725   G1 PTRY -001.104 0.000 5.110 -001.060
   A1 D     078.500                ( kN/m³)    W1 UDLX +000.634                ( Co/m )
```

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W1	UDLZ	-000.634		(Co/m)	P1	UDLX	-000.236		(Co/m)
P1	UDLZ	+000.236		(Co/m)	S1	UDLX	+001.214		(Co/m)
S1	UDLZ	-001.214		(Co/m)	W2	UDLX	-000.896		(Co/m)
W2	UDLZ	+000.896		(Co/m)	W3	UDLX	-001.884		(Co/m)
W3	UDLZ	+001.884		(Co/m)	W4	UDLX	+002.090		(Co/m)
W4	UDLZ	-002.090		(Co/m)	UT	Stiff-Deck	-+-		(Mt My Mz)

Member 14

D1	PTRY	-000.941	0.000 5.110	-000.924	A1	PTRY	-003.220	0.000 5.110	-003.162
L1	PTRY	-006.416	0.000 5.110	-006.301	G1	PTRY	-000.535	0.000 5.110	-000.525
A1	D	078.500		(kN/m³)	UT	Stiff-Deck	-+-		(Mt My Mz)

Member 14

D1	UDLY	-006.500		(kN/m)	A1	D	078.500		(kN/m³)
W1	UDLX	-000.580		(Co/m)	W1	UDLZ	+000.580		(Co/m)
P1	UDLX	-001.450		(Co/m)	P1	UDLZ	+001.450		(Co/m)
W2	UDLX	-000.936		(Co/m)	W2	UDLZ	+000.936		(Co/m)
W3	UDLX	-001.878		(Co/m)	W3	UDLZ	+001.878		(Co/m)
W4	UDLX	+001.980		(Co/m)	W4	UDLZ	-001.980		(Co/m)
UT	Stiff-Deck	-+-		(Mt My Mz)					

Member 15

D1	PTRY	-001.099	0.000 4.643	-001.092	A1	PTRY	-003.761	0.000 4.643	-003.735
L1	PTRY	-007.495	0.000 4.643	-007.442	G1	PTRY	-000.625	0.000 4.643	-000.620
D1	UDLY	-006.500		(kN/m)	A1	D	078.500		(kN/m³)
W1	UDLX	+000.932		(Co/m)	W1	UDLZ	-000.932		(Co/m)
P1	UDLX	+001.817		(Co/m)	P1	UDLZ	-001.817		(Co/m)
S1	UDLX	+000.342		(Co/m)	S1	UDLZ	-000.342		(Co/m)
W2	UDLX	-001.290		(Co/m)	W2	UDLZ	+001.290		(Co/m)
W3	UDLX	-002.307		(Co/m)	W3	UDLZ	+002.307		(Co/m)
W4	UDLX	+000.956		(Co/m)	W4	UDLZ	-000.956		(Co/m)
UT	Stiff-Deck	-+-		(Mt My Mz)					

Members 152, 156, 207, 262 and 31

D1	UDLY	-000.942		(kN/m)	A1	UDLY	-003.224		(kN/m)
L1	UDLY	-006.423		(kN/m)	G1	UDLY	-000.535		(kN/m)
D1	PTRY	-001.099	0.000 4.644	-001.092	A1	PTRY	-003.762	0.000 4.644	-003.735
L1	PTRY	-007.495	0.000 4.644	-007.443	G1	PTRY	-000.625	0.000 4.644	-000.620
A1	D	078.500		(kN/m³)	UT	Stiff-Deck	-+-		(Mt My Mz)

Members 153, 200, 259 and 31

D1	PTRY	-001.099	0.000 4.643	-001.092	A1	PTRY	-003.761	0.000 4.643	-003.735
L1	PTRY	-007.495	0.000 4.643	-007.442	G1	PTRY	-000.625	0.000 4.643	-000.620
D1	UDLY	-006.500		(kN/m)	A1	D	078.500		(kN/m³)
W1	UDLX	+000.916		(Co/m)	W1	UDLZ	-000.916		(Co/m)
P1	UDLX	+001.786		(Co/m)	P1	UDLZ	-001.786		(Co/m)
S1	UDLX	+000.336		(Co/m)	S1	UDLZ	-000.336		(Co/m)
W2	UDLX	-001.268		(Co/m)	W2	UDLZ	+001.268		(Co/m)
W3	UDLX	-002.268		(Co/m)	W3	UDLZ	+002.268		(Co/m)
W4	UDLX	+000.940		(Co/m)	W4	UDLZ	-000.940		(Co/m)
UT	Stiff-Deck	-+-		(Mt My Mz)					

Members 155, 157, 161, 165, 209, 211, 264, 266, 322 and 32

D1	UDLY	-001.885		(kN/m)	A1	UDLY	-006.450		(kN/m)
L1	UDLY	-012.850		(kN/m)	G1	UDLY	-001.071		(kN/m)
A1	D	078.500		(kN/m³)	UT	Stiff-Deck	-+-		(Mt My Mz)

Member 15

D1	UDLY	-001.866		(kN/m)	A1	UDLY	-006.386		(kN/m)
L1	UDLY	-012.723		(kN/m)	G1	UDLY	-001.060		(kN/m)
A1	D	078.500		(kN/m³)	W1	UDLX	+000.277		(Co/m)
W1	UDLZ	-000.277		(Co/m)	P1	UDLX	-000.608		(Co/m)
P1	UDLZ	+000.608		(Co/m)	S1	UDLX	+000.867		(Co/m)
S1	UDLZ	-000.867		(Co/m)	W2	UDLX	-000.946		(Co/m)

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W2 UDLZ +000.946	(Co/m)	W3 UDLX -001.945		(Co/m)
W3 UDLZ +001.945	(Co/m)	W4 UDLX +001.978		(Co/m)
W4 UDLZ -001.978	(Co/m)	UT Stiff-Deck	-+-	(Mt My Mz)
Members 160 and 17				
D1 UDLY -001.848	(kN/m)	A1 UDLY -006.323		(kN/m)
L1 UDLY -012.598	(kN/m)	G1 UDLY -001.050		(kN/m)
A1 D 078.500	(kN/m³)	UT Stiff-Deck	-+-	(Mt My Mz)
Member 16				
D1 UDLY -007.424	(kN/m)	A1 UDLY -003.161		(kN/m)
L1 UDLY -006.298	(kN/m)	G1 UDLY -000.525		(kN/m)
A1 D 078.500	(kN/m³)	W1 UDLX +000.853		(Co/m)
W1 UDLZ -000.853	(Co/m)	P1 UDLX -000.032		(Co/m)
P1 UDLZ +000.032	(Co/m)	S1 UDLX +001.443		(Co/m)
S1 UDLZ -001.443	(Co/m)	W2 UDLX -000.946		(Co/m)
W2 UDLZ +000.946	(Co/m)	W3 UDLX -001.926		(Co/m)
W3 UDLZ +001.926	(Co/m)	W4 UDLX +001.978		(Co/m)
W4 UDLZ -001.978	(Co/m)	UT Stiff-Deck	-+-	(Mt My Mz)
Member 16				
D1 UDLY -001.867	(kN/m)	A1 UDLY -006.388		(kN/m)
L1 UDLY -012.728	(kN/m)	G1 UDLY -001.061		(kN/m)
A1 D 078.500	(kN/m³)	W1 UDLX -000.580		(Co/m)
W1 UDLZ +000.580	(Co/m)	P1 UDLX -001.450		(Co/m)
P1 UDLZ +001.450	(Co/m)	W2 UDLX -000.936		(Co/m)
W2 UDLZ +000.936	(Co/m)	W3 UDLX -001.892		(Co/m)
W3 UDLZ +001.892	(Co/m)	W4 UDLX +001.980		(Co/m)
W4 UDLZ -001.980	(Co/m)	UT Stiff-Deck	-+-	(Mt My Mz)
Member 16				
D1 UDLY -001.866	(kN/m)	A1 UDLY -006.386		(kN/m)
L1 UDLY -012.723	(kN/m)	G1 UDLY -001.060		(kN/m)
A1 D 078.500	(kN/m³)	W1 UDLX +000.272		(Co/m)
W1 UDLZ -000.272	(Co/m)	P1 UDLX -000.598		(Co/m)
P1 UDLZ +000.598	(Co/m)	S1 UDLX +000.852		(Co/m)
S1 UDLZ -000.852	(Co/m)	W2 UDLX -000.930		(Co/m)
W2 UDLZ +000.930	(Co/m)	W3 UDLX -001.912		(Co/m)
W3 UDLZ +001.912	(Co/m)	W4 UDLX +001.944		(Co/m)
W4 UDLZ -001.944	(Co/m)	UT Stiff-Deck	-+-	(Mt My Mz)
Member 17				
D1 UDLY -007.424	(kN/m)	A1 UDLY -003.161		(kN/m)
L1 UDLY -006.299	(kN/m)	G1 UDLY -000.525		(kN/m)
A1 D 078.500	(kN/m³)	W1 UDLX +000.272		(Co/m)
W1 UDLZ -000.272	(Co/m)	P1 UDLX -000.598		(Co/m)
P1 UDLZ +000.598	(Co/m)	S1 UDLX +000.852		(Co/m)
S1 UDLZ -000.852	(Co/m)	W2 UDLX -000.930		(Co/m)
W2 UDLZ +000.930	(Co/m)	W3 UDLX -001.884		(Co/m)
W3 UDLZ +001.884	(Co/m)	W4 UDLX +001.980		(Co/m)
W4 UDLZ -001.980	(Co/m)	UT Stiff-Deck	-+-	(Mt My Mz)
Member 17				
D1 UDLY -007.424	(kN/m)	A1 UDLY -003.161		(kN/m)
L1 UDLY -006.298	(kN/m)	G1 UDLY -000.525		(kN/m)
A1 D 078.500	(kN/m³)	W1 UDLX +000.838		(Co/m)
W1 UDLZ -000.838	(Co/m)	P1 UDLX -000.032		(Co/m)
P1 UDLZ +000.032	(Co/m)	S1 UDLX +001.418		(Co/m)
S1 UDLZ -001.418	(Co/m)	W2 UDLX -000.930		(Co/m)
W2 UDLZ +000.930	(Co/m)	W3 UDLX -001.894		(Co/m)
W3 UDLZ +001.894	(Co/m)	W4 UDLX +001.944		(Co/m)
W4 UDLZ -001.944	(Co/m)	UT Stiff-Deck	-+-	(Mt My Mz)
Member 19				

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   A1 D     078.500              ( kN/m³)   W1 UDLZ -001.885              ( Co/m )
   P1 UDLZ -002.320              ( Co/m )   S1 UDLZ -001.595              ( Co/m )
   W2 UDLZ +000.884              ( Co/m )   W3 UDLZ -001.160              ( Co/m )
   W4 UDLZ -000.339              ( Co/m )   UT Stiff-Deck     -+-       (Mt My Mz)
Member 19
   A1 D     078.500              ( kN/m³)   W1 UDLZ -001.885              ( Co/m )
   P1 UDLZ -002.320              ( Co/m )   S1 UDLZ -001.595              ( Co/m )
   W2 UDLZ +001.009              ( Co/m )   W3 UDLZ -001.885              ( Co/m )
   W4 UDLZ -000.275              ( Co/m )   UT Stiff-Deck     -+-       (Mt My Mz)
Member 19
   D1 PTRY -001.028 0.000 2.200 -001.002   A1 PTRY -003.518 0.000 2.200 -003.430
   L1 PTRY -007.010 0.000 2.200 -006.834   G1 PTRY -000.584 0.000 2.200 -000.569
   D1 UDLY -006.500              ( kN/m )   A1 D     078.500              ( kN/m³)
   W1 UDLX +000.634              ( Co/m )   W1 UDLZ -000.634              ( Co/m )
   P1 UDLX -000.236              ( Co/m )   P1 UDLZ +000.236              ( Co/m )
   S1 UDLX +001.214              ( Co/m )   S1 UDLZ -001.214              ( Co/m )
   W2 UDLX -000.896              ( Co/m )   W2 UDLZ +000.896              ( Co/m )
   W3 UDLX -001.880              ( Co/m )   W3 UDLZ +001.880              ( Co/m )
   W4 UDLX +002.090              ( Co/m )   W4 UDLZ -002.090              ( Co/m )
   UT Stiff-Deck     -+-       (Mt My Mz)
Member 19
   A1 D     078.500              ( kN/m³)   W1 UDLZ -001.595              ( Co/m )
   P1 UDLZ -002.030              ( Co/m )   S1 UDLZ -001.305              ( Co/m )
   W2 UDLZ +000.978              ( Co/m )   W3 UDLZ -001.885              ( Co/m )
   W4 UDLZ -000.291              ( Co/m )   UT Stiff-Deck     -+-       (Mt My Mz)
Member 19
   D1 PTRY -001.943 0.000 5.110 -001.866   A1 PTRY -006.650 0.000 5.110 -006.386
   L1 PTRY -013.249 0.000 5.110 -012.725   G1 PTRY -001.104 0.000 5.110 -001.060
   D1 UDLY -006.500              ( kN/m )   A1 D     078.500              ( kN/m³)
   W1 UDLX +000.634              ( Co/m )   W1 UDLZ -000.634              ( Co/m )
   P1 UDLX -000.236              ( Co/m )   P1 UDLZ +000.236              ( Co/m )
   S1 UDLX +001.214              ( Co/m )   S1 UDLZ -001.214              ( Co/m )
   W2 UDLX -000.896              ( Co/m )   W2 UDLZ +000.896              ( Co/m )
   W3 UDLX -001.884              ( Co/m )   W3 UDLZ +001.884              ( Co/m )
   W4 UDLX +002.090              ( Co/m )   W4 UDLZ -002.090              ( Co/m )
   UT Stiff-Deck     -+-       (Mt My Mz)
Members 201 and 20
   D1 UDLY -006.500              ( kN/m )   A1 D     078.500              ( kN/m³)
   W1 UDLZ -001.160              ( Co/m )   P1 UDLZ -001.595              ( Co/m )
   S1 UDLZ -000.870              ( Co/m )   W2 UDLZ +000.853              ( Co/m )
   W3 UDLZ -001.885              ( Co/m )   W4 UDLZ -000.355              ( Co/m )
   UT Stiff-Deck     -+-       (Mt My Mz)
Member 21
   D1 UDLY -008.367              ( kN/m )   A1 UDLY -006.388              ( kN/m )
   L1 UDLY -012.728              ( kN/m )   G1 UDLY -001.061              ( kN/m )
   A1 D     078.500              ( kN/m³)   W1 UDLX -000.580              ( Co/m )
   W1 UDLZ +000.580              ( Co/m )   P1 UDLX -001.450              ( Co/m )
   P1 UDLZ +001.450              ( Co/m )   W2 UDLX -000.936              ( Co/m )
   W2 UDLZ +000.936              ( Co/m )   W3 UDLX -001.892              ( Co/m )
   W3 UDLZ +001.892              ( Co/m )   W4 UDLX +001.980              ( Co/m )
   W4 UDLZ -001.980              ( Co/m )   UT Stiff-Deck     -+-       (Mt My Mz)
Member 21
   D1 UDLY -008.366              ( kN/m )   A1 UDLY -006.386              ( kN/m )
   L1 UDLY -012.723              ( kN/m )   G1 UDLY -001.060              ( kN/m )
   A1 D     078.500              ( kN/m³)   W1 UDLX +000.272              ( Co/m )
   W1 UDLZ -000.272              ( Co/m )   P1 UDLX -000.598              ( Co/m )
   P1 UDLZ +000.598              ( Co/m )   S1 UDLX +000.852              ( Co/m )
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   S1 UDLZ -000.852              ( Co/m )   W2 UDLX -000.930              ( Co/m )
   W2 UDLZ +000.930              ( Co/m )   W3 UDLX -001.912              ( Co/m )
   W3 UDLZ +001.912              ( Co/m )   W4 UDLX +001.944              ( Co/m )
   W4 UDLZ -001.944              ( Co/m )   UT Stiff-Deck      -+-      (Mt My Mz)
Members 255 and 30
   D1 PTRY -001.028 0.000 7.311 -000.942   A1 PTRY -003.518 0.000 7.311 -003.224
   L1 PTRY -007.010 0.000 7.311 -006.425   G1 PTRY -000.584 0.000 7.311 -000.535
   D1 UDLY -006.500              ( kN/m )   A1 D     078.500              ( kN/m³)
   W1 UDLX +000.634              ( Co/m )   W1 UDLZ -000.634              ( Co/m )
   P1 UDLX -000.236              ( Co/m )   P1 UDLZ +000.236              ( Co/m )
   S1 UDLX +001.214              ( Co/m )   S1 UDLZ -001.214              ( Co/m )
   W2 UDLX -000.896              ( Co/m )   W2 UDLZ +000.896              ( Co/m )
   W3 UDLX -001.884              ( Co/m )   W3 UDLZ +001.884              ( Co/m )
   W4 UDLX +002.090              ( Co/m )   W4 UDLZ -002.090              ( Co/m )
   UT Stiff-Deck      -+-       (Mt My Mz)
Members 265 and 32
   D1 UDLY -007.443              ( kN/m )   A1 UDLY -003.225              ( kN/m )
   L1 UDLY -006.426              ( kN/m )   G1 UDLY -000.536              ( kN/m )
   A1 D     078.500              ( kN/m³)   W1 UDLX -000.580              ( Co/m )
   W1 UDLZ +000.580              ( Co/m )   P1 UDLX -001.450              ( Co/m )
   P1 UDLZ +001.450              ( Co/m )   W2 UDLX -000.936              ( Co/m )
   W2 UDLZ +000.936              ( Co/m )   W3 UDLX -001.892              ( Co/m )
   W3 UDLZ +001.892              ( Co/m )   W4 UDLX +001.980              ( Co/m )
   W4 UDLZ -001.980              ( Co/m )   UT Stiff-Deck      -+-      (Mt My Mz)
Members 267 and 32
   D1 UDLY -007.442              ( kN/m )   A1 UDLY -003.224              ( kN/m )
   L1 UDLY -006.423              ( kN/m )   G1 UDLY -000.535              ( kN/m )
   A1 D     078.500              ( kN/m³)   W1 UDLX +000.272              ( Co/m )
   W1 UDLZ -000.272              ( Co/m )   P1 UDLX -000.598              ( Co/m )
   P1 UDLZ +000.598              ( Co/m )   S1 UDLX +000.852              ( Co/m )
   S1 UDLZ -000.852              ( Co/m )   W2 UDLX -000.930              ( Co/m )
   W2 UDLZ +000.930              ( Co/m )   W3 UDLX -001.912              ( Co/m )
   W3 UDLZ +001.912              ( Co/m )   W4 UDLX +001.944              ( Co/m )
   W4 UDLZ -001.944              ( Co/m )   UT Stiff-Deck      -+-      (Mt My Mz)
Member 28
   A1 D     078.500              ( kN/m³)   W1 UDLZ -001.885              ( Co/m )
   P1 UDLZ -002.320              ( Co/m )   S1 UDLZ -001.595              ( Co/m )
   W2 UDLZ +000.853              ( Co/m )   W3 UDLZ -000.290              ( Co/m )
   W4 UDLZ -000.355              ( Co/m )   UT Stiff-Deck      -+-      (Mt My Mz)
Member 34
   D1 PTRY -001.799 0.000 4.080 -002.339   L1 PTRY -001.080 0.000 4.080 -001.403
   A1 D     078.500              ( kN/m³)   UT De-activate          (Ignor Member)
Member 34
   D1 PTRY -000.930 0.000 0.748 -001.002   L1 PTRY -000.558 0.000 0.748 -000.601
   D1 UDLY -000.188              ( kN/m )   L1 UDLY -000.113              ( kN/m )
   A1 D     078.500              ( kN/m³)   UT Stiff-Deck      -+-      (Mt My Mz)
Member 34
   D1 PTRY -000.180 0.000 0.784 -000.343   L1 PTRY -000.108 0.000 0.784 -000.206
   D1 UDLY -001.796              ( kN/m )   L1 UDLY -001.078              ( kN/m )
   A1 D     078.500              ( kN/m³)   UT Stiff-Deck      -+-      (Mt My Mz)
Member 34
   D1 PTRY -000.343 0.000 1.568 -000.671   L1 PTRY -000.206 0.000 1.568 -000.403
   D1 UDLY -001.796              ( kN/m )   L1 UDLY -001.078              ( kN/m )
   A1 D     078.500              ( kN/m³)   UT Stiff-Deck      -+-      (Mt My Mz)
Member 34
   D1 PTRY -001.357 0.000 5.140 -002.913   L1 PTRY -000.814 0.000 5.140 -001.748
   A1 D     078.500              ( kN/m³)   UT Stiff-Deck      -+-      (Mt My Mz)
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Member 34
D1 PTRY -000.671 0.000 1.987 -001.087 L1 PTRY -000.403 0.000 1.987 -000.652
D1 UDLY -001.796 (kN/m) L1 UDLY -001.078 (kN/m)
A1 D 078.500 (kN/m³) UT Stiff-Deck -+- (Mt My Mz)

Member 34
D1 PTRY -001.982 0.000 1.616 -002.351 L1 PTRY -001.189 0.000 1.616 -001.411
A1 D 078.500 (kN/m³) UT Stiff-Deck -+- (Mt My Mz)

Member 34
D1 PTRY -001.258 0.000 5.085 -001.249 L1 PTRY -000.755 0.000 5.085 -000.749
A1 D 078.500 (kN/m³) W1 UDLX +000.470 (Co/m)
W1 UDLZ -000.470 (Co/m) P1 UDLX +000.905 (Co/m)
P1 UDLZ -000.905 (Co/m) S1 UDLX +000.180 (Co/m)
S1 UDLZ -000.180 (Co/m) W2 UDLX -000.634 (Co/m)
W2 UDLZ +000.634 (Co/m) W3 UDLX -001.184 (Co/m)
W3 UDLZ +001.184 (Co/m) W4 UDLX +000.467 (Co/m)
W4 UDLZ -000.467 (Co/m) UT Stiff-Deck -+- (Mt My Mz)

Member 35
D1 PTRY -001.249 0.000 4.643 -001.240 L1 PTRY -000.749 0.000 4.643 -000.744
A1 D 078.500 (kN/m³) W1 UDLX +000.458 (Co/m)
W1 UDLZ -000.458 (Co/m) P1 UDLX +000.893 (Co/m)
P1 UDLZ -000.893 (Co/m) S1 UDLX +000.168 (Co/m)
S1 UDLZ -000.168 (Co/m) W2 UDLX -000.634 (Co/m)
W2 UDLZ +000.634 (Co/m) W3 UDLX -001.134 (Co/m)
W3 UDLZ +001.134 (Co/m) W4 UDLX +000.470 (Co/m)
W4 UDLZ -000.470 (Co/m) UT Stiff-Deck -+- (Mt My Mz)

Member 35
D1 PTRY -001.911 0.000 1.025 -001.156 L1 PTRY -001.147 0.000 1.025 -000.694
A1 D 078.500 (kN/m³) W1 UDLX +001.229 (Co/m)
W1 UDLZ -001.229 (Co/m) P1 UDLX +000.794 (Co/m)
P1 UDLZ -000.794 (Co/m) S1 UDLX +001.519 (Co/m)
S1 UDLZ -001.519 (Co/m) W2 UDLX -000.419 (Co/m)
W2 UDLZ +000.419 (Co/m) W3 UDLX -000.397 (Co/m)
W3 UDLZ +000.397 (Co/m) W4 UDLX +000.721 (Co/m)
W4 UDLZ -000.721 (Co/m) UT Stiff-Deck -+- (Mt My Mz)

Member 35
D1 PTRY -002.913 0.000 1.712 -002.327 L1 PTRY -001.748 0.000 1.712 -001.396
A1 D 078.500 (kN/m³) UT Stiff-Deck -+- (Mt My Mz)

Member 35
D1 PTRY -002.338 0.000 7.024 -002.384 L1 PTRY -001.404 0.000 7.024 -001.430
A1 D 078.500 (kN/m³) UT Stiff-Deck -+- (Mt My Mz)

Member 35
D1 PTRY -002.338 0.000 7.164 -002.139 L1 PTRY -001.404 0.000 7.164 -001.284
A1 D 078.500 (kN/m³) UT Stiff-Deck -+- (Mt My Mz)

Member 35
D1 PTRY -001.168 0.000 7.311 -001.071 L1 PTRY -000.701 0.000 7.311 -000.642
A1 D 078.500 (kN/m³) W1 UDLX +000.317 (Co/m)
W1 UDLZ -000.317 (Co/m) P1 UDLX -000.118 (Co/m)
P1 UDLZ +000.118 (Co/m) S1 UDLX +000.607 (Co/m)
S1 UDLZ -000.607 (Co/m) W2 UDLX -000.448 (Co/m)
W2 UDLZ +000.448 (Co/m) W3 UDLX -000.942 (Co/m)
W3 UDLZ +000.942 (Co/m) W4 UDLX +001.045 (Co/m)
W4 UDLZ -001.045 (Co/m) UT Stiff-Deck -+- (Mt My Mz)

Member 35
D1 UDLY -001.071 (kN/m) L1 UDLY -000.643 (kN/m)
D1 PTRY -001.258 0.000 5.096 -001.249 L1 PTRY -000.755 0.000 5.096 -000.750
A1 D 078.500 (kN/m³) UT Stiff-Deck -+- (Mt My Mz)

Members 357, 359-360 and 36

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   D1 UDLY -002.142                ( kN/m )    L1 UDLY -001.285                ( kN/m )
   A1 D     078.500                ( kN/m³)    UT Stiff-Deck      -+-       (Mt My Mz)
Member 35
   D1 UDLY -001.071                ( kN/m )    L1 UDLY -000.642                ( kN/m )
   D1 PTRY -001.249 0.000 4.644 -001.240       L1 PTRY -000.750 0.000 4.644 -000.744
   A1 D     078.500                ( kN/m³)    UT Stiff-Deck      -+-       (Mt My Mz)
Member 36
   D1 UDLY -001.071                ( kN/m )    L1 UDLY -000.643                ( kN/m )
   A1 D     078.500                ( kN/m³)    W1 UDLX -000.290                ( Co/m )
   W1 UDLZ +000.290                ( Co/m )    P1 UDLX -000.725                ( Co/m )
   P1 UDLZ +000.725                ( Co/m )    W2 UDLX -000.468                ( Co/m )
   W2 UDLZ +000.468                ( Co/m )    W3 UDLX -000.946                ( Co/m )
   W3 UDLZ +000.946                ( Co/m )    W4 UDLX +000.990                ( Co/m )
   W4 UDLZ -000.990                ( Co/m )    UT Stiff-Deck      -+-       (Mt My Mz)
Member 36
   D1 UDLY -001.071                ( kN/m )    L1 UDLY -000.642                ( kN/m )
   A1 D     078.500                ( kN/m³)    W1 UDLX +000.136                ( Co/m )
   W1 UDLZ -000.136                ( Co/m )    P1 UDLX -000.299                ( Co/m )
   P1 UDLZ +000.299                ( Co/m )    S1 UDLX +000.426                ( Co/m )
   S1 UDLZ -000.426                ( Co/m )    W2 UDLX -000.465                ( Co/m )
   W2 UDLZ +000.465                ( Co/m )    W3 UDLX -000.956                ( Co/m )
   W3 UDLZ +000.956                ( Co/m )    W4 UDLX +000.972                ( Co/m )
   W4 UDLZ -000.972                ( Co/m )    UT Stiff-Deck      -+-       (Mt My Mz)
Member 36
   D1 PTRY -001.075 0.000 1.910 -001.041       A1 PTRY -003.678 0.000 1.910 -003.564
   L1 PTRY -007.329 0.000 1.910 -007.101       G1 PTRY -000.611 0.000 1.910 -000.592
   D1 UDLY -006.500                ( kN/m )    A1 D     078.500                ( kN/m³)
   W1 UDLX +002.036                ( Co/m )    P1 UDLX +001.151                ( Co/m )
   S1 UDLX +002.626                ( Co/m )    W2 UDLX -003.835                ( Co/m )
   W3 UDLX -000.979                ( Co/m )    W4 UDLX -002.360                ( Co/m )
   UT Stiff-Deck      -+-       (Mt My Mz)
Member 36
   D1 PTRY -001.041 0.000 4.170 -001.075       A1 PTRY -003.564 0.000 4.170 -003.678
   L1 PTRY -007.101 0.000 4.170 -007.329       G1 PTRY -000.592 0.000 4.170 -000.611
   D1 UDLY -006.500                ( kN/m )    A1 D     078.500                ( kN/m³)
   W1 UDLX +002.036                ( Co/m )    P1 UDLX +001.151                ( Co/m )
   S1 UDLX +002.626                ( Co/m )    W2 UDLX -003.245                ( Co/m )
   W3 UDLX -000.979                ( Co/m )    W4 UDLX -002.360                ( Co/m )
   UT Stiff-Deck      -+-       (Mt My Mz)
Member 36
   D1 UDLY -006.958                ( kN/m )    A1 UDLY -001.566                ( kN/m )
   L1 UDLY -003.120                ( kN/m )    G1 UDLY -000.260                ( kN/m )
   A1 D     078.500                ( kN/m³)    W1 UDLX +002.036                ( Co/m )
   P1 UDLX +001.151                ( Co/m )    S1 UDLX +002.626                ( Co/m )
   W2 UDLX -003.835                ( Co/m )    W3 UDLX -000.979                ( Co/m )
   W4 UDLX -002.360                ( Co/m )    UT Stiff-Deck      -+-       (Mt My Mz)
Member 36
   D1 PTRY -001.075 0.000 4.735 -001.005       A1 PTRY -003.678 0.000 4.735 -003.440
   L1 PTRY -007.329 0.000 4.735 -006.855       G1 PTRY -000.611 0.000 4.735 -000.571
   D1 UDLY -006.500                ( kN/m )    A1 D     078.500                ( kN/m³)
   W1 UDLX +002.036                ( Co/m )    P1 UDLX +001.151                ( Co/m )
   S1 UDLX +002.626                ( Co/m )    W2 UDLX -002.360                ( Co/m )
   W3 UDLX -000.979                ( Co/m )    W4 UDLX -003.540                ( Co/m )
   UT Stiff-Deck      -+-       (Mt My Mz)
Member 36
   D1 PTRY -002.149 0.000 1.911 -002.081       A1 PTRY -007.352 0.000 1.911 -007.120
   L1 PTRY -014.649 0.000 1.911 -014.187       G1 PTRY -001.221 0.000 1.911 -001.182
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   A1 D     078.500              ( kN/m³)   UT Stiff-Deck      -+-       (Mt My Mz)
Member 36
   D1 PTRY -002.143 0.000 1.916 -002.076   A1 PTRY -007.334 0.000 1.916 -007.103
   L1 PTRY -014.613 0.000 1.916 -014.153   G1 PTRY -001.218 0.000 1.916 -001.180
   A1 D     078.500              ( kN/m³)   UT Stiff-Deck      -+-       (Mt My Mz)
Member 37
   D1 PTRY -001.067 0.000 1.924 -001.034   A1 PTRY -003.652 0.000 1.924 -003.538
   L1 PTRY -007.276 0.000 1.924 -007.050   G1 PTRY -000.606 0.000 1.924 -000.588
   D1 TY2  -000.185             (  kN  )   A1 TY2  -000.633              (  kN  )
   L1 TY2  -001.261             (  kN  )   G1 TY2  -000.105              (  kN  )
   A1 D     078.500             ( kN/m³)   W1 UDLX +000.753              ( Co/m )
   W1 UDLZ +000.832             ( Co/m )   P1 UDLX +001.636              ( Co/m )
   P1 UDLZ +001.811             ( Co/m )   S1 UDLX +000.163              ( Co/m )
   S1 UDLZ +000.181             ( Co/m )   W2 UDLX +002.838              ( Co/m )
   W2 UDLZ +003.139             ( Co/m )   W3 UDLX -002.497              ( Co/m )
   W3 UDLZ -002.763             ( Co/m )   W4 UDLX +000.590              ( Co/m )
   W4 UDLZ +000.651             ( Co/m )   UT De-activate          (Ignor Member)
Members 372 and 39
   D1 PTRY -002.082 0.000 4.171 -001.913   A1 PTRY -007.125 0.000 4.171 -006.544
   L1 PTRY -014.197 0.000 4.171 -013.039   G1 PTRY -001.183 0.000 4.171 -001.087
   A1 D     078.500              ( kN/m³)   UT Stiff-Deck      -+-       (Mt My Mz)
Members 373 and 39
   D1 PTRY -002.074 0.000 4.188 -001.786   A1 PTRY -007.096 0.000 4.188 -006.112
   L1 PTRY -014.139 0.000 4.188 -012.179   G1 PTRY -001.178 0.000 4.188 -001.015
   A1 D     078.500              ( kN/m³)   UT Stiff-Deck      -+-       (Mt My Mz)
Member 37
   D1 PTRY -001.224 0.000 4.210 -001.351   A1 PTRY -004.186 0.000 4.210 -004.625
   L1 PTRY -008.340 0.000 4.210 -009.214   G1 PTRY -000.695 0.000 4.210 -000.768
   A1 D     078.500              ( kN/m³)   W1 UDLX +000.755              ( Co/m )
   W1 UDLZ +000.723             ( Co/m )   P1 UDLX +001.640              ( Co/m )
   P1 UDLZ +001.571             ( Co/m )   S1 UDLX +000.164              ( Co/m )
   S1 UDLZ +000.157             ( Co/m )   W2 UDLX +002.492              ( Co/m )
   W2 UDLZ +002.387             ( Co/m )   W3 UDLX -002.503              ( Co/m )
   W3 UDLZ -002.397             ( Co/m )   W4 UDLX +000.590              ( Co/m )
   W4 UDLZ +000.566             ( Co/m )   UT Stiff-Deck      -+-       (Mt My Mz)
Members 376, 400, 458 and 55
   D1 PTRY -001.911 0.000 4.738 -001.825   A1 PTRY -006.541 0.000 4.738 -006.244
   L1 PTRY -013.034 0.000 4.738 -012.443   G1 PTRY -001.086 0.000 4.738 -001.037
   A1 D     078.500              ( kN/m³)   UT Stiff-Deck      -+-       (Mt My Mz)
Members 377, 401, 459 and 56
   D1 PTRY -000.837 0.000 4.739 -000.820   A1 PTRY -002.864 0.000 4.739 -002.806
   L1 PTRY -005.707 0.000 4.739 -005.590   G1 PTRY -000.476 0.000 4.739 -000.466
   D1 UDLY -000.955             ( kN/m )   A1 UDLY -003.269              ( kN/m )
   L1 UDLY -006.513             ( kN/m )   G1 UDLY -000.543              ( kN/m )
   A1 D     078.500             ( kN/m³)   UT Stiff-Deck      -+-       (Mt My Mz)
Members 378, 402, 460 and 56
   D1 UDLY -000.955             ( kN/m )   A1 UDLY -003.269              ( kN/m )
   L1 UDLY -006.513             ( kN/m )   G1 UDLY -000.543              ( kN/m )
   D1 PTRY -001.034 0.000 4.739 -000.867   A1 PTRY -003.537 0.000 4.739 -002.968
   L1 PTRY -007.047 0.000 4.739 -005.914   G1 PTRY -000.587 0.000 4.739 -000.493
   A1 D     078.500              ( kN/m³)   UT Stiff-Deck      -+-       (Mt My Mz)
Members 379, 403, 461 and 57
   D1 PTRY -001.027 0.000 4.770 -000.862   A1 PTRY -003.514 0.000 4.770 -002.949
   L1 PTRY -007.002 0.000 4.770 -005.876   G1 PTRY -000.583 0.000 4.770 -000.490
   D1 UDLY -001.027             ( kN/m )   A1 UDLY -003.514              ( kN/m )
   L1 UDLY -007.002             ( kN/m )   G1 UDLY -000.583              ( kN/m )
   A1 D     078.500             ( kN/m³)   UT Stiff-Deck      -+-       (Mt My Mz)
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Member 38

D1 UDLY -007.527		(kN/m)	A1 UDLY -003.514		(kN/m)
L1 UDLY -007.002		(kN/m)	G1 UDLY -000.583		(kN/m)
A1 D 078.500		(kN/m³)	W1 UDLX +000.929		(Co/m)
W1 UDLZ +000.929		(Co/m)	P1 UDLX +001.814		(Co/m)
P1 UDLZ +001.814		(Co/m)	S1 UDLX +000.339		(Co/m)
S1 UDLZ +000.339		(Co/m)	W2 UDLX +002.800		(Co/m)
W2 UDLZ +002.800		(Co/m)	W3 UDLX -002.130		(Co/m)
W3 UDLZ -002.130		(Co/m)	W4 UDLX +003.304		(Co/m)
W4 UDLZ +003.304		(Co/m)	UT Stiff-Deck	-+-	(Mt My Mz)

Member 38

D1 UDLY -006.500		(kN/m)	A1 D 078.500		(kN/m³)
W1 UDLX +002.036		(Co/m)	P1 UDLX +001.151		(Co/m)
S1 UDLX +002.626		(Co/m)	W2 UDLX -002.655		(Co/m)
W3 UDLX -000.979		(Co/m)	W4 UDLX -002.360		(Co/m)
UT Stiff-Deck	-+-	(Mt My Mz)			

Member 38

D1 UDLY -006.500		(kN/m)	A1 D 078.500		(kN/m³)
W1 UDLX +002.036		(Co/m)	P1 UDLX +001.151		(Co/m)
S1 UDLX +002.626		(Co/m)	W2 UDLX -002.360		(Co/m)
W3 UDLX -000.979		(Co/m)	W4 UDLX -003.835		(Co/m)
UT Stiff-Deck	-+-	(Mt My Mz)			

Members 383, 406, 464, 595 and 64

D1 PTRY -001.721 0.000 3.293 -002.089			A1 PTRY -005.890 0.000 3.293 -007.148		
L1 PTRY -011.736 0.000 3.293 -014.243			G1 PTRY -000.978 0.000 3.293 -001.187		
A1 D 078.500		(kN/m³)	UT Stiff-Deck	-+-	(Mt My Mz)

Member 38

D1 PTRY -001.041 0.000 4.170 -001.075			A1 PTRY -003.564 0.000 4.170 -003.678		
L1 PTRY -007.101 0.000 4.170 -007.329			G1 PTRY -000.592 0.000 4.170 -000.611		
D1 UDLY -006.500		(kN/m)	A1 D 078.500		(kN/m³)
W1 UDLX +002.002		(Co/m)	P1 UDLX +001.132		(Co/m)
S1 UDLX +002.582		(Co/m)	W2 UDLX -003.190		(Co/m)
W3 UDLX -000.962		(Co/m)	W4 UDLX -002.320		(Co/m)
UT Stiff-Deck	-+-	(Mt My Mz)			

Members 386 and 40

D1 PTRY -001.075 0.000 4.735 -001.005			A1 PTRY -003.678 0.000 4.735 -003.440		
L1 PTRY -007.329 0.000 4.735 -006.855			G1 PTRY -000.611 0.000 4.735 -000.571		
D1 UDLY -006.500		(kN/m)	A1 D 078.500		(kN/m³)
W1 UDLX +002.002		(Co/m)	P1 UDLX +001.132		(Co/m)
S1 UDLX +002.582		(Co/m)	W2 UDLX -002.320		(Co/m)
W3 UDLX -000.962		(Co/m)	W4 UDLX -003.480		(Co/m)
UT Stiff-Deck	-+-	(Mt My Mz)			

Member 38

D1 UDLY -007.505		(kN/m)	A1 UDLY -003.440		(kN/m)
L1 UDLY -006.855		(kN/m)	G1 UDLY -000.571		(kN/m)
A1 D 078.500		(kN/m³)	W1 UDLX +002.036		(Co/m)
P1 UDLX +001.151		(Co/m)	S1 UDLX +002.626		(Co/m)
W2 UDLX -003.835		(Co/m)	W3 UDLX -000.979		(Co/m)
W4 UDLX -000.590		(Co/m)	UT Stiff-Deck	-+-	(Mt My Mz)

Member 38

D1 PTRY -001.208 0.000 4.795 -001.206			A1 PTRY -004.133 0.000 4.795 -004.125		
L1 PTRY -008.235 0.000 4.795 -008.220			G1 PTRY -000.686 0.000 4.795 -000.685		
D1 UDLY -006.500		(kN/m)	A1 D 078.500		(kN/m³)
W1 UDLX +002.112		(Co/m)	P1 UDLX +001.227		(Co/m)
S1 UDLX +002.702		(Co/m)	W2 UDLX -002.655		(Co/m)
W3 UDLX -000.922		(Co/m)	W4 UDLX -000.590		(Co/m)
UT Stiff-Deck	-+-	(Mt My Mz)			

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Member 38

D1 UDLY -007.706	(kN/m)	A1 UDLY -004.125	(kN/m)
L1 UDLY -008.220	(kN/m)	G1 UDLY -000.685	(kN/m)
A1 D 078.500	(kN/m³)	W1 UDLX +001.187	(Co/m)
P1 UDLX +000.752	(Co/m)	S1 UDLX +001.477	(Co/m)
W2 UDLX -001.160	(Co/m)	W3 UDLX -000.342	(Co/m)
W4 UDLX -000.290	(Co/m)	UT Stiff-Deck -+-	(Mt My Mz)

Members 390, 418, 495 and 60

D1 UDLY -006.958	(kN/m)	A1 UDLY -001.566	(kN/m)
L1 UDLY -003.120	(kN/m)	G1 UDLY -000.260	(kN/m)
A1 D 078.500	(kN/m³)	W1 UDLX +002.002	(Co/m)
P1 UDLX +001.132	(Co/m)	S1 UDLX +002.582	(Co/m)
W2 UDLX -003.770	(Co/m)	W3 UDLX -000.962	(Co/m)
W4 UDLX -002.320	(Co/m)	UT Stiff-Deck -+-	(Mt My Mz)

Members 391, 422, 491, 592 and 64

D1 UDLY -000.458	(kN/m)	A1 UDLY -001.566	(kN/m)
L1 UDLY -003.120	(kN/m)	G1 UDLY -000.260	(kN/m)
D1 PTRY -001.206 0.000 3.592 -001.247		A1 PTRY -004.125 0.000 3.592 -004.268	
L1 PTRY -008.220 0.000 3.592 -008.505		G1 PTRY -000.685 0.000 3.592 -000.709	
A1 D 078.500	(kN/m³)	UT Stiff-Deck -+-	(Mt My Mz)

Members 392, 425, 593 and 64

D1 UDLY -006.500	(kN/m)	A1 D 078.500	(kN/m³)
W1 UDLX +002.002	(Co/m)	P1 UDLX +001.132	(Co/m)
S1 UDLX +002.582	(Co/m)	W2 UDLX -002.610	(Co/m)
W3 UDLX -000.962	(Co/m)	W4 UDLX -002.320	(Co/m)
UT Stiff-Deck -+-	(Mt My Mz)		

Member 39

D1 PTRY -001.224 0.000 4.210 -001.351		A1 PTRY -004.186 0.000 4.210 -004.625	
L1 PTRY -008.340 0.000 4.210 -009.214		G1 PTRY -000.695 0.000 4.210 -000.768	
A1 D 078.500	(kN/m³)	W1 UDLX +000.371	(Co/m)
W1 UDLZ +000.355	(Co/m)	P1 UDLX +000.806	(Co/m)
P1 UDLZ +000.772	(Co/m)	S1 UDLX +000.081	(Co/m)
S1 UDLZ +000.077	(Co/m)	W2 UDLX +001.225	(Co/m)
W2 UDLZ +001.173	(Co/m)	W3 UDLX -001.230	(Co/m)
W3 UDLZ -001.178	(Co/m)	W4 UDLX +000.290	(Co/m)
W4 UDLZ +000.278	(Co/m)	UT Stiff-Deck -+-	(Mt My Mz)

Members 404 and 46

D1 UDLY -007.527	(kN/m)	A1 UDLY -003.514	(kN/m)
L1 UDLY -007.002	(kN/m)	G1 UDLY -000.583	(kN/m)
A1 D 078.500	(kN/m³)	W1 UDLX +000.914	(Co/m)
W1 UDLZ +000.914	(Co/m)	P1 UDLX +001.784	(Co/m)
P1 UDLZ +001.784	(Co/m)	S1 UDLX +000.334	(Co/m)
S1 UDLZ +000.334	(Co/m)	W2 UDLX +002.752	(Co/m)
W2 UDLZ +002.752	(Co/m)	W3 UDLX -002.094	(Co/m)
W3 UDLZ -002.094	(Co/m)	W4 UDLX +003.248	(Co/m)
W4 UDLZ +003.248	(Co/m)	UT Stiff-Deck -+-	(Mt My Mz)

Members 405, 463, 594 and 64

D1 UDLY -006.500	(kN/m)	A1 D 078.500	(kN/m³)
W1 UDLX +002.002	(Co/m)	P1 UDLX +001.132	(Co/m)
S1 UDLX +002.582	(Co/m)	W2 UDLX -002.320	(Co/m)
W3 UDLX -000.962	(Co/m)	W4 UDLX -003.770	(Co/m)
UT Stiff-Deck -+-	(Mt My Mz)		

Members 409, 467, 470 and 59

D1 UDLY -007.505	(kN/m)	A1 UDLY -003.440	(kN/m)
L1 UDLY -006.855	(kN/m)	G1 UDLY -000.571	(kN/m)
A1 D 078.500	(kN/m³)	W1 UDLX +002.002	(Co/m)
P1 UDLX +001.132	(Co/m)	S1 UDLX +002.582	(Co/m)

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The Maltings, East Tyndall Street
Cardiff Bay, Cardiff CF24 5EA
Tel : 029 2045 1331 Fax : 029 2045 1344

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   W2 UDLX -003.770                ( Co/m )   W3 UDLX -000.962                ( Co/m )
   W4 UDLX -000.580                ( Co/m )   UT Stiff-Deck      -+-       (Mt My Mz)
Members 410, 468, 475, 597 and 64
   D1 UDLY -001.826                ( kN/m )   A1 UDLY -006.248                ( kN/m )
   L1 UDLY -012.450                ( kN/m )   G1 UDLY -001.037                ( kN/m )
   A1 D     078.500                ( kN/m³)   UT Stiff-Deck      -+-       (Mt My Mz)
Members 411, 469, 481, 598 and 65
   D1 UDLY -001.777                ( kN/m )   A1 UDLY -006.080                ( kN/m )
   L1 UDLY -012.114                ( kN/m )   G1 UDLY -001.009                ( kN/m )
   A1 D     078.500                ( kN/m³)   UT Stiff-Deck      -+-       (Mt My Mz)
Members 412, 473, 589 and 62
   D1 PTRY -001.208 0.000 4.795 -001.206   A1 PTRY -004.133 0.000 4.795 -004.125
   L1 PTRY -008.235 0.000 4.795 -008.220   G1 PTRY -000.686 0.000 4.795 -000.685
   D1 UDLY -006.500                ( kN/m )   A1 D     078.500                ( kN/m³)
   W1 UDLX +002.076                ( Co/m )   P1 UDLX +001.206                ( Co/m )
   S1 UDLX +002.656                ( Co/m )   W2 UDLX -002.610                ( Co/m )
   W3 UDLX -000.906                ( Co/m )   W4 UDLX -000.580                ( Co/m )
   UT Stiff-Deck      -+-       (Mt My Mz)
Members 413, 471, 497, 599 and 65
   D1 UDLY -000.956                ( kN/m )   A1 UDLY -003.272                ( kN/m )
   L1 UDLY -006.519                ( kN/m )   G1 UDLY -000.543                ( kN/m )
   D1 PTRY -000.868 0.000 2.810 -000.874   A1 PTRY -002.971 0.000 2.810 -002.992
   L1 PTRY -005.919 0.000 2.810 -005.961   G1 PTRY -000.493 0.000 2.810 -000.497
   A1 D     078.500                ( kN/m³)   UT Stiff-Deck      -+-       (Mt My Mz)
Members 414, 472, 501, 600 and 65
   D1 PTRY -002.056 0.000 4.795 -002.027   A1 PTRY -007.034 0.000 4.795 -006.933
   L1 PTRY -014.016 0.000 4.795 -013.815   G1 PTRY -001.168 0.000 4.795 -001.151
   A1 D     078.500                ( kN/m³)   UT Stiff-Deck      -+-       (Mt My Mz)
Members 415, 479, 591 and 62
   D1 UDLY -007.706                ( kN/m )   A1 UDLY -004.125                ( kN/m )
   L1 UDLY -008.220                ( kN/m )   G1 UDLY -000.685                ( kN/m )
   A1 D     078.500                ( kN/m³)   W1 UDLX +002.374                ( Co/m )
   P1 UDLX +001.504                ( Co/m )   S1 UDLX +002.954                ( Co/m )
   W2 UDLX -002.320                ( Co/m )   W3 UDLX -000.684                ( Co/m )
   W4 UDLX -000.580                ( Co/m )   UT Stiff-Deck      -+-       (Mt My Mz)
Members 416, 474, 509, 602 and 65
   D1 PTRY -001.902 0.000 2.810 -001.748   A1 PTRY -006.511 0.000 2.810 -005.984
   L1 PTRY -012.972 0.000 2.810 -011.922   G1 PTRY -001.081 0.000 2.810 -000.994
   A1 D     078.500                ( kN/m³)   UT Stiff-Deck      -+-       (Mt My Mz)
Members 417, 476, 514, 603 and 65
   D1 UDLY -001.206                ( kN/m )   A1 UDLY -004.125                ( kN/m )
   L1 UDLY -008.220                ( kN/m )   G1 UDLY -000.685                ( kN/m )
   D1 PTRY -000.821 0.000 6.705 -000.690   A1 PTRY -002.808 0.000 6.705 -002.361
   L1 PTRY -005.595 0.000 6.705 -004.704   G1 PTRY -000.466 0.000 6.705 -000.392
   A1 D     078.500                ( kN/m³)   UT Stiff-Deck      -+-       (Mt My Mz)
Member 41
   D1 PTRY -001.027 0.000 2.832 -000.868   A1 PTRY -003.513 0.000 2.832 -002.969
   L1 PTRY -006.999 0.000 2.832 -005.915   G1 PTRY -000.583 0.000 2.832 -000.493
   D1 UDLY -006.500                ( kN/m )   A1 D     078.500                ( kN/m³)
   W1 UDLX +000.769                ( Co/m )   W1 UDLZ +000.769                ( Co/m )
   P1 UDLX +001.654                ( Co/m )   P1 UDLZ +001.654                ( Co/m )
   S1 UDLX +000.179                ( Co/m )   S1 UDLZ +000.179                ( Co/m )
   W2 UDLX +003.194                ( Co/m )   W2 UDLZ +003.194                ( Co/m )
   W3 UDLX -002.124                ( Co/m )   W3 UDLZ -002.124                ( Co/m )
   W4 UDLX +002.270                ( Co/m )   W4 UDLZ +002.270                ( Co/m )
   UT Stiff-Deck      -+-       (Mt My Mz)
Members 420, 478, 531, 605 and 65
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   D1 PTRY -000.848 0.000 4.795 -000.821   A1 PTRY -002.901 0.000 4.795 -002.808
   L1 PTRY -005.780 0.000 4.795 -005.594   G1 PTRY -000.482 0.000 4.795 -000.466
   D1 UDLY -000.726              ( kN/m )  A1 UDLY -002.486              ( kN/m )
   L1 UDLY -004.953              ( kN/m )  G1 UDLY -000.413              ( kN/m )
   A1 D     078.500              ( kN/m³)  UT Stiff-Deck     -+-       (Mt My Mz)
Members 421, 480, 535, 606 and 66
   D1 PTRY -001.205 0.000 3.593 -001.247   A1 PTRY -004.124 0.000 3.593 -004.267
   L1 PTRY -008.217 0.000 3.593 -008.502   G1 PTRY -000.685 0.000 3.593 -000.709
   D1 UDLY -000.690              ( kN/m )  A1 UDLY -002.360              ( kN/m )
   L1 UDLY -004.702              ( kN/m )  G1 UDLY -000.392              ( kN/m )
   A1 D     078.500              ( kN/m³)  UT Stiff-Deck     -+-       (Mt My Mz)
Members 423, 482, 538, 607 and 66
   D1 UDLY -001.600              ( kN/m )  A1 UDLY -005.477              ( kN/m )
   L1 UDLY -010.913              ( kN/m )  G1 UDLY -000.910              ( kN/m )
   A1 D     078.500              ( kN/m³)  UT Stiff-Deck     -+-       (Mt My Mz)
Members 424, 483, 540, 608 and 66
   D1 PTRY -001.546 0.000 6.711 -001.378   A1 PTRY -005.288 0.000 6.711 -004.715
   L1 PTRY -010.538 0.000 6.711 -009.395   G1 PTRY -000.878 0.000 6.711 -000.783
   A1 D     078.500              ( kN/m³)  UT Stiff-Deck     -+-       (Mt My Mz)
Members 426, 484, 542, 609 and 66
   D1 UDLY -000.874              ( kN/m )  A1 UDLY -002.991              ( kN/m )
   L1 UDLY -005.960              ( kN/m )  G1 UDLY -000.497              ( kN/m )
   D1 PTRY -000.874 0.000 4.795 -000.673   A1 PTRY -002.991 0.000 4.795 -002.302
   L1 PTRY -005.960 0.000 4.795 -004.587   G1 PTRY -000.497 0.000 4.795 -000.382
   A1 D     078.500              ( kN/m³)  UT Stiff-Deck     -+-       (Mt My Mz)
Members 427, 485, 543, 610 and 66
   D1 PTRY -000.725 0.000 6.716 -000.688   A1 PTRY -002.482 0.000 6.716 -002.355
   L1 PTRY -004.945 0.000 6.716 -004.693   G1 PTRY -000.412 0.000 6.716 -000.391
   D1 UDLY -000.873              ( kN/m )  A1 UDLY -002.987              ( kN/m )
   L1 UDLY -005.951              ( kN/m )  G1 UDLY -000.496              ( kN/m )
   A1 D     078.500              ( kN/m³)  UT Stiff-Deck     -+-       (Mt My Mz)
Members 428, 486, 544, 611 and 66
   D1 UDLY -001.379              ( kN/m )  A1 UDLY -004.718              ( kN/m )
   L1 UDLY -009.401              ( kN/m )  G1 UDLY -000.784              ( kN/m )
   A1 D     078.500              ( kN/m³)  UT Stiff-Deck     -+-       (Mt My Mz)
Member 43
   D1 PTRY -000.869 0.000 4.824 -000.669   A1 PTRY -002.974 0.000 4.824 -002.288
   L1 PTRY -005.926 0.000 4.824 -004.560   G1 PTRY -000.494 0.000 4.824 -000.380
   D1 UDLY -006.500              ( kN/m )  A1 D     078.500              ( kN/m³)
   W1 UDLX +000.769              ( Co/m )  W1 UDLZ +000.769              ( Co/m )
   P1 UDLX +001.654              ( Co/m )  P1 UDLZ +001.654              ( Co/m )
   S1 UDLX +000.179              ( Co/m )  S1 UDLZ +000.179              ( Co/m )
   W2 UDLX +002.455              ( Co/m )  W2 UDLZ +002.455              ( Co/m )
   W3 UDLX -002.195              ( Co/m )  W3 UDLZ -002.195              ( Co/m )
   W4 UDLX +002.270              ( Co/m )  W4 UDLZ +002.270              ( Co/m )
   UT Stiff-Deck     -+-       (Mt My Mz)
Members 431, 489, 548, 614 and 66
   D1 UDLY -000.873              ( kN/m )  A1 UDLY -002.987              ( kN/m )
   L1 UDLY -005.951              ( kN/m )  G1 UDLY -000.496              ( kN/m )
   D1 PTRY -000.672 0.000 6.716 -000.504   A1 PTRY -002.298 0.000 6.716 -001.726
   L1 PTRY -004.580 0.000 6.716 -003.438   G1 PTRY -000.382 0.000 6.716 -000.287
   A1 D     078.500              ( kN/m³)  UT Stiff-Deck     -+-       (Mt My Mz)
Members 432, 490, 549, 615 and 66
   D1 UDLY -001.563              ( kN/m )  A1 UDLY -005.349              ( kN/m )
   L1 UDLY -010.658              ( kN/m )  G1 UDLY -000.889              ( kN/m )
   A1 D     078.500              ( kN/m³)  UT Stiff-Deck     -+-       (Mt My Mz)
Member 43
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   D1 PTRY -000.668 0.000 6.748 -000.502   A1 PTRY -002.287 0.000 6.748 -001.717
   L1 PTRY -004.558 0.000 6.748 -003.422   G1 PTRY -000.380 0.000 6.748 -000.285
   D1 UDLY -006.500             ( kN/m )   A1 D     078.500              ( kN/m³)
   W1 UDLX +000.932             ( Co/m )   W1 UDLZ +000.932              ( Co/m )
   P1 UDLX +001.817             ( Co/m )   P1 UDLZ +001.817              ( Co/m )
   S1 UDLX +000.342             ( Co/m )   S1 UDLZ +000.342              ( Co/m )
   W2 UDLX +002.270             ( Co/m )   W2 UDLZ +002.270              ( Co/m )
   W3 UDLX -002.476             ( Co/m )   W3 UDLZ -002.476              ( Co/m )
   W4 UDLX +003.055             ( Co/m )   W4 UDLZ +003.055              ( Co/m )
   UT Stiff-Deck     -+-       (Mt My Mz)
Members 435, 494, 553, 618 and 67
   D1 UDLY -000.874             ( kN/m )   A1 UDLY -002.991              ( kN/m )
   L1 UDLY -005.959             ( kN/m )   G1 UDLY -000.497              ( kN/m )
   D1 PTRY -000.505 0.000 1.803 -000.370   A1 PTRY -001.728 0.000 1.803 -001.267
   L1 PTRY -003.443 0.000 1.803 -002.524   G1 PTRY -000.287 0.000 1.803 -000.210
   A1 D     078.500             ( kN/m³)   UT Stiff-Deck     -+-       (Mt My Mz)
Member 43
   D1 PTRY -000.500 0.000 1.759 -000.362   A1 PTRY -001.709 0.000 1.759 -001.237
   L1 PTRY -003.406 0.000 1.759 -002.465   G1 PTRY -000.284 0.000 1.759 -000.205
   D1 UDLY -006.500             ( kN/m )   A1 D     078.500              ( kN/m³)
   W1 UDLX +000.932             ( Co/m )   W1 UDLZ +000.932              ( Co/m )
   P1 UDLX +001.817             ( Co/m )   P1 UDLZ +001.817              ( Co/m )
   S1 UDLX +000.342             ( Co/m )   S1 UDLZ +000.342              ( Co/m )
   W2 UDLX +002.999             ( Co/m )   W2 UDLZ +002.999              ( Co/m )
   W3 UDLX -002.307             ( Co/m )   W3 UDLZ -002.307              ( Co/m )
   W4 UDLX +000.590             ( Co/m )   W4 UDLZ +000.590              ( Co/m )
   UT Stiff-Deck     -+-       (Mt My Mz)
Members 438, 499, 557, 621 and 67
   D1 UDLY -000.874             ( kN/m )   A1 UDLY -002.991              ( kN/m )
   L1 UDLY -005.959             ( kN/m )   G1 UDLY -000.497              ( kN/m )
   D1 PTRY -000.370 0.000 1.791 -000.711   A1 PTRY -001.267 0.000 1.791 -002.432
   L1 PTRY -002.524 0.000 1.791 -004.846   G1 PTRY -000.210 0.000 1.791 -000.404
   A1 D     078.500             ( kN/m³)   UT Stiff-Deck     -+-       (Mt My Mz)
Member 44
   D1 PTRY -000.349 0.000 2.027 -000.650   A1 PTRY -001.193 0.000 2.027 -002.223
   L1 PTRY -002.378 0.000 2.027 -004.429   G1 PTRY -000.198 0.000 2.027 -000.369
   D1 UDLY -006.500             ( kN/m )   A1 D     078.500              ( kN/m³)
   W1 UDLX +000.972             ( Co/m )   W1 UDLZ -000.972              ( Co/m )
   P1 UDLX +001.857             ( Co/m )   P1 UDLZ -001.857              ( Co/m )
   S1 UDLX +000.382             ( Co/m )   S1 UDLZ -000.382              ( Co/m )
   W2 UDLX -002.126             ( Co/m )   W2 UDLZ +002.126              ( Co/m )
   W3 UDLX -002.476             ( Co/m )   W3 UDLZ +002.476              ( Co/m )
   W4 UDLX +000.661             ( Co/m )   W4 UDLZ -000.661              ( Co/m )
   UT Stiff-Deck     -+-       (Mt My Mz)
Member 44
   D1 PTRY -001.142 0.000 2.055 -000.685   A1 PTRY -003.909 0.000 2.055 -002.344
   L1 PTRY -007.789 0.000 2.055 -004.670   G1 PTRY -000.649 0.000 2.055 -000.389
   D1 UDLY -006.500             ( kN/m )   A1 D     078.500              ( kN/m³)
   W1 UDLX +000.972             ( Co/m )   W1 UDLZ -000.972              ( Co/m )
   P1 UDLX +001.857             ( Co/m )   P1 UDLZ -001.857              ( Co/m )
   S1 UDLX +000.382             ( Co/m )   S1 UDLZ -000.382              ( Co/m )
   W2 UDLX -002.126             ( Co/m )   W2 UDLZ +002.126              ( Co/m )
   W3 UDLX -002.476             ( Co/m )   W3 UDLZ +002.476              ( Co/m )
   W4 UDLX +000.661             ( Co/m )   W4 UDLZ -000.661              ( Co/m )
   UT Stiff-Deck     -+-       (Mt My Mz)
Member 44
   D1 TY2  -002.070             (  kN  )   A1 TY2  -007.085              (  kN  )
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   L1 TY2  -014.116                ( kN   )   G1 TY2  -001.176                ( kN   )
   A1 D     078.500                ( kN/m³)   W1 UDLX +002.036                ( Co/m )
   P1 UDLX +001.151                ( Co/m )   S1 UDLX +002.626                ( Co/m )
   W2 UDLX -000.590                ( Co/m )   W3 UDLX -000.979                ( Co/m )
   W4 UDLX -002.435                ( Co/m )   UT Stiff-Deck      -+-       (Mt My Mz)
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Member 46

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   D1 PTRY -001.075 0.000 4.735 -001.005   A1 PTRY -003.678 0.000 4.735 -003.440
   L1 PTRY -007.329 0.000 4.735 -006.855   G1 PTRY -000.611 0.000 4.735 -000.571
   D1 UDLY -006.500                ( kN/m )   A1 D     078.500                ( kN/m³)
   W1 UDLX +001.001                ( Co/m )   P1 UDLX +000.566                ( Co/m )
   S1 UDLX +001.291                ( Co/m )   W2 UDLX -001.160                ( Co/m )
   W3 UDLX -000.481                ( Co/m )   W4 UDLX -001.740                ( Co/m )
   UT Stiff-Deck      -+-       (Mt My Mz)
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Members 477, 523 and 60

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   D1 PTRY -001.027 0.000 2.832 -000.868   A1 PTRY -003.513 0.000 2.832 -002.969
   L1 PTRY -006.999 0.000 2.832 -005.915   G1 PTRY -000.583 0.000 2.832 -000.493
   D1 UDLY -006.500                ( kN/m )   A1 D     078.500                ( kN/m³)
   W1 UDLX +000.756                ( Co/m )   W1 UDLZ +000.756                ( Co/m )
   P1 UDLX +001.626                ( Co/m )   P1 UDLZ +001.626                ( Co/m )
   S1 UDLX +000.176                ( Co/m )   S1 UDLZ +000.176                ( Co/m )
   W2 UDLX +003.140                ( Co/m )   W2 UDLZ +003.140                ( Co/m )
   W3 UDLX -002.088                ( Co/m )   W3 UDLZ -002.088                ( Co/m )
   W4 UDLX +002.232                ( Co/m )   W4 UDLZ +002.232                ( Co/m )
   UT Stiff-Deck      -+-       (Mt My Mz)
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Members 488, 547 and 61

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   D1 PTRY -000.869 0.000 4.824 -000.669   A1 PTRY -002.974 0.000 4.824 -002.288
   L1 PTRY -005.926 0.000 4.824 -004.560   G1 PTRY -000.494 0.000 4.824 -000.380
   D1 UDLY -006.500                ( kN/m )   A1 D     078.500                ( kN/m³)
   W1 UDLX +000.756                ( Co/m )   W1 UDLZ +000.756                ( Co/m )
   P1 UDLX +001.626                ( Co/m )   P1 UDLZ +001.626                ( Co/m )
   S1 UDLX +000.176                ( Co/m )   S1 UDLZ +000.176                ( Co/m )
   W2 UDLX +002.414                ( Co/m )   W2 UDLZ +002.414                ( Co/m )
   W3 UDLX -002.158                ( Co/m )   W3 UDLZ -002.158                ( Co/m )
   W4 UDLX +002.232                ( Co/m )   W4 UDLZ +002.232                ( Co/m )
   UT Stiff-Deck      -+-       (Mt My Mz)
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Members 493, 552 and 61

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   D1 PTRY -000.668 0.000 6.748 -000.502   A1 PTRY -002.287 0.000 6.748 -001.717
   L1 PTRY -004.558 0.000 6.748 -003.422   G1 PTRY -000.380 0.000 6.748 -000.285
   D1 UDLY -006.500                ( kN/m )   A1 D     078.500                ( kN/m³)
   W1 UDLX +000.916                ( Co/m )   W1 UDLZ +000.916                ( Co/m )
   P1 UDLX +001.786                ( Co/m )   P1 UDLZ +001.786                ( Co/m )
   S1 UDLX +000.336                ( Co/m )   S1 UDLZ +000.336                ( Co/m )
   W2 UDLX +002.232                ( Co/m )   W2 UDLZ +002.232                ( Co/m )
   W3 UDLX -002.434                ( Co/m )   W3 UDLZ -002.434                ( Co/m )
   W4 UDLX +003.004                ( Co/m )   W4 UDLZ +003.004                ( Co/m )
   UT Stiff-Deck      -+-       (Mt My Mz)
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Members 498, 556, 620 and 68

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   D1 PTRY -000.500 0.000 1.759 -000.362   A1 PTRY -001.709 0.000 1.759 -001.237
   L1 PTRY -003.406 0.000 1.759 -002.465   G1 PTRY -000.284 0.000 1.759 -000.205
   D1 UDLY -006.500                ( kN/m )   A1 D     078.500                ( kN/m³)
   W1 UDLX +000.916                ( Co/m )   W1 UDLZ +000.916                ( Co/m )
   P1 UDLX +001.786                ( Co/m )   P1 UDLZ +001.786                ( Co/m )
   S1 UDLX +000.336                ( Co/m )   S1 UDLZ +000.336                ( Co/m )
   W2 UDLX +002.948                ( Co/m )   W2 UDLZ +002.948                ( Co/m )
   W3 UDLX -002.268                ( Co/m )   W3 UDLZ -002.268                ( Co/m )
   W4 UDLX +000.580                ( Co/m )   W4 UDLZ +000.580                ( Co/m )
   UT Stiff-Deck      -+-       (Mt My Mz)
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Members 502, 560, 623 and 68

D1	PTRY	-000.349	0.000	2.027	-000.650	A1	PTRY	-001.193	0.000	2.027	-002.223
L1	PTRY	-002.378	0.000	2.027	-004.429	G1	PTRY	-000.198	0.000	2.027	-000.369
D1	UDLY	-006.500			(kN/m)	A1	D	078.500			(kN/m³)
W1	UDLX	+000.956			(Co/m)	W1	UDLZ	-000.956			(Co/m)
P1	UDLX	+001.826			(Co/m)	P1	UDLZ	-001.826			(Co/m)
S1	UDLX	+000.376			(Co/m)	S1	UDLZ	-000.376			(Co/m)
W2	UDLX	-002.090			(Co/m)	W2	UDLZ	+002.090			(Co/m)
W3	UDLX	-002.434			(Co/m)	W3	UDLZ	+002.434			(Co/m)
W4	UDLX	+000.650			(Co/m)	W4	UDLZ	-000.650			(Co/m)
UT	Stiff-Deck		-+-		(Mt My Mz)						

Members 504, 563, 626 and 68

D1	PTRY	-001.142	0.000	2.055	-000.685	A1	PTRY	-003.909	0.000	2.055	-002.344
L1	PTRY	-007.789	0.000	2.055	-004.670	G1	PTRY	-000.649	0.000	2.055	-000.389
D1	UDLY	-006.500			(kN/m)	A1	D	078.500			(kN/m³)
W1	UDLX	+000.956			(Co/m)	W1	UDLZ	-000.956			(Co/m)
P1	UDLX	+001.826			(Co/m)	P1	UDLZ	-001.826			(Co/m)
S1	UDLX	+000.376			(Co/m)	S1	UDLZ	-000.376			(Co/m)
W2	UDLX	-002.090			(Co/m)	W2	UDLZ	+002.090			(Co/m)
W3	UDLX	-002.434			(Co/m)	W3	UDLZ	+002.434			(Co/m)
W4	UDLX	+000.650			(Co/m)	W4	UDLZ	-000.650			(Co/m)
UT	Stiff-Deck		-+-		(Mt My Mz)						

Member 50

D1	TY2	-002.070			(kN)	A1	TY2	-007.085			(kN)
L1	TY2	-014.116			(kN)	G1	TY2	-001.176			(kN)
A1	D	078.500			(kN/m³)	W1	UDLX	+002.002			(Co/m)
P1	UDLX	+001.132			(Co/m)	S1	UDLX	+002.582			(Co/m)
W2	UDLX	-000.580			(Co/m)	W3	UDLX	-000.962			(Co/m)
W4	UDLX	-002.394			(Co/m)	UT	Stiff-Deck		-+-		(Mt My Mz)

Member 51

D1	UDLY	-006.500			(kN/m)	A1	D	078.500			(kN/m³)
W1	UDLX	+000.972			(Co/m)	W1	UDLZ	+000.972			(Co/m)
P1	UDLX	+001.857			(Co/m)	P1	UDLZ	+001.857			(Co/m)
S1	UDLX	+000.382			(Co/m)	S1	UDLZ	+000.382			(Co/m)
W2	UDLX	+001.945			(Co/m)	W2	UDLZ	+001.945			(Co/m)
W3	UDLX	-002.307			(Co/m)	W3	UDLZ	-002.307			(Co/m)
W4	UDLX	-000.590			(Co/m)	W4	UDLZ	-000.590			(Co/m)
UT	Stiff-Deck		-+-		(Mt My Mz)						

Member 52

D1	UDLY	-006.500			(kN/m)	A1	D	078.500			(kN/m³)
W1	UDLX	+000.972			(Co/m)	W1	UDLZ	+000.972			(Co/m)
P1	UDLX	+001.857			(Co/m)	P1	UDLZ	+001.857			(Co/m)
S1	UDLX	+000.382			(Co/m)	S1	UDLZ	+000.382			(Co/m)
W2	UDLX	+001.941			(Co/m)	W2	UDLZ	+001.941			(Co/m)
W3	UDLX	-002.307			(Co/m)	W3	UDLZ	-002.307			(Co/m)
W4	UDLX	-000.590			(Co/m)	W4	UDLZ	-000.590			(Co/m)
UT	Stiff-Deck		-+-		(Mt My Mz)						

Member 52

D1	UDLY	-006.500			(kN/m)	A1	D	078.500			(kN/m³)
W1	UDLX	+000.973			(Co/m)	W1	UDLZ	+000.973			(Co/m)
P1	UDLX	+001.858			(Co/m)	P1	UDLZ	+001.858			(Co/m)
S1	UDLX	+000.383			(Co/m)	S1	UDLZ	+000.383			(Co/m)
W2	UDLX	+001.925			(Co/m)	W2	UDLZ	+001.925			(Co/m)
W3	UDLX	-002.307			(Co/m)	W3	UDLZ	-002.308			(Co/m)
W4	UDLX	-000.590			(Co/m)	W4	UDLZ	-000.590			(Co/m)
UT	Stiff-Deck		-+-		(Mt My Mz)						

Member 52

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Tel : 029 2045 1331 Fax : 029 2045 1344

Job ref : GOA/A/1511
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```
   D1 UDLY -006.500              ( kN/m )    A1 D     078.500          ( kN/m³)
   W1 UDLX +000.973              ( Co/m )    W1 UDLZ +000.973          ( Co/m )
   P1 UDLX +001.858              ( Co/m )    P1 UDLZ +001.858          ( Co/m )
   S1 UDLX +000.383              ( Co/m )    S1 UDLZ +000.383          ( Co/m )
   W2 UDLX +001.925              ( Co/m )    W2 UDLZ +001.925          ( Co/m )
   W3 UDLX -002.364              ( Co/m )    W3 UDLZ -002.364          ( Co/m )
   W4 UDLX -000.590              ( Co/m )    W4 UDLZ -000.590          ( Co/m )
   UT Stiff-Deck      -+-      (Mt My Mz)
```

Member 53

```
   D1 UDLY -006.500              ( kN/m )    A1 D     078.500          ( kN/m³)
   W1 UDLX +000.973              ( Co/m )    W1 UDLZ +000.974          ( Co/m )
   P1 UDLX +001.858              ( Co/m )    P1 UDLZ +001.859          ( Co/m )
   S1 UDLX +000.383              ( Co/m )    S1 UDLZ +000.383          ( Co/m )
   W2 UDLX +001.925              ( Co/m )    W2 UDLZ +001.925          ( Co/m )
   W3 UDLX -002.379              ( Co/m )    W3 UDLZ -002.380          ( Co/m )
   W4 UDLX +000.584              ( Co/m )    W4 UDLZ +000.584          ( Co/m )
   UT Stiff-Deck      -+-      (Mt My Mz)
```

Member 53

```
   D1 UDLY -006.500              ( kN/m )    A1 D     078.500          ( kN/m³)
   W1 UDLX +000.973              ( Co/m )    W1 UDLZ +000.973          ( Co/m )
   P1 UDLX +001.858              ( Co/m )    P1 UDLZ +001.857          ( Co/m )
   S1 UDLX +000.383              ( Co/m )    S1 UDLZ +000.383          ( Co/m )
   W2 UDLX +001.925              ( Co/m )    W2 UDLZ +001.924          ( Co/m )
   W3 UDLX -002.379              ( Co/m )    W3 UDLZ -002.378          ( Co/m )
   W4 UDLX +000.584              ( Co/m )    W4 UDLZ +000.584          ( Co/m )
   UT Stiff-Deck      -+-      (Mt My Mz)
```

Members 571, 633, 692 and 73

```
   D1 UDLY -006.500              ( kN/m )    A1 D     078.500          ( kN/m³)
   W1 UDLX +000.956              ( Co/m )    W1 UDLZ +000.956          ( Co/m )
   P1 UDLX +001.826              ( Co/m )    P1 UDLZ +001.826          ( Co/m )
   S1 UDLX +000.376              ( Co/m )    S1 UDLZ +000.376          ( Co/m )
   W2 UDLX +001.912              ( Co/m )    W2 UDLZ +001.912          ( Co/m )
   W3 UDLX -002.268              ( Co/m )    W3 UDLZ -002.268          ( Co/m )
   W4 UDLX -000.580              ( Co/m )    W4 UDLZ -000.580          ( Co/m )
   UT Stiff-Deck      -+-      (Mt My Mz)
```

Members 572, 635, 694 and 73

```
   D1 UDLY -006.500              ( kN/m )    A1 D     078.500          ( kN/m³)
   W1 UDLX +000.956              ( Co/m )    W1 UDLZ +000.956          ( Co/m )
   P1 UDLX +001.826              ( Co/m )    P1 UDLZ +001.826          ( Co/m )
   S1 UDLX +000.376              ( Co/m )    S1 UDLZ +000.376          ( Co/m )
   W2 UDLX +001.908              ( Co/m )    W2 UDLZ +001.908          ( Co/m )
   W3 UDLX -002.268              ( Co/m )    W3 UDLZ -002.268          ( Co/m )
   W4 UDLX -000.580              ( Co/m )    W4 UDLZ -000.580          ( Co/m )
   UT Stiff-Deck      -+-      (Mt My Mz)
```

Members 575, 637, 696 and 73

```
   D1 UDLY -006.500              ( kN/m )    A1 D     078.500          ( kN/m³)
   W1 UDLX +000.956              ( Co/m )    W1 UDLZ +000.956          ( Co/m )
   P1 UDLX +001.826              ( Co/m )    P1 UDLZ +001.826          ( Co/m )
   S1 UDLX +000.376              ( Co/m )    S1 UDLZ +000.376          ( Co/m )
   W2 UDLX +001.892              ( Co/m )    W2 UDLZ +001.892          ( Co/m )
   W3 UDLX -002.268              ( Co/m )    W3 UDLZ -002.268          ( Co/m )
   W4 UDLX -000.580              ( Co/m )    W4 UDLZ -000.580          ( Co/m )
   UT Stiff-Deck      -+-      (Mt My Mz)
```

Members 577, 639, 698 and 73

```
   D1 UDLY -006.500              ( kN/m )    A1 D     078.500          ( kN/m³)
   W1 UDLX +000.956              ( Co/m )    W1 UDLZ +000.956          ( Co/m )
   P1 UDLX +001.826              ( Co/m )    P1 UDLZ +001.826          ( Co/m )
```

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S1	UDLX	+000.376	(Co/m)	S1	UDLZ	+000.376	(Co/m)
W2	UDLX	+001.892	(Co/m)	W2	UDLZ	+001.892	(Co/m)
W3	UDLX	-002.324	(Co/m)	W3	UDLZ	-002.324	(Co/m)
W4	UDLX	-000.580	(Co/m)	W4	UDLZ	-000.580	(Co/m)
UT	Stiff-Deck	-+-	(Mt My Mz)				

Member 57

D1	UDLY	-006.500	(kN/m)	A1	D	078.500	(kN/m³)
W1	UDLX	+000.956	(Co/m)	W1	UDLZ	+000.958	(Co/m)
P1	UDLX	+001.826	(Co/m)	P1	UDLZ	+001.828	(Co/m)
S1	UDLX	+000.376	(Co/m)	S1	UDLZ	+000.376	(Co/m)
W2	UDLX	+001.892	(Co/m)	W2	UDLZ	+001.892	(Co/m)
W3	UDLX	-002.338	(Co/m)	W3	UDLZ	-002.340	(Co/m)
W4	UDLX	+000.574	(Co/m)	W4	UDLZ	+000.574	(Co/m)
UT	Stiff-Deck	-+-	(Mt My Mz)				

Member 58

D1	UDLY	-006.500	(kN/m)	A1	D	078.500	(kN/m³)
W1	UDLX	+000.956	(Co/m)	W1	UDLZ	+000.956	(Co/m)
P1	UDLX	+001.826	(Co/m)	P1	UDLZ	+001.826	(Co/m)
S1	UDLX	+000.376	(Co/m)	S1	UDLZ	+000.376	(Co/m)
W2	UDLX	+001.892	(Co/m)	W2	UDLZ	+001.892	(Co/m)
W3	UDLX	-002.338	(Co/m)	W3	UDLZ	-002.338	(Co/m)
W4	UDLX	+000.574	(Co/m)	W4	UDLZ	+000.574	(Co/m)
UT	Stiff-Deck	-+-	(Mt My Mz)				

Member 58

D1	UDLY	-007.527	(kN/m)	A1	UDLY	-003.514	(kN/m)
L1	UDLY	-007.002	(kN/m)	G1	UDLY	-000.583	(kN/m)
A1	D	078.500	(kN/m³)	W1	UDLX	+000.457	(Co/m)
W1	UDLZ	+000.457	(Co/m)	P1	UDLX	+000.892	(Co/m)
P1	UDLZ	+000.892	(Co/m)	S1	UDLX	+000.167	(Co/m)
S1	UDLZ	+000.167	(Co/m)	W2	UDLX	+001.376	(Co/m)
W2	UDLZ	+001.376	(Co/m)	W3	UDLX	-001.047	(Co/m)
W3	UDLZ	-001.047	(Co/m)	W4	UDLX	+001.624	(Co/m)
W4	UDLZ	+001.624	(Co/m)	UT	Stiff-Deck	-+-	(Mt My Mz)

Member 64

D1	UDLY	-001.143	(kN/m)	L1	UDLY	-000.686	(kN/m)
A1	D	078.500	(kN/m³)	W1	UDLX	+001.001	(Co/m)
P1	UDLX	+000.566	(Co/m)	S1	UDLX	+001.291	(Co/m)
W2	UDLX	-001.885	(Co/m)	W3	UDLX	-000.481	(Co/m)
W4	UDLX	-000.290	(Co/m)	UT	Stiff-Deck	-+-	(Mt My Mz)

Member 65

D1	UDLY	-002.076	(kN/m)	L1	UDLY	-001.246	(kN/m)
A1	D	078.500	(kN/m³)	UT	Stiff-Deck	-+-	(Mt My Mz)

Member 65

D1	UDLY	-002.020	(kN/m)	L1	UDLY	-001.212	(kN/m)
A1	D	078.500	(kN/m³)	UT	Stiff-Deck	-+-	(Mt My Mz)

Member 65

D1	UDLY	-000.520	(kN/m)	L1	UDLY	-000.312	(kN/m)
A1	D	078.500	(kN/m³)	W1	UDLX	+001.001	(Co/m)
P1	UDLX	+000.566	(Co/m)	S1	UDLX	+001.291	(Co/m)
W2	UDLX	-001.885	(Co/m)	W3	UDLX	-000.481	(Co/m)
W4	UDLX	-001.160	(Co/m)	UT	Stiff-Deck	-+-	(Mt My Mz)

Member 65

D1	PTRY	-001.027	0.000 2.832 -000.868	A1	PTRY	-003.513	0.000 2.832 -002.969
L1	PTRY	-006.999	0.000 2.832 -005.915	G1	PTRY	-000.583	0.000 2.832 -000.493
D1	UDLY	-006.500	(kN/m)	A1	D	078.500	(kN/m³)
W1	UDLX	+000.757	(Co/m)	W1	UDLZ	+000.726	(Co/m)
P1	UDLX	+001.627	(Co/m)	P1	UDLZ	+001.561	(Co/m)

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   S1 UDLX +000.176              ( Co/m )   S1 UDLZ +000.169              ( Co/m )
   W2 UDLX +003.141              ( Co/m )   W2 UDLZ +003.013              ( Co/m )
   W3 UDLX -002.090              ( Co/m )   W3 UDLZ -002.004              ( Co/m )
   W4 UDLX +002.233              ( Co/m )   W4 UDLZ +002.142              ( Co/m )
   UT Stiff-Deck     -+-       (Mt My Mz)
Member 66
   D1 PTRY -000.869 0.000 2.412 -000.769   A1 PTRY -002.974 0.000 2.412 -002.631
   L1 PTRY -005.926 0.000 2.412 -005.243   G1 PTRY -000.494 0.000 2.412 -000.437
   D1 UDLY -006.500              ( kN/m )   A1 D     078.500              ( kN/m³)
   W1 UDLX +000.756              ( Co/m )   W1 UDLZ +000.775              ( Co/m )
   P1 UDLX +001.626              ( Co/m )   P1 UDLZ +001.666              ( Co/m )
   S1 UDLX +000.176              ( Co/m )   S1 UDLZ +000.180              ( Co/m )
   W2 UDLX +002.594              ( Co/m )   W2 UDLZ +002.658              ( Co/m )
   W3 UDLX -002.088              ( Co/m )   W3 UDLZ -002.140              ( Co/m )
   W4 UDLX +002.231              ( Co/m )   W4 UDLZ +002.286              ( Co/m )
   UT Stiff-Deck     -+-       (Mt My Mz)
Member 67
   D1 PTRY -000.769 0.000 2.411 -000.669   A1 PTRY -002.631 0.000 2.411 -002.288
   L1 PTRY -005.243 0.000 2.411 -004.560   G1 PTRY -000.437 0.000 2.411 -000.380
   D1 UDLY -006.500              ( kN/m )   A1 D     078.500              ( kN/m³)
   W1 UDLX +000.788              ( Co/m )   W1 UDLZ +000.804              ( Co/m )
   P1 UDLX +001.658              ( Co/m )   P1 UDLZ +001.691              ( Co/m )
   S1 UDLX +000.208              ( Co/m )   S1 UDLZ +000.213              ( Co/m )
   W2 UDLX +002.231              ( Co/m )   W2 UDLZ +002.277              ( Co/m )
   W3 UDLX -002.157              ( Co/m )   W3 UDLZ -002.201              ( Co/m )
   W4 UDLX +002.231              ( Co/m )   W4 UDLZ +002.277              ( Co/m )
   UT Stiff-Deck     -+-       (Mt My Mz)
Member 67
   D1 UDLY -001.087              ( kN/m )   L1 UDLY -000.652              ( kN/m )
   D1 PTRY -000.987 0.000 2.810 -000.994   L1 PTRY -000.592 0.000 2.810 -000.596
   A1 D     078.500              ( kN/m³)   UT Stiff-Deck     -+-       (Mt My Mz)
Member 67
   D1 PTRY -000.668 0.000 2.240 -000.613   A1 PTRY -002.287 0.000 2.240 -002.098
   L1 PTRY -004.558 0.000 2.240 -004.181   G1 PTRY -000.380 0.000 2.240 -000.348
   D1 UDLY -006.500              ( kN/m )   A1 D     078.500              ( kN/m³)
   W1 UDLX +000.916              ( Co/m )   W1 UDLZ +000.919              ( Co/m )
   P1 UDLX +001.786              ( Co/m )   P1 UDLZ +001.792              ( Co/m )
   S1 UDLX +000.336              ( Co/m )   S1 UDLZ +000.337              ( Co/m )
   W2 UDLX +002.232              ( Co/m )   W2 UDLZ +002.239              ( Co/m )
   W3 UDLX -002.434              ( Co/m )   W3 UDLZ -002.442              ( Co/m )
   W4 UDLX +002.232              ( Co/m )   W4 UDLZ +002.239              ( Co/m )
   UT Stiff-Deck     -+-       (Mt My Mz)
Member 67
   D1 PTRY -002.163 0.000 2.810 -001.988   L1 PTRY -001.297 0.000 2.810 -001.192
   A1 D     078.500              ( kN/m³)   UT Stiff-Deck     -+-       (Mt My Mz)
Member 67
   D1 PTRY -000.613 0.000 4.508 -000.502   A1 PTRY -002.098 0.000 4.508 -001.717
   L1 PTRY -004.181 0.000 4.508 -003.422   G1 PTRY -000.348 0.000 4.508 -000.285
   D1 UDLY -006.500              ( kN/m )   A1 D     078.500              ( kN/m³)
   W1 UDLX +000.916              ( Co/m )   W1 UDLZ +000.919              ( Co/m )
   P1 UDLX +001.786              ( Co/m )   P1 UDLZ +001.792              ( Co/m )
   S1 UDLX +000.336              ( Co/m )   S1 UDLZ +000.337              ( Co/m )
   W2 UDLX +002.232              ( Co/m )   W2 UDLZ +002.239              ( Co/m )
   W3 UDLX -002.434              ( Co/m )   W3 UDLZ -002.443              ( Co/m )
   W4 UDLX +003.260              ( Co/m )   W4 UDLZ +003.271              ( Co/m )
   UT Stiff-Deck     -+-       (Mt My Mz)
Member 68
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Tel : 029 2045 1331 Fax : 029 2045 1344

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   D1 PTRY -001.166 0.000 2.832 -000.986   L1 PTRY -000.700 0.000 2.832 -000.592
   A1 D     078.500             ( kN/m³)   W1 UDLX +000.379              ( Co/m )
   W1 UDLZ +000.348             ( Co/m )   P1 UDLX +000.814              ( Co/m )
   P1 UDLZ +000.748             ( Co/m )   S1 UDLX +000.088              ( Co/m )
   S1 UDLZ +000.081             ( Co/m )   W2 UDLX +001.571              ( Co/m )
   W2 UDLZ +001.443             ( Co/m )   W3 UDLX -001.046              ( Co/m )
   W3 UDLZ -000.960             ( Co/m )   W4 UDLX +001.117              ( Co/m )
   W4 UDLZ +001.026             ( Co/m )   UT Stiff-Deck     -+-       (Mt My Mz)
Member 68
   D1 PTRY -001.373 0.000 4.795 -001.370   L1 PTRY -000.824 0.000 4.795 -000.822
   A1 D     078.500             ( kN/m³)   W1 UDLX +001.038              ( Co/m )
   P1 UDLX +000.603             ( Co/m )   S1 UDLX +001.328              ( Co/m )
   W2 UDLX -001.305             ( Co/m )   W3 UDLX -000.453              ( Co/m )
   W4 UDLX -000.290             ( Co/m )   UT Stiff-Deck     -+-       (Mt My Mz)
Member 68
   D1 UDLY -001.370             ( kN/m )   L1 UDLY -000.822              ( kN/m )
   A1 D     078.500             ( kN/m³)   W1 UDLX +001.187              ( Co/m )
   P1 UDLX +000.752             ( Co/m )   S1 UDLX +001.477              ( Co/m )
   W2 UDLX -001.160             ( Co/m )   W3 UDLX -000.342              ( Co/m )
   W4 UDLX -000.290             ( Co/m )   UT Stiff-Deck     -+-       (Mt My Mz)
Member 68
   D1 PTRY -002.337 0.000 4.795 -002.303   L1 PTRY -001.402 0.000 4.795 -001.382
   A1 D     078.500             ( kN/m³)   UT Stiff-Deck     -+-       (Mt My Mz)
Member 69
   D1 UDLY -001.370             ( kN/m )   L1 UDLY -000.822              ( kN/m )
   D1 PTRY -000.933 0.000 6.705 -000.784   L1 PTRY -000.560 0.000 6.705 -000.470
   A1 D     078.500             ( kN/m³)   UT Stiff-Deck     -+-       (Mt My Mz)
Member 70
   D1 PTRY -000.963 0.000 4.795 -000.932   L1 PTRY -000.578 0.000 4.795 -000.559
   D1 UDLY -000.825             ( kN/m )   L1 UDLY -000.495              ( kN/m )
   A1 D     078.500             ( kN/m³)   UT Stiff-Deck     -+-       (Mt My Mz)
Member 70
   D1 UDLY -001.818             ( kN/m )   L1 UDLY -001.091              ( kN/m )
   A1 D     078.500             ( kN/m³)   UT Stiff-Deck     -+-       (Mt My Mz)
Member 70
   D1 UDLY -000.993             ( kN/m )   L1 UDLY -000.596              ( kN/m )
   D1 PTRY -000.993 0.000 2.412 -000.879   L1 PTRY -000.596 0.000 2.412 -000.528
   A1 D     078.500             ( kN/m³)   UT Stiff-Deck     -+-       (Mt My Mz)
Member 70
   D1 PTRY -000.988 0.000 2.412 -000.874   L1 PTRY -000.593 0.000 2.412 -000.524
   A1 D     078.500             ( kN/m³)   W1 UDLX +000.378              ( Co/m )
   W1 UDLZ +000.396             ( Co/m )   P1 UDLX +000.813              ( Co/m )
   P1 UDLZ +000.851             ( Co/m )   S1 UDLX +000.088              ( Co/m )
   S1 UDLZ +000.092             ( Co/m )   W2 UDLX +001.297              ( Co/m )
   W2 UDLZ +001.358             ( Co/m )   W3 UDLX -001.044              ( Co/m )
   W3 UDLZ -001.093             ( Co/m )   W4 UDLX +001.115              ( Co/m )
   W4 UDLZ +001.168             ( Co/m )   UT Stiff-Deck     -+-       (Mt My Mz)
Member 70
   D1 UDLY -000.993             ( kN/m )   L1 UDLY -000.596              ( kN/m )
   D1 PTRY -000.879 0.000 2.383 -000.764   L1 PTRY -000.528 0.000 2.383 -000.459
   A1 D     078.500             ( kN/m³)   UT Stiff-Deck     -+-       (Mt My Mz)
Member 70
   D1 PTRY -000.873 0.000 2.411 -000.760   L1 PTRY -000.524 0.000 2.411 -000.456
   A1 D     078.500             ( kN/m³)   W1 UDLX +000.394              ( Co/m )
   W1 UDLZ +000.411             ( Co/m )   P1 UDLX +000.829              ( Co/m )
   P1 UDLZ +000.864             ( Co/m )   S1 UDLX +000.104              ( Co/m )
   S1 UDLZ +000.109             ( Co/m )   W2 UDLX +001.115              ( Co/m )
```

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Slowikowski, Blackshaw and Partners

The Maltings, East Tyndall Street
Cardiff Bay, Cardiff CF24 5EA
Tel : 029 2045 1331 Fax : 029 2045 1344

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   W2 UDLZ +001.163                ( Co/m )    W3 UDLX -001.078                ( Co/m )
   W3 UDLZ -001.124                ( Co/m )    W4 UDLX +001.115                ( Co/m )
   W4 UDLZ +001.163                ( Co/m )    UT Stiff-Deck      -+-       (Mt My Mz)
Member 70
   D1 PTRY -001.757 0.000 6.711 -001.566    L1 PTRY -001.054 0.000 6.711 -000.940
   A1 D     078.500                ( kN/m³)    UT Stiff-Deck      -+-       (Mt My Mz)
Member 71
   D1 PTRY -000.824 0.000 6.716 -000.782    L1 PTRY -000.495 0.000 6.716 -000.469
   D1 UDLY -000.992                ( kN/m )    L1 UDLY -000.595                ( kN/m )
   A1 D     078.500                ( kN/m³)    UT Stiff-Deck      -+-       (Mt My Mz)
Member 71
   D1 UDLY -000.992                ( kN/m )    L1 UDLY -000.595                ( kN/m )
   D1 PTRY -000.763 0.000 2.240 -000.700    L1 PTRY -000.458 0.000 2.240 -000.420
   A1 D     078.500                ( kN/m³)    UT Stiff-Deck      -+-       (Mt My Mz)
Member 71
   D1 PTRY -000.760 0.000 2.240 -000.696    L1 PTRY -000.456 0.000 2.240 -000.418
   A1 D     078.500                ( kN/m³)    W1 UDLX +000.458                ( Co/m )
   W1 UDLZ +000.461                ( Co/m )    P1 UDLX +000.893                ( Co/m )
   P1 UDLZ +000.899                ( Co/m )    S1 UDLX +000.168                ( Co/m )
   S1 UDLZ +000.169                ( Co/m )    W2 UDLX +001.116                ( Co/m )
   W2 UDLZ +001.123                ( Co/m )    W3 UDLX -001.217                ( Co/m )
   W3 UDLZ -001.225                ( Co/m )    W4 UDLX +001.116                ( Co/m )
   W4 UDLZ +001.123                ( Co/m )    UT Stiff-Deck      -+-       (Mt My Mz)
Member 71
   D1 UDLY -000.992                ( kN/m )    L1 UDLY -000.595                ( kN/m )
   D1 PTRY -000.700 0.000 4.476 -000.573    L1 PTRY -000.420 0.000 4.476 -000.344
   A1 D     078.500                ( kN/m³)    UT Stiff-Deck      -+-       (Mt My Mz)
Member 71
   D1 PTRY -000.696 0.000 4.508 -000.570    L1 PTRY -000.418 0.000 4.508 -000.342
   A1 D     078.500                ( kN/m³)    W1 UDLX +000.458                ( Co/m )
   W1 UDLZ +000.461                ( Co/m )    P1 UDLX +000.893                ( Co/m )
   P1 UDLZ +000.899                ( Co/m )    S1 UDLX +000.168                ( Co/m )
   S1 UDLZ +000.169                ( Co/m )    W2 UDLX +001.116                ( Co/m )
   W2 UDLZ +001.123                ( Co/m )    W3 UDLX -001.217                ( Co/m )
   W3 UDLZ -001.225                ( Co/m )    W4 UDLX +001.630                ( Co/m )
   W4 UDLZ +001.641                ( Co/m )    UT Stiff-Deck      -+-       (Mt My Mz)
Member 71
   D1 UDLY -000.520                ( kN/m )    L1 UDLY -000.312                ( kN/m )
   D1 PTRY -001.370 0.000 3.592 -001.418    L1 PTRY -000.822 0.000 3.592 -000.851
   A1 D     078.500                ( kN/m³)    UT Stiff-Deck      -+-       (Mt My Mz)
Member 71
   D1 PTRY -001.370 0.000 3.593 -001.417    L1 PTRY -000.822 0.000 3.593 -000.850
   D1 UDLY -000.784                ( kN/m )    L1 UDLY -000.470                ( kN/m )
   A1 D     078.500                ( kN/m³)    UT Stiff-Deck      -+-       (Mt My Mz)
Member 71
   D1 UDLY -001.567                ( kN/m )    L1 UDLY -000.940                ( kN/m )
   A1 D     078.500                ( kN/m³)    UT Stiff-Deck      -+-       (Mt My Mz)
Member 71
   D1 UDLY -001.776                ( kN/m )    L1 UDLY -001.066                ( kN/m )
   A1 D     078.500                ( kN/m³)    UT Stiff-Deck      -+-       (Mt My Mz)
Member 71
   D1 UDLY -000.993                ( kN/m )    L1 UDLY -000.596                ( kN/m )
   D1 PTRY -000.574 0.000 1.803 -000.421    L1 PTRY -000.344 0.000 1.803 -000.252
   A1 D     078.500                ( kN/m³)    UT Stiff-Deck      -+-       (Mt My Mz)
Member 72
   D1 PTRY -000.568 0.000 1.759 -000.411    L1 PTRY -000.341 0.000 1.759 -000.246
   A1 D     078.500                ( kN/m³)    W1 UDLX +000.458                ( Co/m )
```

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Cardiff Bay, Cardiff CF24 5EA
Tel . 029 2045 1331 Fax : 029 2045 1344

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   W1 UDLZ +000.458              ( Co/m )    P1 UDLX +000.893              ( Co/m )
   P1 UDLZ +000.893              ( Co/m )    S1 UDLX +000.168              ( Co/m )
   S1 UDLZ +000.168              ( Co/m )    W2 UDLX +001.474              ( Co/m )
   W2 UDLZ +001.474              ( Co/m )    W3 UDLX -001.134              ( Co/m )
   W3 UDLZ -001.134              ( Co/m )    W4 UDLX +000.290              ( Co/m )
   W4 UDLZ +000.290              ( Co/m )    UT Stiff-Deck      -+-      (Mt My Mz)
Member 72
   D1 UDLY -000.993              ( kN/m )    L1 UDLY -000.596              ( kN/m )
   D1 PTRY -000.421 0.000 1.791 -000.808     L1 PTRY -000.252 0.000 1.791 -000.485
   A1 D     078.500              ( kN/m³)    UT Stiff-Deck      -+-      (Mt My Mz)
Member 72
   D1 PTRY -000.396 0.000 2.027 -000.738     L1 PTRY -000.238 0.000 2.027 -000.443
   A1 D     078.500              ( kN/m³)    W1 UDLX +000.478              ( Co/m )
   W1 UDLZ -000.478              ( Co/m )    P1 UDLX +000.913              ( Co/m )
   P1 UDLZ -000.913              ( Co/m )    S1 UDLX +000.188              ( Co/m )
   S1 UDLZ -000.188              ( Co/m )    W2 UDLX -001.045              ( Co/m )
   W2 UDLZ +001.045              ( Co/m )    W3 UDLX -001.217              ( Co/m )
   W3 UDLZ +001.217              ( Co/m )    W4 UDLX +000.325              ( Co/m )
   W4 UDLZ -000.325              ( Co/m )    UT Stiff-Deck      -+-      (Mt My Mz)
Member 72
   A1 D     078.500              ( kN/m³)    W1 UDLX +001.001              ( Co/m )
   P1 UDLX +000.566              ( Co/m )    S1 UDLX +001.291              ( Co/m )
   W2 UDLX -001.305              ( Co/m )    W3 UDLX -000.481              ( Co/m )
   W4 UDLX -001.160              ( Co/m )    UT Stiff-Deck      -+-      (Mt My Mz)
Member 72
   D1 PTRY -001.298 0.000 2.055 -000.778     L1 PTRY -000.779 0.000 2.055 -000.467
   A1 D     078.500              ( kN/m³)    W1 UDLX +000.478              ( Co/m )
   W1 UDLZ -000.478              ( Co/m )    P1 UDLX +000.913              ( Co/m )
   P1 UDLZ -000.913              ( Co/m )    S1 UDLX +000.188              ( Co/m )
   S1 UDLZ -000.188              ( Co/m )    W2 UDLX -001.045              ( Co/m )
   W2 UDLZ +001.045              ( Co/m )    W3 UDLX -001.217              ( Co/m )
   W3 UDLZ +001.217              ( Co/m )    W4 UDLX +000.325              ( Co/m )
   W4 UDLZ -000.325              ( Co/m )    UT Stiff-Deck      -+-      (Mt My Mz)
Member 73
   A1 D     078.500              ( kN/m³)    W1 UDLX +001.001              ( Co/m )
   P1 UDLX +000.566              ( Co/m )    S1 UDLX +001.291              ( Co/m )
   W2 UDLX -001.160              ( Co/m )    W3 UDLX -000.481              ( Co/m )
   W4 UDLX -001.885              ( Co/m )    UT Stiff-Deck      -+-      (Mt My Mz)
Member 73
   D1 PTRY -001.956 0.000 3.293 -002.374     L1 PTRY -001.174 0.000 3.293 -001.425
   A1 D     078.500              ( kN/m³)    UT Stiff-Deck      -+-      (Mt My Mz)
Member 73
   A1 D     078.500              ( kN/m³)    W1 UDLX +000.478              ( Co/m )
   W1 UDLZ +000.478              ( Co/m )    P1 UDLX +000.913              ( Co/m )
   P1 UDLZ +000.913              ( Co/m )    S1 UDLX +000.188              ( Co/m )
   S1 UDLZ +000.188              ( Co/m )    W2 UDLX +000.956              ( Co/m )
   W2 UDLZ +000.956              ( Co/m )    W3 UDLX -001.134              ( Co/m )
   W3 UDLZ -001.134              ( Co/m )    W4 UDLX -000.290              ( Co/m )
   W4 UDLZ -000.290              ( Co/m )    UT Stiff-Deck      -+-      (Mt My Mz)
Member 74
   A1 D     078.500              ( kN/m³)    W1 UDLX +000.478              ( Co/m )
   W1 UDLZ +000.478              ( Co/m )    P1 UDLX +000.913              ( Co/m )
   P1 UDLZ +000.913              ( Co/m )    S1 UDLX +000.188              ( Co/m )
   S1 UDLZ +000.188              ( Co/m )    W2 UDLX +000.954              ( Co/m )
   W2 UDLZ +000.954              ( Co/m )    W3 UDLX -001.134              ( Co/m )
   W3 UDLZ -001.134              ( Co/m )    W4 UDLX -000.290              ( Co/m )
   W4 UDLZ -000.290              ( Co/m )    UT Stiff-Deck      -+-      (Mt My Mz)
```

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Member 74

```
A1 D      078.500          ( kN/m³)   W1 UDLX +000.478          ( Co/m )
W1 UDLZ +000.478           ( Co/m )   P1 UDLX +000.913          ( Co/m )
P1 UDLZ +000.913           ( Co/m )   S1 UDLX +000.188          ( Co/m )
S1 UDLZ +000.188           ( Co/m )   W2 UDLX +000.946          ( Co/m )
W2 UDLZ +000.946           ( Co/m )   W3 UDLX -001.134          ( Co/m )
W3 UDLZ -001.134           ( Co/m )   W4 UDLX -000.290          ( Co/m )
W4 UDLZ -000.290           ( Co/m )   UT Stiff-Deck     -+-   (Mt My Mz)
```

Member 74

```
A1 D      078.500          ( kN/m³)   W1 UDLX +000.478          ( Co/m )
W1 UDLZ +000.478           ( Co/m )   P1 UDLX +000.913          ( Co/m )
P1 UDLZ +000.913           ( Co/m )   S1 UDLX +000.188          ( Co/m )
S1 UDLZ +000.188           ( Co/m )   W2 UDLX +000.946          ( Co/m )
W2 UDLZ +000.946           ( Co/m )   W3 UDLX -001.162          ( Co/m )
W3 UDLZ -001.162           ( Co/m )   W4 UDLX -000.290          ( Co/m )
W4 UDLZ -000.290           ( Co/m )   UT Stiff-Deck     -+-   (Mt My Mz)
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Members 750-766 and 768-78

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A1 D      078.500          ( kN/m³)   UT Tension-Only     (No Compression)
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NOTE : The active density D (automatic self-weight) applies to current and all subsequent members till redefine

COMPOSITE SECTION PROPERTIES

Composite Section Properties for the following members are used in the frame analysis in all but loading cases 2 to 5.
Members 1-2, 4-14, 18-20, 29-32, 34-35, 40-41, 44, 47, 50-52, 54-55, 57-59, 63-72, 75-91, 93-97, 99-100, 103, 106, 109, 111-113, 115-119, 121, 123-127, 129, 131, 133-134, 136, 138-139, 141-142, 144-174, 176-184, 187-188, 190-197, 199-213, 215-216, 218, 226, 228, 230-238, 240-246, 248-249, 251-254, 257, 259-268, 275, 277-278, 280-283, 285-289, 291-297, 299-300, 303, 305-307, 311, 314, 316, 318-319, 321-322, 324-325, 327, 366-367, 372-374, 376-382, 386-389, 392, 396-397, 400-405, 408-409, 412, 414-415, 417, 420-421, 423-427, 430-431, 433-434, 436, 439, 441, 447-451, 453-455, 458-463, 466-467, 470, 472-473, 476, 478-480, 482-485, 488-489, 492-493, 496, 500-501, 503, 508, 510-512, 514-515, 517-518, 520-522, 525-526, 528-536, 538, 540, 542-543, 547-548, 550, 552, 554,

558-559, 561-562, 566, 569, 572, 574-584, 586, 589, 591, 593-594, 596, 600, 603, 605-610, 613-614, 616-617, 619, 622, 624-625, 628, 630, 632, 634-640, 643, 654, 656, 659-664, 668, 670, 673, 677, 680, 690, 693-694, 696-699, 701-702, 704, 734 and 736-737

MEMBER PROPERTIES

Members 1-2, 4-11, 18-20, 22, 29-35, 40-41, 44-48, 50-51, 54, 57, 63, 79, 87, 92-94, 99-100, 103, 105-109, 111, 113, 116-117, 119, 121-122, 125, 129, 133-134, 137-138, 145, 147, 163, 169, 176-177, 181, 186, 191, 194, 214, 224, 226-229, 231-232, 234, 236, 238, 240, 243, 246, 249, 252, 254, 273-282, 284-285, 287, 291, 301, 304, 307-311, 313-315, 317, 320, 323, 326-327, 329-331, 333-337, 339, 341-348, 352, 371, 375, 387-388, 409, 412, 414, 431, 433, 436, 439, 441, 457, 467, 470, 472-473, 501, 555, 589, 596, 600-601, 625, 628, 654, 658, 667, 671, 675, 679, 682, 684, 723, 725, 728-730 and 732-749

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M  ...  ...          203x203 UC 86 [S 275]
 A 109.63E-4          Ix 9451.7E-8        Iy 3130.3E-8        J 136.8E-8
 E 205E6              G 78.84615E6
```

Members 3, 24-25, 52-53, 55-56, 58-59, 64-72, 76, 78, 81-82, 112, 115, 118, 123-124, 126-128, 130-132, 141, 143-144, 151, 166, 172, 174, 178-180, 182-185, 187-188, 192, 195, 198-199, 219, 233, 235, 237, 241-242, 244-245, 247-248, 255, 258, 283, 286, 288-289, 292-300, 305, 312, 519, 522, 525, 528, 530, 532,

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571-572, 575, 577-578, 580, 633, 635, 637, 639, 641-642, 645-646, 692, 694, 696, 698, 786-789, 803-804, 807, 816, 822, 840, 851, 855, 858, 862-863, 867, 878, 881, 883, 886, 890-891, 896, 902-905, 907-908, 910, 917, 924-925, 929, 932-934, 944, 948, 951, 955-956, 960, 965-967 and 995-996

M ... ... 254x254 UC 107 [S 275]
A 136.38E-4 Ix 17517.3E-8 Iy 5934.5E-8 J 172.43E-8
E 205E6 G 78.84615E6

Members 12-14, 17, 21, 23, 39, 42-43, 49, 60, 80, 84-85, 89, 91, 95-98, 101-102, 104, 110, 114, 120, 142, 148-150, 152-153, 156, 158, 162, 164, 168, 170, 173, 175, 196-197, 200-201, 203-205, 207, 210, 212, 216-218, 220, 222-223, 225, 230, 239, 256-257, 259-260, 262, 265, 267-268, 272, 290, 316, 319, 324, 364-367, 380-382, 384-386, 390, 392, 398, 404-405, 407-408, 418-419, 425, 430, 434, 437, 440, 442, 444, 462-463, 465-466, 477, 488, 493, 495, 498, 502, 504, 506, 523, 547, 552, 556, 560, 563, 565, 582, 593-594, 604, 613, 617, 620, 623, 626, 685, 706, 767, 897, 922, 943, 946, 949, 961-962, 972-979, 981, 983-984, 986-994, 997 and 999-1003

M ... ... 152x152 UC 30 [S 275]
A 38.26E-4 Ix 1748.9E-8 Iy 561.4E-8 J 10.51E-8
E 205E6 G 78.84615E6

Members 15-16, 26-28, 61-62, 73, 83, 86, 88, 90, 140, 146, 154-155, 157, 159-161, 165, 167, 171, 202, 206, 208-209, 211, 213, 215, 221, 261, 263-264, 266, 269, 271, 318, 321-322, 325, 328, 332, 340, 349-351, 353-363, 368-369, 372-374, 376-379, 383, 391, 393-397, 400-403, 406, 410-411, 413, 416, 420-424, 426-428, 432, 435, 438, 445, 447, 449, 452, 456, 458-461, 464, 468-469, 471, 474-475, 478, 480-486, 489-491, 494, 497, 499, 508-509, 511, 531, 535, 538, 540-544, 546, 548-549, 551, 553, 557, 559, 562, 566, 568, 573, 576, 592, 595, 597-599, 602, 605-607, 609-611, 614-615, 618, 621, 644, 647-653, 655, 657, 659-665, 668-669, 672, 674, 676, 678, 681, 683, 687, 689, 695, 700, 703, 705, 707-722, 726 and 731

M ... ... 203x133 UB 30 [S 275]
A 38.21E-4 Ix 2896.5E-8 Iy 385.5E-8 J 10.3E-8
E 205E6 G 78.84615E6

Members 36-38

M ... ... 305x305 UC 198 [S 275]
A 252.41E-4 Ix 50918.3E-8 Iy 16313.3E-8 J 734.01E-8
E 205E6 G 78.84615E6

Members 74, 135, 189, 250, 270, 302, 338, 370, 429, 443, 487, 505, 545, 564, 612, 627, 666, 686, 724 and 727

M ... ... 10 Round Bar
A .7853982E-4 Ix 4.90873865783215EIy 4.90873865783215EJ .09E-8
E 205E6 G 78.84615E6

Members 75, 77, 136, 139, 190, 193, 251, 253, 303, 306 and 608

M ... ... 254x146 UB 43 [S 275]
A 54.77E-4 Ix 6544.6E-8 Iy 678.3E-8 J 23.88E-8
E 205E6 G 78.84615E6

Members 389, 415, 417, 476, 479, 514, 591, 603, 656, 810, 812 and 814

M ... ... 203x203 UC 60 [S 275]
A 76.37E-4 Ix 6127.4E-8 Iy 2067.5E-8 J 47.23E-8
E 205E6 G 78.84615E6

Members 399, 446, 448, 450-451, 453-455, 507, 510, 512, 517, 526, 533, 536, 567, 569, 574, 579, 583, 585, 588, 629-630, 632, 634, 638, 688, 690, 693, 697, 701, 820, 824, 869, 871, 899, 915, 931, 938, 964 and 970

M ... ... 254x254 UC 132 [S 275]
A 168.13E-4 Ix 22535.6E-8 Iy 7538.2E-8 J 318.57E-8
E 205E6 G 78.84615E6

Members 492, 496, 500, 503, 550, 554, 558, 561, 616, 619, 622, 624, 670, 673, 677 and 680

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M  ...  ...          254x254 UC 167 [S 275]
 A 212.85E-4          Ix 30004.6E-8       Iy 9876.8E-8        J 626.39E-8
 E 205E6              G 78.84615E6
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Members 513, 515-516, 518, 520-521, 524, 527, 529, 534, 537, 539, 570, 581, 584, 586-587, 590, 631, 636, 640, 643, 691, 699, 702, 704, 783-785, 790-802, 805-806, 808-809, 811, 813, 815, 817-819, 821, 823, 825-839, 841-850, 852-854, 856-857, 859-861, 864-866, 868, 870, 872-877, 879-880, 882, 884-885, 887-889, 892-895, 898, 900-901, 906, 909, 911-914, 916, 918-921, 923, 926-928, 930, 935-937, 939-942, 945, 947, 950, 952, 954, 957-959, 963, 968-969, 971 and 998

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M  ...  ...          254x254 UC 73 [S 275]
 A 93.1E-4            Ix 11414.2E-8       Iy 3914.7E-8        J 57.62E-8
 E 205E6              G 78.84615E6
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Members 750-766, 768-782, 953, 980, 982 and 985

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M  ...  ...          150x20 Flat
 A 30E-4              Ix 562.5E-8         Iy 10E-8            J 40E-8
 E 205E6              G 78.84615E6
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MEMBER ORIENTATION

Members 767, 788-789, 826, 828, 901, 910, 912, 914, 918-920, 934-935, 937, 939, 967, 969, 971, 996, 998, 1000 and 1002-1003 ß -116.64
Members 786, 823, 902-903, 906-907, 909, 932, 936, 965, 968, 994 and 997 ß -116.66
Members 787, 829-830, 905, 908, 913, 916, 933, 966, 995 and 1001 ß -116.63
Members 813, 866, 895, 928, 959 and 990 ß -066.01
Members 814, 962, 980, 985 and 991 ß -066.37
Members 816, 862, 890, 924, 955 and 983 ß -120.68
Members 819, 827, 868, 872, 898, 930, 963 and 992 ß -116.93
Members 820, 824, 869, 871, 899, 915, 931, 938, 964, 970, 993 and 999 ß -116.92
Members 822, 867, 896, 929, 960 and 988 ß -120.70
Members 825 and 870 ß -027.40

MEMBER END RELEASES

1	●●○	●●●	2	●●○	●●●	3	●●○	●●●	4	●●○	●●●
6	●●●	●●○	9	●●●	●●○	11	●●●	●●○	12	●●○	●●●
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684	●●○	●●○	685	●●○	●●○	687	●●○	●●○	688	●●○	●●○
689	●●○	●●○	690	●●○	●●●	691	●●○	●●○	694	●●○	●●●
695	●●○	●●○	698	●●●	●●○	699	●●○	●●●	700	●●○	●●○
701	●●●	●●○	703	●●○	●●○	704	●●●	●●○	705	●●○	●●●
706	●●●	●●○	707	●●●	●●○	708	●●○	●●●	709	●●○	●●○
710	●●○	●●○	711	●●○	●●●	712	●●●	●●○	713	●●●	●●○
714	●●○	●●○	715	●●○	●●○	716	●●○	●●○	717	●●○	●●○
718	●●○	●●○	719	●●○	●●●	720	●●○	●●○	721	●●●	●●○
722	●●○	●●○	723	●●○	●●●	725	●●○	●●●	726	●●○	●●○
728	●●○	●●○	729	●●○	●●○	730	●●●	●●○	731	●●○	●●○
734	●●○	●●●	737	●●●	●●○	739	●●●	●●○	740	●●●	●●○
743	●●○	●●●	744	●●○	●●●	745	●●●	●●○	747	●●●	●●○
749	●●●	●●○									

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Date	: JULY 2007
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Approved	.

Analysis of steel frame giving maximum values
Results from all loading conditions available on CD if requested

Member Forces (Maximum Values)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
1	9	8.05C	-0.01	72.91	0.00	0.00	0.00	155.08	0.00	15.31
	49	8.05C	0.01	47.74	0.00	147.38	0.00	@ 3.665	@ 2.443	@ 3.665
2	12	13.79C	0.36	121.92	0.00	0.00	0.01	308.36	0.01	35.64
	52	13.79C	-0.36	119.07	0.00	285.22	0.01	@ 4.733	@ 2.343	@ 3.787
3	24	46.98C	-0.01	123.13	0.01	0.00	0.02	122.31	0.03	3.88
	73	46.98C	0.01	112.11	0.01	122.33	0.03	@ 1.040	@ 1.030	@ 1.698
4	35	47.40C	-0.01	143.90	0.00	0.00	0.01	347.94	0.02	30.05
	56	47.40C	0.01	140.95	0.00	347.95	0.02	@ 2.443	@ 2.419	@ 3.262
5	49	2.21T	-0.01	12.59	0.00	147.39	0.00	155.08	0.00	15.31
	50	2.21T	0.01	-12.59	0.00	147.39	0.00	@ 3.665	@ 2.443	@ 3.665
6	50	2.23C	-0.01	-47.74	0.00	147.38	0.00	155.08	0.00	15.31
	51	2.23C	0.01	-72.91	0.00	0.00	0.00	@ 3.665	@ 2.443	@ 3.665
7	52	4.26C	0.36	11.21	0.00	285.20	0.00	308.36	0.01	35.64
	53	4.26C	-0.36	8.36	0.00	308.34	0.00	@ 4.733	@ 2.343	@ 3.787
8	53	8.77T	0.36	-98.11	0.00	308.36	0.00	308.36	0.01	35.64
	54	8.77T	-0.36	-100.97	0.00	72.75	0.00	@ 4.733	@ 2.343	@ 3.787
9	54	18.67T	-5.72	-166.81	0.00	73.51	0.00	308.36	0.01	35.64
	55	18.67T	5.72	-167.34	0.00	0.00	0.00	@ 4.733	@ 2.343	@ 3.787
10	56	7.48C	-0.01	-7.39	0.00	347.94	0.00	347.94	0.02	30.05
	57	7.48C	0.01	-9.68	0.00	331.69	0.00	@ 2.443	@ 2.419	@ 3.262
11	57	1.47T	-0.01	-151.33	0.00	331.69	0.00	347.94	0.02	30.05
	58	1.47T	0.01	-153.95	0.00	0.00	0.00	@ 2.443	@ 2.419	@ 3.262
12	58	3.11C	0.01	90.58	0.00	0.00	0.00	138.73	0.00	21.16
	59	3.11C	-0.01	81.74	0.00	79.96	0.00	@ 2.351	@ 0.919	@ 2.337
13	59	3.09C	0.00	48.25	0.00	79.73	0.00	138.73	0.00	21.16
	60	3.09C	0.00	34.70	0.00	138.74	0.00	@ 2.351	@ 0.919	@ 2.337
14	60	2.38C	0.00	-47.82	0.00	138.73	0.00	138.73	0.00	21.16
	61	2.38C	0.00	-70.20	0.00	0.00	0.00	@ 2.351	@ 0.919	@ 2.337
15	62	47.57C	0.01	39.36	-0.01	0.00	0.02	40.71	0.00	8.15
	75	47.57C	-0.01	38.93	-0.01	40.71	0.01	@ 1.040	@ 1.030	@ 1.720
16	62	0.00C	0.00	60.19	0.00	-42.05	0.00	21.60		3.78
	125	0.00C	0.00	-66.82	0.00	-44.31	0.00	@ 2.061		@ 2.061
17	64	47.70T	0.00	17.68	0.00	0.00	0.00	4.29		0.13
	134	47.70T	0.00	-15.74	0.00	0.00	0.00	@ 0.497		@ 0.507
18	65	2.07C	0.01	72.91	0.00	0.00	0.00	155.07	0.00	17.26

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Date : JULY 2007
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Member Forces (Maximum Values)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	76	2.07C	-0.01	47.74	0.00	147.38	0.00	@ 3.665	@ 4.863	@ 3.665
19	66	15.23C	0.00	111.68	0.00	0.00	0.00	261.35	0.00	27.68
	79	15.23C	0.00	108.83	0.00	260.97	0.00	@ 3.171	@ 2.343	@ 3.550
20	67	38.18C	0.00	143.90	0.01	0.00	0.00	347.94	0.02	30.05
	83	38.18C	0.00	140.95	0.01	347.95	0.02	@ 2.443	@ 2.419	@ 3.262
21	68	58.42C	0.00	0.48	0.00	0.00	0.00	0.27	0.00	1.28
	94	58.42C	0.00	-0.48	0.00	0.00	0.00	@ 1.143	@ 2.262	@ 2.285
22	70	123.86C	0.12	51.80	0.00	0.00	-0.02	117.42	-0.02	9.38
	96	123.86C	-0.12	49.05	0.00	115.22	-0.02	@ 2.745	@ 2.262	@ 2.216
23	71	25.08C	0.00	0.58	0.00	0.00	0.00	0.39		0.09
	103	25.08C	0.00	-0.58	0.00	0.00	0.00	@ 1.370		@ 1.370
24	72	2.95C	0.00	123.13	0.00	0.00	0.00	122.31	-0.01	3.88
	108	2.95C	0.00	112.11	0.00	122.33	0.00	@ 1.040	@ 1.040	@ 1.698
25	73	94.82C	-0.01	-42.59	0.01	122.31	0.00	122.31	0.03	3.88
	107	94.82C	0.01	-46.69	0.01	0.00	0.02	@ 1.040	@ 1.030	@ 1.698
26	74	2.04T	0.00	39.36	0.00	0.00	0.00	40.71	0.00	8.15
	126	2.04T	0.00	38.93	0.00	40.71	0.00	@ 1.040	@ 1.030	@ 1.720
27	74	0.00C	0.00	60.19	0.00	-42.05	0.00	21.60		3.78
	196	0.00C	0.00	-66.82	0.00	-44.31	0.00	@ 2.061		@ 2.061
28	75	31.75C	0.01	-13.76	-0.02	40.71	0.01	40.71	0.00	8.15
	111	31.75C	-0.01	-14.95	-0.02	0.00	-0.03	@ 1.040	@ 1.030	@ 1.720
29	76	0.87C	0.01	12.59	0.00	147.38	0.00	155.07	0.00	17.26
	77	0.87C	-0.01	-12.59	0.00	147.38	0.00	@ 3.665	@ 4.863	@ 3.665
30	77	0.89T	0.01	-47.74	0.00	147.38	0.00	155.07	0.00	17.26
	78	0.89T	-0.01	-72.91	0.00	0.00	0.00	@ 3.665	@ 4.863	@ 3.665
31	79	2.93C	0.00	1.27	0.00	260.96	0.00	261.35	0.00	27.68
	80	2.93C	0.00	-1.89	0.00	259.86	0.00	@ 3.171	@ 2.343	@ 3.550
32	80	8.98T	0.00	-108.36	0.00	259.86	0.00	261.35	0.00	27.68
	81	8.98T	0.00	-111.21	0.00	0.00	0.00	@ 3.171	@ 2.343	@ 3.550
33	81	14.94T	0.00	-184.01	-7.53	0.02	1.54			0.05
	82	14.94T	0.00	-188.55	-7.53	-81.95	-1.77			@ 0.255
34	83	7.01C	0.00	-7.39	0.01	347.94	0.00	347.94	0.02	30.05
	84	7.01C	0.00	-9.68	0.01	331.68	0.01	@ 2.443	@ 2.419	@ 3.262
35	84	10.22C	0.00	-151.33	0.00	331.69	0.00	347.94	0.02	30.05
	85	10.22C	0.00	-153.95	0.00	0.00	0.01	@ 2.443	@ 2.419	@ 3.262
36	85	32.26C	0.11	798.50	0.00	0.00	0.00	728.58	0.01	10.98
	86	32.26C	-0.11	787.48	0.00	735.89	0.01	@ 0.919	@ 2.337	@ 2.095
37	86	14.51T	0.02	-80.63	0.00	582.86	0.01	728.58	0.01	10.98
	87	14.51T	-0.02	-97.53	0.00	456.10	0.01	@ 0.919	@ 2.337	@ 2.095
38	87	9.70T	0.01	-180.04	0.00	456.10	0.00	728.58	0.01	10.98

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Job ref : GOA/A/1511
Sheet : / 45 -
Made By .
Date . JULY 2007
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Approved :

Member Forces (Maximum Values)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
	88	9.70T	-0.01	-207.96	0.00	0.00	0.00	@ 0.919	@ 2.337	@ 2.095
39	90	4.53C	0.00	17.68	0.00	0.00	0.00	4.29		0.13
	207	4.53C	0.00	-15.74	0.00	0.00	0.00	@ 0.497		@ 0.507
40	91	10.01T	0.01	109.22	0.00	0.00	0.00	236.32	0.00	23.53
	135	10.01T	-0.01	84.83	0.00	229.65	0.00	@ 3.503	@ 4.733	@ 3.550
41	92	28.02C	0.00	143.90	0.01	0.00	0.00	347.94	0.02	30.05
	151	28.02C	0.00	140.96	0.01	347.95	0.02	@ 2.443	@ 2.419	@ 3.262
42	93	45.37C	0.00	0.48	-0.01	0.00	0.01	0.27	-0.01	1.99
	162	45.37C	0.00	-0.48	-0.01	0.00	-0.01	@ 1.143	@ 2.262	@ 2.285
43	94	16.28T	0.00	0.39	0.00	0.00	0.00	0.27	0.00	1.28
	95	16.28T	0.00	-0.39	0.00	0.00	0.00	@ 1.143	@ 2.262	@ 2.285
44	95	3.63T	-0.01	130.17	0.00	0.00	0.00	289.49	0.00	25.08
	98	3.63T	0.01	127.55	0.00	280.02	0.00	@ 4.146	@ 2.173	@ 3.238
45	96	4.85C	0.12	4.59	-0.01	115.23	-0.01	117.42	-0.02	9.38
	99	4.85C	-0.12	4.03	-0.01	117.22	-0.01	@ 2.745	@ 2.262	@ 2.216
46	97	90.99C	0.13	51.80	0.00	0.00	-0.01	117.42	-0.02	9.39
	165	90.99C	-0.13	49.05	0.00	115.22	-0.02	@ 2.745	@ 2.262	@ 2.216
47	98	3.24T	-0.01	6.00	0.00	280.00	0.00	289.49	0.00	25.08
	101	3.24T	0.01	3.62	0.00	289.49	0.00	@ 4.146	@ 2.173	@ 3.238
48	99	11.42T	0.12	-82.73	0.00	117.42	0.00	117.42	-0.02	9.38
	102	11.42T	-0.12	-84.42	0.00	0.00	0.00	@ 2.745	@ 2.262	@ 2.216
49	100	15.10C	0.00	0.58	0.00	0.00	0.00	0.39		0.09
	172	15.10C	0.00	-0.58	0.00	0.00	0.00	@ 1.370		@ 1.370
50	101	10.07T	-0.01	-121.72	0.00	289.49	0.00	289.49	0.00	25.08
	105	10.07T	0.01	-124.55	0.00	0.00	0.00	@ 4.146	@ 2.173	@ 3.238
51	102	2.75C	-0.01	171.98	0.00	0.00	0.00	263.25	0.00	20.58
	106	2.75C	0.01	171.35	0.00	89.61	0.00	@ 2.173	@ 2.156	@ 3.047
52	103	5.10T	-0.01	230.34	0.00	0.00	-0.01	550.18	-0.03	28.71
	110	5.10T	0.01	227.55	0.00	426.98	-0.02	@ 3.516	@ 5.483	@ 3.516
53	104	6.37C	0.01	123.13	0.00	0.00	0.00	122.31	0.00	3.88
	189	6.37C	-0.01	112.11	0.00	122.33	0.00	@ 1.040	@ 1.030	@ 1.698
54	106	4.85T	-0.01	106.17	0.00	89.61	0.00	263.25	0.00	20.58
	109	4.85T	0.01	104.18	0.00	263.25	0.00	@ 2.173	@ 2.156	@ 3.047
55	107	20.32T	-0.01	193.47	0.01	0.00	-0.04	400.49	0.01	16.46
	115	20.32T	0.01	191.12	0.01	301.51	-0.03	@ 3.135	@ 5.102	@ 3.119
56	108	17.17C	0.00	-42.59	0.00	122.31	-0.01	122.31	-0.01	3.88
	176	17.17C	0.00	-46.69	0.00	0.00	-0.01	@ 1.040	@ 1.040	@ 1.698
57	109	4.90T	-0.01	-6.97	0.00	263.25	0.00	263.25	0.00	20.58
	113	4.90T	0.01	-9.36	0.00	247.03	0.00	@ 2.173	@ 2.156	@ 3.047
58	110	11.61T	-0.01	75.86	0.00	426.98	-0.02	550.18	-0.03	28.71

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Member Forces (Maximum Values)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	114	11.61T	0.01	73.38	0.00	550.18	-0.02	@ 3.516	@ 5.483	@ 3.516
59	111	154.85T	-0.11	166.74	0.01	0.00	-0.02	358.87	-0.03	19.30
	116	154.85T	0.11	165.57	0.01	130.26	-0.01	@ 3.136	@ 5.123	@ 3.361
60	111	99.97T	-0.06	6.58	0.02	0.00	-0.07	1.24		0.02
	121	99.97T	0.06	-6.72	0.02	0.00	-0.06	@ 0.378		@ 0.378
61	112	4.21C	0.00	39.36	0.00	0.00	0.00	40.71	0.00	8.15
	206	4.21C	0.00	38.93	0.00	40.71	0.00	@ 1.040	@ 1.030	@ 1.720
62	112	0.00C	0.00	60.19	0.00	-42.05	0.00	21.60		3.78
	269	0.00C	0.00	-66.82	0.00	-44.31	0.00	@ 2.061		@ 2.061
63	113	8.67T	-0.01	-123.12	0.00	247.03	0.00	263.25	0.00	20.58
	117	8.67T	0.01	-125.52	0.00	0.00	0.00	@ 2.173	@ 2.156	@ 3.047
64	114	13.50T	-0.01	-85.71	0.00	550.18	-0.02	550.18	-0.03	28.71
	118	13.50T	0.01	-88.69	0.00	376.92	-0.03	@ 3.516	@ 5.483	@ 3.516
65	115	61.14T	-0.01	64.33	0.01	301.52	-0.03	400.49	0.01	16.46
	119	61.14T	0.01	61.98	0.01	400.49	-0.02	@ 3.135	@ 5.102	@ 3.119
66	116	154.85T	-0.11	165.56	0.01	130.26	-0.01	358.87	-0.03	19.30
	120	154.85T	0.11	140.12	0.01	250.22	0.00	@ 3.136	@ 5.123	@ 3.361
67	118	25.29T	-0.01	-245.39	0.00	376.96	0.00	550.18	-0.03	28.71
	122	25.29T	0.01	-247.69	0.00	0.00	0.00	@ 3.516	@ 5.483	@ 3.516
68	119	70.80T	-0.01	-78.55	0.01	400.49	-0.01	400.49	0.01	16.46
	123	70.80T	0.01	-81.53	0.01	241.45	0.01	@ 3.135	@ 5.102	@ 3.119
69	120	101.05T	-0.11	97.00	0.01	250.21	-0.02	358.87	-0.03	19.30
	124	101.05T	0.11	40.30	0.01	358.87	-0.01	@ 3.136	@ 5.123	@ 3.361
70	121	41.42T	-0.01	109.57	0.01	0.00	-0.04	216.99		11.77
	137	41.42T	0.01	-63.27	0.01	170.53	-0.01	@ 3.603		@ 3.497
71	123	57.76T	-0.01	-209.43	0.00	241.41	-0.03	400.49	0.01	16.46
	127	57.76T	0.01	-211.15	0.00	0.00	-0.02	@ 3.135	@ 5.102	@ 3.119
72	124	80.83T	-0.11	-8.47	0.01	358.87	-0.03	358.87	-0.03	19.30
	131	80.83T	0.11	-91.44	0.01	261.66	-0.01	@ 3.136	@ 5.123	@ 3.361
73	126	0.96C	0.00	-13.76	0.00	40.71	0.00	40.71	0.00	8.15
	180	0.96C	0.00	-14.95	0.00	0.00	0.00	@ 1.040	@ 1.030	@ 1.720
74	128	0.00C	0.00	0.00	0.00	0.00	0.00			0.00
	130	0.00C	0.00	0.00	0.00	0.00	0.00			@ 0.741
75	129	17.99T	0.03	126.52	0.00	0.00	0.00	222.90		33.48
	143	17.99T	-0.03	-127.31	0.00	0.00	0.00	@ 3.512		@ 3.512
76	131	69.46T	-0.11	-135.11	0.01	261.66	-0.03	358.87	-0.03	19.30
	133	69.46T	0.11	-190.22	0.01	0.00	-0.02	@ 3.136	@ 5.123	@ 3.361
77	132	18.02T	-0.02	124.62	0.00	0.00	0.00	219.99		34.33
	145	18.02T	0.02	-121.03	0.00	0.00	0.00	@ 3.545		@ 3.545
78	134	45.96T	-0.01	184.98	0.00	0.00	0.01	323.19	0.00	16.93

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Member Forces (Maximum Values)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	138	45.96T	0.01	88.07	0.00	313.20	0.00	@ 2.938	@ 2.200	@ 3.570
79	135	9.45T	0.01	12.02	0.00	229.65	0.00	236.32	0.00	23.53
	144	9.45T	-0.01	-12.66	0.00	228.54	0.00	@ 3.503	@ 4.733	@ 3.550
80	136	33.74T	0.00	72.22	0.01	0.00	-0.01	91.73		18.46
	219	33.74T	0.00	-72.10	0.01	0.00	0.02	@ 2.516		@ 2.516
81	137	41.42T	-0.01	-63.27	0.01	170.53	-0.01	216.99		11.77
	139	41.42T	0.01	-133.34	0.01	0.00	0.01	@ 3.603		@ 3.497
82	138	41.99T	-0.01	26.32	0.00	313.21	0.01	323.19	0.00	16.93
	146	41.99T	0.01	-147.77	0.00	0.00	-0.01	@ 2.938	@ 2.200	@ 3.570
83	140	11.22T	-0.01	82.80	0.00	0.00	0.00	105.45		19.01
	147	11.22T	0.01	-82.30	0.00	0.00	0.00	@ 2.529		@ 2.529
84	141	29.54T	0.02	90.26	0.00	0.00	-0.01	114.94		34.17
	222	29.54T	-0.02	-90.14	0.00	0.00	0.01	@ 2.548		@ 2.548
85	142	9.82T	0.00	65.18	0.00	0.00	0.00	83.12		18.41
	148	9.82T	0.00	-64.93	0.00	0.00	0.00	@ 2.529		@ 2.529
86	143	25.48T	0.00	83.37	0.00	0.00	0.00	106.45		19.17
	225	25.48T	0.00	-83.37	0.00	0.00	0.00	@ 2.554		@ 2.554
87	144	7.36T	0.01	-84.36	0.00	228.55	0.00	236.32	0.00	23.53
	149	7.36T	-0.01	-108.75	0.00	0.00	0.00	@ 3.503	@ 4.733	@ 3.550
88	145	21.64T	0.00	83.55	0.00	0.00	0.00	106.90		19.33
	228	21.64T	0.00	-83.55	0.00	0.00	0.00	@ 2.559		@ 2.559
89	146	18.36T	0.00	82.94	0.00	0.00	0.00	106.34		31.98
	231	18.36T	0.00	-82.94	0.00	0.00	0.00	@ 2.564		@ 2.564
90	147	15.43T	0.00	82.27	0.00	0.00	0.00	105.69		19.26
	234	15.43T	0.00	-82.27	0.00	0.00	0.00	@ 2.569		@ 2.569
91	148	12.69T	0.00	65.19	0.00	0.00	0.00	83.93		18.96
	237	12.69T	0.00	-65.19	0.00	0.00	0.00	@ 2.575		@ 2.575
92	149	3.22T	0.01	-155.21	-34.67	0.01	9.33			0.04
	150	3.22T	-0.01	-159.74	-34.67	-69.28	-5.93			@ 0.251
93	151	45.81T	0.00	-7.39	0.01	347.94	0.00	347.94	0.02	30.05
	152	45.81T	0.00	-9.68	0.00	331.69	0.01	@ 2.443	@ 2.419	@ 3.262
94	152	59.84T	0.00	-151.33	0.00	331.69	0.01	347.94	0.02	30.05
	153	59.84T	0.00	-153.95	0.00	0.00	0.01	@ 2.443	@ 2.419	@ 3.262
95	153	97.11T	0.00	-281.27	0.01	0.00	0.00	-258.59	0.01	7.23
	154	97.11T	0.00	-281.66	0.01	-261.20	0.01	@ 0.919	@ 2.337	@ 0.891
96	154	46.29C	0.00	97.62	0.00	-106.63	0.01	-258.59	0.01	7.23
	155	46.29C	0.00	84.08	0.00	42.01	0.01	@ 0.919	@ 2.337	@ 0.891
97	155	14.49C	0.00	-8.27	0.00	42.01	0.00	-258.59	0.01	7.23
	156	14.49C	0.00	-27.46	0.00	0.00	0.00	@ 0.919	@ 2.337	@ 0.891
98	158	8.29C	0.00	17.68	0.00	0.00	0.00	4.29		0.13

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Member Forces (Maximum Values)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	280	8.29C	0.00	-15.74	0.00	0.00	0.00	@ 0.497		@ 0.507
99	159	9.37C	0.01	109.22	0.00	0.00	0.00	236.32	0.01	23.53
	253	9.37C	-0.01	84.83	0.00	229.65	0.00	@ 3.503	@ 4.733	@ 3.550
100	160	38.46C	0.01	143.90	0.01	0.00	0.00	347.94	0.01	30.05
	274	38.46C	-0.01	140.96	0.01	347.95	0.01	@ 2.443	@ 2.419	@ 3.262
101	161	27.80C	0.00	0.48	-0.01	0.00	0.01	0.27	-0.01	2.63
	170	27.80C	0.00	-0.48	-0.01	0.00	-0.01	@ 1.143	@ 2.262	@ 2.285
102	162	17.70T	0.00	0.39	0.00	0.00	0.00	0.27	-0.01	1.99
	163	17.70T	0.00	-0.39	0.00	0.00	0.00	@ 1.143	@ 2.262	@ 2.285
103	163	9.36T	0.00	130.17	0.00	0.00	0.00	289.49	0.00	25.08
	166	9.36T	0.00	127.55	0.00	280.02	0.00	@ 4.146	@ 2.151	@ 3.238
104	164	18.07C	0.00	0.48	0.00	0.00	0.00	0.27	-0.01	2.96
	319	18.07C	0.00	-0.48	0.00	0.00	-0.01	@ 1.143	@ 2.262	@ 2.285
105	165	30.01T	0.13	4.59	0.00	115.24	0.00	117.42	-0.02	9.39
	167	30.01T	-0.13	4.04	0.00	117.22	0.00	@ 2.745	@ 2.262	@ 2.216
106	166	4.08T	0.00	6.00	0.00	280.00	0.00	289.49	0.00	25.08
	169	4.08T	0.00	3.62	0.00	289.49	0.00	@ 4.146	@ 2.151	@ 3.238
107	167	9.77T	0.13	-82.73	0.00	117.42	0.01	117.42	-0.02	9.39
	171	9.77T	-0.13	-84.42	0.00	0.00	0.01	@ 2.745	@ 2.262	@ 2.216
108	168	53.59C	0.13	51.81	0.00	0.00	-0.01	117.41	0.01	9.39
	182	53.59C	-0.13	49.05	0.00	115.23	-0.01	@ 2.745	@ 2.745	@ 2.216
109	169	1.89T	0.00	-121.72	0.00	289.49	0.00	289.49	0.00	25.08
	173	1.89T	0.00	-124.55	0.00	0.00	0.00	@ 4.146	@ 2.151	@ 3.238
110	170	18.82T	0.00	0.39	0.00	0.00	0.00	0.27	-0.01	2.63
	177	18.82T	0.00	-0.39	0.00	0.00	0.00	@ 1.143	@ 2.262	@ 2.285
111	171	10.26T	0.00	171.98	0.00	0.00	0.00	263.25	0.00	20.58
	174	10.26T	0.00	171.35	0.00	89.61	0.00	@ 2.173	@ 0.522	@ 3.047
112	172	3.33T	0.00	229.77	0.00	0.00	0.00	548.18	0.00	28.71
	179	3.33T	0.00	226.98	0.00	425.92	0.00	@ 3.516	@ 5.483	@ 3.516
113	174	8.79T	0.00	106.17	0.00	89.61	0.00	263.25	0.00	20.58
	178	8.79T	0.00	104.18	0.00	263.25	0.00	@ 2.173	@ 0.522	@ 3.047
114	175	9.60C	0.00	0.58	0.00	0.00	0.00	0.39		0.09
	220	9.60C	0.00	-0.58	0.00	0.00	0.00	@ 1.370		@ 1.370
115	176	1.48C	0.00	192.98	0.00	0.00	-0.01	398.97	-0.01	16.46
	184	1.48C	0.00	190.63	0.00	300.75	-0.01	@ 3.135	@ 1.552	@ 3.119
116	177	24.44T	0.01	130.17	0.00	0.00	0.00	289.49	0.01	25.08
	197	24.44T	-0.01	127.55	0.00	280.02	0.01	@ 4.146	@ 2.151	@ 3.238
117	178	4.92T	0.00	-6.97	0.00	263.25	0.00	263.25	0.00	20.58
	181	4.92T	0.00	-9.36	0.00	247.03	0.00	@ 2.173	@ 0.522	@ 3.047
118	179	3.25T	0.00	75.29	0.00	425.92	0.00	548.18	0.00	28.71

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Member Forces (Maximum Values)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	183	3.25T	0.00	72.81	0.00	548.18	0.00	@ 3.516	@ 5.483	@ 3.516
119	180	1.90T	0.02	186.68	0.00	0.00	0.00	361.94	0.00	33.54
	185	1.90T	-0.02	163.49	0.00	137.41	0.00	@ 3.136	@ 5.123	@ 3.361
120	180	10.73C	0.02	5.88	-0.01	0.00	0.00	1.14		0.02
	191	10.73C	-0.02	-6.36	-0.01	0.00	-0.01	@ 0.378		@ 0.378
121	181	3.02T	0.00	-123.12	0.00	247.03	0.00	263.25	0.00	20.58
	186	3.02T	0.00	-125.52	0.00	0.00	0.00	@ 2.173	@ 0.522	@ 3.047
122	182	37.14T	0.13	4.59	0.00	115.25	0.01	117.41	0.01	9.39
	201	37.14T	-0.13	4.04	0.00	117.23	0.01	@ 2.745	@ 2.745	@ 2.216
123	183	2.32T	0.00	-86.28	0.00	548.18	0.00	548.18	0.00	28.71
	187	2.32T	0.00	-89.26	0.00	373.79	0.00	@ 3.516	@ 5.483	@ 3.516
124	184	0.80C	0.00	63.84	0.00	300.76	0.00	398.97	-0.01	16.46
	188	0.80C	0.00	61.50	0.00	398.97	0.00	@ 3.135	@ 1.552	@ 3.119
125	185	1.89T	0.02	163.49	0.00	137.41	0.00	361.94	0.00	33.54
	190	1.89T	-0.02	138.27	0.00	255.82	0.00	@ 3.136	@ 5.123	@ 3.361
126	187	1.44T	0.00	-243.33	0.00	373.80	0.00	548.18	0.00	28.71
	192	1.44T	0.00	-245.62	0.00	0.00	0.00	@ 3.516	@ 5.483	@ 3.516
127	188	1.05T	0.00	-79.04	0.00	398.97	0.00	398.97	-0.01	16.46
	193	1.05T	0.00	-82.02	0.00	238.96	0.00	@ 3.135	@ 1.552	@ 3.119
128	189	17.55C	0.01	-42.59	0.00	122.31	0.00	122.31	0.00	3.88
	244	17.55C	-0.01	-46.69	0.00	0.00	0.00	@ 1.040	@ 1.030	@ 1.698
129	190	2.16T	0.02	95.16	0.00	255.81	0.00	361.94	0.00	33.54
	195	2.16T	-0.02	38.92	0.00	361.94	0.00	@ 3.136	@ 5.123	@ 3.361
130	191	5.35C	-0.01	109.57	0.00	0.00	-0.01	216.99		29.36
	210	5.35C	0.01	-63.27	0.00	170.53	-0.01	@ 3.603		@ 3.497
131	193	0.98T	0.00	-207.28	0.00	238.95	0.00	398.97	-0.01	16.46
	198	0.98T	0.00	-209.00	0.00	0.00	0.00	@ 3.135	@ 1.552	@ 3.119
132	194	10.05T	0.01	123.13	0.00	0.00	0.00	122.31	-0.01	3.88
	313	10.05T	-0.01	112.11	0.00	122.33	-0.01	@ 1.040	@ 1.030	@ 1.698
133	195	2.61T	0.02	-9.86	0.00	361.94	0.00	361.94	0.00	33.54
	203	2.61T	-0.02	-92.24	0.00	262.56	0.00	@ 3.136	@ 5.123	@ 3.361
134	197	9.10T	0.01	6.00	0.00	280.00	0.00	289.49	0.01	25.08
	212	9.10T	-0.01	3.62	0.00	289.49	0.00	@ 4.146	@ 2.151	@ 3.238
135	199	0.00C	0.00	0.00	0.00	0.00	0.00			0.00
	202	0.00C	0.00	0.00	0.00	0.00	0.00			@ 0.825
136	200	4.62T	0.00	126.52	0.00	0.00	0.00	222.90	0.00	33.48
	224	4.62T	0.00	-127.31	0.00	0.00	0.00	@ 3.512	@ 7.025	@ 3.512
137	201	18.41T	0.13	-82.72	0.00	117.41	0.01	117.41	0.01	9.39
	215	18.41T	-0.13	-84.42	0.00	0.00	0.01	@ 2.745	@ 2.745	@ 2.216
	203	4.83C	0.02	-135.91	0.00	262.57	0.00	361.94	0.00	33.54

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Member Forces (Maximum Values)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	205	4.83C	-0.02	-190.54	0.00	0.00	0.00	@ 3.136	@ 5.123	@ 3.361
139	204	7.93T	0.01	124.62	0.00	0.00	0.00	219.99		34.33
	233	7.93T	-0.01	-121.03	0.00	0.00	0.00	@ 3.545		@ 3.545
140	206	5.27C	0.00	-13.76	0.00	40.71	0.00	40.71	0.00	8.15
	252	5.27C	0.00	-14.95	0.00	0.00	0.00	@ 1.040	@ 1.030	@ 1.720
141	207	16.26T	-0.01	170.70	0.00	0.00	-0.02	297.01	-0.02	15.46
	211	16.26T	0.01	73.80	0.00	281.79	-0.02	@ 3.149	@ 2.200	@ 3.623
142	209	8.70C	0.00	72.22	0.00	0.00	-0.01	91.73		18.46
	223	8.70C	0.00	-72.10	0.00	0.00	0.00	@ 2.516		@ 2.516
143	210	5.35C	-0.01	-63.27	0.00	170.53	-0.01	216.99		29.36
	213	5.35C	0.01	-133.34	0.00	0.00	-0.02	@ 3.603		@ 3.497
144	211	35.07T	-0.01	32.47	0.00	281.79	-0.02	297.01	-0.02	15.46
	241	35.07T	0.01	-141.62	0.00	0.00	-0.02	@ 3.149	@ 2.200	@ 3.623
145	212	12.21C	0.01	-121.72	0.00	289.49	0.00	289.49	0.01	25.08
	230	12.21C	-0.01	-124.55	0.00	0.00	0.00	@ 4.146	@ 2.151	@ 3.238
146	214	13.63T	0.00	41.94	0.00	0.00	0.00	53.42		9.51
	245	13.63T	0.00	-41.69	0.00	0.00	0.00	@ 2.529		@ 2.529
147	215	16.01T	0.01	171.98	0.00	0.00	0.01	263.25	0.01	20.58
	239	16.01T	-0.01	171.35	0.00	89.61	0.01	@ 2.173	@ 0.522	@ 3.047
148	216	7.12T	0.02	90.26	0.00	0.00	-0.01	114.94		34.17
	227	7.12T	-0.02	-90.14	0.00	0.00	0.00	@ 2.548		@ 2.548
149	217	18.79T	0.00	24.33	0.01	0.00	-0.02	31.08		16.10
	248	18.79T	0.00	-24.33	0.01	0.00	0.01	@ 2.555		@ 2.555
150	219	7.99C	0.00	65.64	0.00	0.00	-0.01	76.13		12.82
	226	7.99C	0.00	-65.53	0.00	0.00	0.01	@ 2.298		@ 2.298
151	220	7.14T	0.01	229.77	0.00	0.00	0.01	548.18	0.00	28.71
	250	7.14T	-0.01	226.98	0.00	425.92	0.01	@ 3.516	@ 3.499	@ 3.516
152	222	4.80C	0.00	81.93	0.00	0.00	-0.01	95.07		23.47
	229	4.80C	0.00	-81.83	0.00	0.00	0.00	@ 2.298		@ 2.298
153	223	60.62C	0.00	65.64	0.00	0.00	-0.02	76.13		12.82
	288	60.62C	0.00	-65.53	0.00	0.00	-0.01	@ 2.298		@ 2.298
154	224	8.36T	0.00	83.37	0.00	0.00	0.00	106.45		19.17
	236	8.36T	0.00	-83.37	0.00	0.00	0.00	@ 2.554		@ 2.554
155	225	1.72C	0.01	75.82	0.00	0.00	0.00	88.03		13.11
	232	1.72C	-0.01	-75.82	0.00	0.00	0.00	@ 2.322		@ 2.322
156	227	41.80C	0.00	81.93	0.00	0.00	-0.02	95.07		23.47
	289	41.80C	0.00	-81.83	0.00	0.00	-0.01	@ 2.298		@ 2.298
157	228	2.06T	-0.01	75.83	0.00	0.00	0.00	88.06		13.12
	235	2.06T	0.01	-75.83	0.00	0.00	0.00	@ 2.323		@ 2.323
158	231	3.90T	0.00	75.09	0.00	0.00	0.00	87.20		21.51

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Cardiff Bay, Cardiff CF24 5EA
Tel : 029 2045 1331 Fax : 029 2045 1344

Job ref : GOA/A/1511
Sheet : / 51 -
Made By :
Date : JULY 2007
Checked :
Approved :

Member Forces (Maximum Values)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	238	3.90T	0.00	-75.09	0.00	0.00	0.00	@ 2.323		@ 2.323
159	233	10.25T	0.00	83.55	0.00	0.00	0.00	106.90		19.33
	243	10.25T	0.00	-83.55	0.00	0.00	0.00	@ 2.559		@ 2.559
160	234	5.61T	0.00	74.38	0.00	0.00	0.00	86.39		12.87
	240	5.61T	0.00	-74.38	0.00	0.00	0.00	@ 2.323		@ 2.323
161	236	26.79C	0.01	75.82	0.00	0.00	-0.01	88.03		13.11
	292	26.79C	-0.01	-75.82	0.00	0.00	0.00	@ 2.322		@ 2.322
162	237	6.95T	0.00	58.80	0.00	0.00	0.00	68.29		12.55
	242	6.95T	0.00	-58.80	0.00	0.00	0.00	@ 2.323		@ 2.323
163	239	16.45T	0.01	106.17	0.00	89.61	0.01	263.25	0.01	20.58
	247	16.45T	-0.01	104.18	0.00	263.25	0.01	@ 2.173	@ 0.522	@ 3.047
164	241	13.15T	0.00	82.94	0.00	0.00	0.00	106.34		31.98
	246	13.15T	0.00	-82.94	0.00	0.00	0.00	@ 2.564		@ 2.564
165	243	13.95C	-0.01	75.83	0.00	0.00	-0.01	88.06		13.12
	294	13.95C	0.01	-75.83	0.00	0.00	0.00	@ 2.323		@ 2.323
166	244	5.20C	0.01	192.98	0.00	0.00	0.00	398.96		16.46
	256	5.20C	-0.01	190.63	0.00	300.75	0.00	@ 3.135		@ 3.119
167	245	16.38T	0.00	82.27	0.00	0.00	0.00	105.69		19.26
	249	16.38T	0.00	-82.27	0.00	0.00	0.00	@ 2.569		@ 2.569
168	246	3.55C	0.00	75.09	0.00	0.00	-0.01	87.20		21.51
	295	3.55C	0.00	-75.09	0.00	0.00	0.00	@ 2.323		@ 2.323
169	247	7.29T	0.01	-6.97	0.00	263.25	0.00	263.25	0.01	20.58
	254	7.29T	-0.01	-9.36	0.00	247.03	0.00	@ 2.173	@ 0.522	@ 3.047
170	248	19.54T	0.00	65.19	0.00	0.00	-0.01	83.93		18.96
	251	19.54T	0.00	-65.19	0.00	0.00	0.00	@ 2.575		@ 2.575
171	249	4.78T	0.00	74.38	0.00	0.00	0.00	86.39		12.87
	298	4.78T	0.00	-74.38	0.00	0.00	0.00	@ 2.323		@ 2.323
172	250	6.69T	0.01	75.29	0.00	425.92	0.00	548.18	0.00	28.71
	255	6.69T	-0.01	72.81	0.00	548.18	0.00	@ 3.516	@ 3.499	@ 3.516
173	251	11.51T	0.00	58.80	0.00	0.00	-0.01	68.29		12.55
	300	11.51T	0.00	-58.80	0.00	0.00	0.00	@ 2.323		@ 2.323
174	252	1.72C	0.01	166.74	0.00	0.00	0.00	358.87	-0.01	19.30
	257	1.72C	-0.01	165.57	0.00	130.26	0.00	@ 3.136	@ 5.123	@ 3.361
175	252	5.84C	0.00	6.58	0.00	0.00	-0.01	1.24		0.02
	264	5.84C	0.00	-6.72	0.00	0.00	-0.01	@ 0.378		@ 0.378
176	253	10.30C	0.01	12.02	0.00	229.65	0.00	236.32	0.01	23.53
	259	10.30C	-0.01	-12.66	0.00	228.54	0.01	@ 3.503	@ 4.733	@ 3.550
177	254	5.34C	0.01	-123.12	0.00	247.03	0.00	263.25	0.01	20.58
	260	5.34C	-0.01	-125.52	0.00	0.00	0.00	@ 2.173	@ 0.522	@ 3.047
178	255	4.79T	0.01	-86.28	0.00	548.18	0.00	548.18	0.00	28.71

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Cardiff Bay, Cardiff CF24 5EA
Tel : 029 2045 1331 Fax : 029 2045 1344

Job ref : GOA/A/1511
Sheet : / 52 -
Made By :
Date : JULY 2007
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Approved :

Member Forces (Maximum Values)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	261	4.79T	-0.01	-89.26	0.00	373.79	0.00	@ 3.516	@ 3.499	@ 3.516
179	256	2.95C	0.01	63.84	0.00	300.76	0.00	398.96		16.46
	262	2.95C	-0.01	61.50	0.00	398.96	0.00	@ 3.135		@ 3.119
180	257	1.72C	0.01	165.57	0.00	130.26	0.00	358.87	-0.01	19.30
	263	1.72C	-0.01	140.12	0.00	250.22	0.00	@ 3.136	@ 5.123	@ 3.361
181	259	15.03C	0.01	-84.36	0.00	228.55	0.01	236.32	0.01	23.53
	265	15.03C	-0.01	-108.75	0.00	0.00	0.00	@ 3.503	@ 4.733	@ 3.550
182	261	4.58T	0.01	-243.33	0.00	373.80	0.00	548.18	0.00	28.71
	266	4.58T	-0.01	-245.62	0.00	0.00	0.00	@ 3.516	@ 3.499	@ 3.516
183	262	2.23T	0.01	-79.04	0.00	398.96	0.00	398.96		16.46
	267	2.23T	-0.01	-82.02	0.00	238.95	0.00	@ 3.135		@ 3.119
184	263	3.32C	0.01	97.00	0.00	250.21	0.00	358.87	-0.01	19.30
	268	3.32C	-0.01	40.30	0.00	358.87	0.00	@ 3.136	@ 5.123	@ 3.361
185	264	6.02C	0.01	109.57	0.00	0.00	0.00	216.99		29.36
	283	6.02C	-0.01	-63.27	0.00	170.53	0.00	@ 3.603		@ 3.497
186	265	25.94C	0.01	-155.21	-90.35	0.01	24.77			0.05
	270	25.94C	-0.01	-159.74	-90.35	-69.28	-14.98			@ 0.229
187	267	3.96T	0.01	-207.28	0.00	238.95	0.00	398.96		16.46
	271	3.96T	-0.01	-209.00	0.00	0.00	0.00	@ 3.135		@ 3.119
188	268	4.15C	0.01	-8.47	0.00	358.87	0.00	358.87	-0.01	19.30
	276	4.15C	-0.01	-91.44	0.00	261.66	0.00	@ 3.136	@ 5.123	@ 3.361
189	272	0.00C	0.00	0.00	0.00	0.00	0.00			0.00
	275	0.00C	0.00	0.00	0.00	0.00	0.00			@ 0.775
190	273	2.40C	0.00	126.52	0.00	0.00	0.00	222.90		33.48
	297	2.40C	0.00	-127.31	0.00	0.00	0.00	@ 3.512		@ 3.512
191	274	45.62C	0.01	-7.39	-0.01	347.94	0.00	347.94	0.01	30.05
	278	45.62C	-0.01	-9.68	-0.01	331.69	-0.01	@ 2.443	@ 2.419	@ 3.262
192	276	5.85C	0.01	-135.11	0.00	261.66	-0.01	358.87	-0.01	19.30
	279	5.85C	-0.01	-190.22	0.00	0.00	0.00	@ 3.136	@ 5.123	@ 3.361
193	277	2.28C	0.01	124.62	0.00	0.00	0.00	219.99		34.33
	302	2.28C	-0.01	-121.03	0.00	0.00	0.00	@ 3.545		@ 3.545
194	278	50.81C	0.00	-151.33	0.00	331.69	-0.01	347.94	0.01	30.05
	281	50.81C	0.00	-153.95	0.00	0.00	-0.01	@ 2.443	@ 2.419	@ 3.262
195	280	5.33C	0.00	216.87	0.00	0.00	0.00	420.15	0.00	21.07
	284	5.33C	0.00	155.36	0.00	409.34	0.00	@ 2.885	@ 2.200	@ 3.517
196	281	65.89C	0.00	-281.27	0.01	0.00	-0.01	-258.59	0.00	7.68
	287	65.89C	0.00	-281.66	0.01	-261.20	0.00	@ 0.919	@ 0.928	@ 0.909
197	282	10.15C	0.00	72.22	0.00	0.00	0.00	91.73		18.46
	286	10.15C	0.00	-72.10	0.00	0.00	0.00	@ 2.516		@ 2.516
198	283	6.03C	0.00	-63.27	0.00	170.53	0.00	216.99		29.36

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Job ref : GOA/A/1511
Sheet · / 53 -
Made By .
Date : JULY 2007
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Approved :

Member Forces (Maximum Values)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	285	6.03C	0.00	-133.34	0.00	0.00	0.00	@ 3.603		@ 3.497
199	284	5.19C	0.01	30.76	0.00	409.35	0.00	420.15	0.00	21.07
	304	5.19C	-0.01	-189.84	0.00	0.00	0.00	@ 2.885	@ 2.200	@ 3.517
200	286	78.24C	0.00	65.64	0.00	0.00	-0.01	76.13		12.82
	365	78.24C	0.00	-65.53	0.00	0.00	-0.01	@ 2.298		@ 2.298
201	287	37.66T	0.00	99.39	0.00	-113.30	0.00	-258.59	0.00	7.68
	293	37.66T	0.00	85.84	0.00	30.26	0.00	@ 0.919	@ 0.928	@ 0.909
202	290	1.11C	-0.01	82.80	-0.03	0.00	0.11	105.45		19.01
	307	1.11C	0.01	-82.30	-0.03	0.00	-0.03	@ 2.529		@ 2.529
203	291	8.47C	0.02	90.26	0.00	0.00	0.00	114.94		34.17
	299	8.47C	-0.02	-90.14	0.00	0.00	0.00	@ 2.548		@ 2.548
204	293	13.23T	0.00	5.14	0.00	30.25	0.00	-258.59	0.00	7.68
	301	13.23T	0.00	-23.09	0.00	0.00	0.00	@ 0.919	@ 0.928	@ 0.909
205	296	2.48C	0.00	41.93	-0.71	0.00	-0.18	53.41	-0.81	15.74
	310	2.48C	0.00	-41.68	1.32	0.00	1.38	@ 2.529	@ 1.791	@ 2.529
206	297	6.54C	0.00	83.37	0.00	0.00	0.00	106.45		19.17
	303	6.54C	0.00	-83.37	0.00	0.00	0.00	@ 2.554		@ 2.554
207	299	55.39C	0.00	81.93	0.00	0.00	-0.01	95.07		23.47
	367	55.39C	0.00	-81.83	0.00	0.00	-0.01	@ 2.298		@ 2.298
208	302	3.83C	0.00	83.55	0.00	0.00	0.00	106.90		19.33
	305	3.83C	0.00	-83.55	0.00	0.00	0.00	@ 2.559		@ 2.559
209	303	36.84C	0.01	75.82	0.00	0.00	-0.01	88.03		13.11
	369	36.84C	-0.01	-75.82	0.00	0.00	-0.01	@ 2.322		@ 2.322
210	304	2.47T	0.00	106.27	0.00	0.00	0.00	136.26		31.98
	306	2.47T	0.00	-106.27	0.00	0.00	0.00	@ 2.564		@ 2.564
211	305	20.00C	-0.01	75.83	0.00	0.00	-0.01	88.06		13.12
	371	20.00C	0.01	-75.83	0.00	0.00	-0.01	@ 2.323		@ 2.323
212	306	4.65C	0.00	96.23	0.00	0.00	-0.01	111.75		21.51
	373	4.65C	0.00	-96.23	0.00	0.00	-0.01	@ 2.323		@ 2.323
213	307	0.89T	0.00	82.27	0.02	0.00	-0.05	105.69		19.26
	309	0.89T	0.00	-82.27	0.02	0.00	0.05	@ 2.569		@ 2.569
214	308	34.37C	0.14	51.81	0.00	0.00	-0.01	117.41	-0.01	9.39
	321	34.37C	-0.14	49.05	0.00	115.23	-0.01	@ 2.745	@ 2.745	@ 2.216
215	309	1.81T	0.00	74.38	0.03	0.00	-0.07	86.39		12.87
	375	1.81T	0.00	-74.38	0.03	0.00	0.06	@ 2.323		@ 2.323
216	310	2.14C	0.00	41.76	0.49	0.00	-0.42	53.76	0.21	16.09
	312	2.14C	0.00	-41.76	-0.47	0.00	-0.39	@ 2.575	@ 2.626	@ 2.575
217	311	8.20C	0.00	0.58	0.00	0.00	0.00	0.39		0.09
	327	8.20C	0.00	-0.58	0.00	0.00	0.00	@ 1.370		@ 1.370
218	312	1.20C	0.00	37.66	1.40	0.00	-1.17	43.74	0.55	10.65

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Job ref : GOA/A/1511
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Date . JULY 2007
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Approved :

Member Forces (Maximum Values)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	377	1.20C	0.00	-37.66	-1.26	0.00	-0.83	@ 2.323	@ 2.462	@ 2.323
219	313	16.70C	0.01	-42.59	0.00	122.31	0.00	122.31	-0.01	3.88
	331	16.70C	-0.01	-46.69	0.00	0.00	0.00	@ 1.040	@ 1.030	@ 1.698
220	314	0.87C	0.00	39.36	0.00	0.00	0.00	40.70	0.00	13.50
	315	0.87C	0.00	38.93	0.00	40.71	0.00	@ 1.040	@ 1.030	@ 1.720
221	314	0.00C	0.00	60.19	0.00	-42.05	0.00	21.60		3.78
	348	0.00C	0.00	-66.82	0.00	-44.31	0.00	@ 2.061		@ 2.061
222	315	5.21C	0.00	-13.76	0.00	40.70	0.00	40.70	0.00	13.50
	334	5.21C	0.00	-14.95	0.00	0.00	0.00	@ 1.040	@ 1.030	@ 1.720
223	317	9.73C	0.00	17.68	0.00	0.00	0.00	4.29		0.13
	357	9.73C	0.00	-15.74	0.00	0.00	0.00	@ 0.497		@ 0.507
224	318	25.66C	0.00	12.66	0.00	0.00	0.00	-68.16	0.00	3.02
	385	25.66C	0.00	-24.40	0.00	-28.86	0.00	@ 2.285	@ 2.285	@ 2.416
225	319	10.19C	0.00	0.39	0.00	0.00	0.00	0.27	-0.01	2.96
	320	10.19C	0.00	-0.39	0.00	0.00	-0.01	@ 1.143	@ 2.262	@ 2.285
226	320	19.88C	0.01	130.17	0.00	0.00	0.00	289.49	-0.01	25.08
	322	19.88C	-0.01	127.55	0.00	280.02	-0.01	@ 4.146	@ 2.151	@ 3.238
227	321	16.84C	0.14	4.60	0.00	115.25	0.00	117.41	-0.01	9.39
	323	16.84C	-0.14	4.04	0.00	117.23	0.01	@ 2.745	@ 2.745	@ 2.216
228	322	7.76C	0.01	6.00	0.00	280.00	0.00	289.49	-0.01	25.08
	325	7.76C	-0.01	3.62	0.00	289.49	-0.01	@ 4.146	@ 2.151	@ 3.238
229	323	15.07C	0.14	-82.72	0.00	117.41	-0.01	117.41	-0.01	9.39
	326	15.07C	-0.14	-84.41	0.00	0.00	-0.01	@ 2.745	@ 2.745	@ 2.216
230	324	1.94C	0.00	122.01	0.00	0.00	0.00	121.64	0.00	11.34
	379	1.94C	0.00	112.11	0.00	121.74	0.00	@ 1.040	@ 1.030	@ 1.670
231	325	10.05T	0.01	-121.72	0.00	289.49	0.00	289.49	-0.01	25.08
	329	10.05T	-0.01	-124.55	0.00	0.00	0.00	@ 4.146	@ 2.151	@ 3.238
232	326	11.76C	0.01	171.98	0.00	0.00	-0.01	263.25	-0.01	20.58
	330	11.76C	-0.01	171.35	0.00	89.61	-0.01	@ 2.173	@ 0.522	@ 3.047
233	327	5.60C	0.01	230.22	0.00	0.00	0.00	548.75	0.00	28.71
	333	5.60C	-0.01	227.43	0.00	426.76	0.00	@ 3.516	@ 3.499	@ 3.516
234	330	12.12C	0.01	106.17	0.00	89.61	-0.01	263.25	-0.01	20.58
	332	12.12C	-0.01	104.18	0.00	263.25	-0.01	@ 2.173	@ 0.522	@ 3.047
235	331	10.21C	0.01	193.44	0.00	0.00	0.00	399.45	0.00	16.46
	337	10.21C	-0.01	191.09	0.00	301.47	0.00	@ 3.135	@ 3.119	@ 3.119
236	332	3.78C	0.01	-6.97	0.00	263.25	-0.01	263.25	-0.01	20.58
	335	3.78C	-0.01	-9.36	0.00	247.03	0.00	@ 2.173	@ 0.522	@ 3.047
237	333	3.10C	0.01	75.13	0.00	426.75	0.00	548.75	0.00	28.71
	336	3.10C	-0.01	72.65	0.00	548.75	0.00	@ 3.516	@ 3.499	@ 3.516
238	334	5.75C	0.01	165.75	0.00	0.00	-0.01	357.20	0.01	33.02

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Member Forces (Maximum Values)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	338	5.75C	-0.01	164.80	0.00	129.58	-0.01	@ 3.136	@ 5.123	@ 3.361
239	334	26.13C	0.00	6.58	0.00	0.00	0.01	1.24		0.02
	344	26.13C	0.00	-6.72	0.00	0.00	0.01	@ 0.378		@ 0.378
240	335	4.02T	0.01	-123.12	0.00	247.03	0.00	263.25	-0.01	20.58
	340	4.02T	-0.01	-125.52	0.00	0.00	0.00	@ 2.173	@ 0.522	@ 3.047
241	336	0.77T	0.01	-86.44	0.00	548.75	0.00	548.75	0.00	28.71
	341	0.77T	-0.01	-89.42	0.00	374.04	0.00	@ 3.516	@ 3.499	@ 3.516
242	337	10.06C	0.01	63.69	0.00	301.48	0.00	399.45	0.00	16.46
	342	10.06C	-0.01	61.34	0.00	399.45	0.00	@ 3.135	@ 3.119	@ 3.119
243	338	5.76C	0.01	164.81	0.00	129.58	-0.01	357.20	0.01	33.02
	343	5.76C	-0.01	139.59	0.00	249.03	0.00	@ 3.136	@ 5.123	@ 3.361
244	341	1.93T	0.01	-243.49	0.00	374.05	0.00	548.75	0.00	28.71
	345	1.93T	-0.01	-245.78	0.00	0.00	0.00	@ 3.516	@ 3.499	@ 3.516
245	342	9.72C	0.01	-79.19	0.00	399.45	0.00	399.45	0.00	16.46
	346	9.72C	-0.01	-82.17	0.00	239.14	0.00	@ 3.135	@ 3.119	@ 3.119
246	343	9.13C	0.01	96.47	0.00	249.01	0.00	357.20	0.01	33.02
	347	9.13C	-0.01	40.24	0.00	357.21	0.00	@ 3.136	@ 5.123	@ 3.361
247	344	17.86C	0.01	109.57	0.00	0.00	0.01	216.99		29.36
	361	17.86C	-0.01	-63.27	0.00	170.53	0.01	@ 3.603		@ 3.497
248	346	8.32C	0.01	-207.43	0.00	239.12	0.00	399.45	0.00	16.46
	349	8.32C	-0.01	-209.15	0.00	0.00	0.00	@ 3.135	@ 3.119	@ 3.119
249	347	12.04C	0.01	-8.54	0.00	357.20	0.00	357.20	0.01	33.02
	353	12.04C	-0.01	-90.92	0.00	260.44	0.00	@ 3.136	@ 5.123	@ 3.361
250	350	0.00C	0.00	0.00	0.00	0.00	0.00			0.00
	352	0.00C	0.00	0.00	0.00	0.00	0.00			@ 0.615
251	351	6.64C	0.00	126.52	0.00	0.00	0.00	222.90		33.48
	366	6.64C	0.00	-127.31	0.00	0.00	0.00	@ 3.512		@ 3.512
252	353	18.34C	0.01	-134.60	0.00	260.44	0.01	357.20	0.01	33.02
	356	18.34C	-0.01	-189.23	0.00	0.00	0.01	@ 3.136	@ 5.123	@ 3.361
253	354	6.06C	0.01	124.62	0.00	0.00	0.00	219.99		34.33
	370	6.06C	-0.01	-121.03	0.00	0.00	0.00	@ 3.545		@ 3.545
254	355	19.26C	0.14	51.82	0.00	0.00	0.00	117.40	0.01	3.55
	388	19.26C	-0.14	49.07	0.00	115.26	0.00	@ 2.745	@ 2.285	@ 2.216
255	357	13.68C	0.01	101.22	0.00	0.00	0.00	183.35		28.42
	374	13.68C	-0.01	-99.43	0.00	0.00	0.00	@ 3.618		@ 3.618
256	358	6.96C	0.00	0.58	0.00	0.00	0.00	0.39		0.09
	394	6.96C	0.00	-0.58	0.00	0.00	0.00	@ 1.370		@ 1.370
257	360	23.04C	0.00	72.22	0.00	0.00	0.01	91.73		18.46
	363	23.04C	0.00	-72.10	0.00	0.00	0.00	@ 2.516		@ 2.516
258	361	17.86C	0.00	-63.27	0.00	170.53	0.01	216.99		29.36

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Made By :
Date . JULY 2007
Checked :
Approved :

Member Forces (Maximum Values)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	362	17.86C	0.00	-133.34	0.00	0.00	0.00	@ 3.603		@ 3.497
259	363	61.92C	0.00	65.64	0.00	0.00	-0.01	76.13		12.82
	440	61.92C	0.00	-65.53	0.00	0.00	-0.01	@ 2.298		@ 2.298
260	364	18.50C	0.02	90.26	0.00	0.00	0.00	114.94		34.17
	368	18.50C	-0.02	-90.14	0.00	0.00	0.00	@ 2.548		@ 2.548
261	366	14.32C	0.00	83.37	0.00	0.00	0.00	106.45		19.17
	372	14.32C	0.00	-83.37	0.00	0.00	0.00	@ 2.554		@ 2.554
262	368	44.43C	0.00	81.93	0.00	0.00	-0.01	95.07		23.47
	442	44.43C	0.00	-81.83	0.00	0.00	-0.01	@ 2.298		@ 2.298
263	370	9.80C	0.00	83.55	0.00	0.00	0.00	106.90		19.33
	376	9.80C	0.00	-83.55	0.00	0.00	0.00	@ 2.559		@ 2.559
264	372	30.16C	0.01	75.82	0.00	0.00	-0.01	88.03		13.11
	444	30.16C	-0.01	-75.82	0.00	0.00	-0.01	@ 2.322		@ 2.322
265	374	6.20C	0.00	65.74	0.00	0.00	0.00	84.30		18.70
	378	6.20C	0.00	-65.74	0.00	0.00	0.00	@ 2.564		@ 2.564
266	376	17.08C	-0.01	75.83	0.00	0.00	-0.01	88.06		13.12
	446	17.08C	0.01	-75.83	0.00	0.00	-0.01	@ 2.323		@ 2.323
267	378	5.03C	0.00	59.53	0.00	0.00	-0.01	69.13		12.58
	448	5.03C	0.00	-59.53	0.00	0.00	-0.01	@ 2.323		@ 2.323
268	379	8.80C	0.00	-43.82	0.00	121.64	0.00	121.64	0.00	11.34
	398	8.80C	0.00	-44.97	0.00	0.00	0.00	@ 1.040	@ 1.030	@ 1.670
269	380	7.22C	0.00	39.36	0.00	0.00	-0.01	40.71		8.15
	381	7.22C	0.00	38.92	0.00	40.71	0.00	@ 1.040		@ 1.720
270	380	0.00C	0.00	60.19	0.00	-42.05	0.00	21.60		223031.20
	416	0.00C	0.00	-66.82	0.00	-44.31	0.00	@ 2.061		@ 2.061
271	381	8.43C	0.00	-13.76	0.00	40.71	0.00	40.71		8.15
	402	8.43C	0.00	-14.96	0.00	0.00	0.00	@ 1.040		@ 1.720
272	383	15.69C	0.00	17.68	0.00	0.00	0.00	4.29		0.13
	427	15.69C	0.00	-15.74	0.00	0.00	0.00	@ 0.497		@ 0.507
273	384	5.40C	0.00	1.38	0.00	0.00	0.00	-13.48	0.00	2.92
	387	5.40C	0.00	-1.38	0.00	0.00	0.00	@ 2.285	@ 2.285	@ 2.285
274	385	16.36T	0.00	46.15	0.00	-68.16	0.00	-68.16	0.00	3.02
	386	16.36T	0.00	-34.48	0.00	0.00	0.00	@ 2.285	@ 2.285	@ 2.416
275	386	10.39T	0.00	79.38	0.00	0.00	0.00	155.76		11.73
	389	10.39T	0.00	56.99	0.00	148.16	0.00	@ 3.396		@ 3.238
276	387	4.30T	0.01	8.35	0.00	-13.48	0.00	-13.48	0.00	2.92
	390	4.30T	-0.01	-6.68	0.00	0.00	0.00	@ 2.285	@ 2.285	@ 2.285
277	388	14.20T	0.14	4.61	0.00	115.28	0.01	117.40	0.01	3.55
	391	14.20T	-0.14	4.06	0.00	117.27	0.01	@ 2.745	@ 2.285	@ 2.216
278	389	8.30T	0.00	12.52	0.00	148.16	0.00	155.76		11.73

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Made By .
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Approved :

Member Forces (Maximum Values)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
	392	8.30T	0.00	-8.72	0.00	152.80	0.00	@ 3.396		@ 3.238
279	390	2.89T	0.01	11.62	0.00	0.00	0.00	23.39	0.00	5.32
	417	2.89T	-0.01	9.01	0.00	22.41	0.00	@ 3.436	@ 4.126	@ 3.238
280	391	3.04T	0.14	-82.71	0.00	117.40	0.00	117.40	0.01	3.55
	393	3.04T	-0.14	-84.40	0.00	0.00	0.00	@ 2.745	@ 2.285	@ 2.216
281	392	6.85T	0.00	-52.88	0.00	152.80	0.00	155.76		11.73
	396	6.85T	0.00	-77.11	0.00	0.00	0.00	@ 3.396		@ 3.238
282	393	7.96T	0.00	171.98	0.00	0.00	0.00	263.25	0.00	20.58
	397	7.96T	0.00	171.35	0.00	89.61	0.00	@ 2.173	@ 0.517	@ 3.047
283	394	4.83T	0.00	229.77	0.00	0.00	0.00	548.18	0.00	28.71
	401	4.83T	0.00	226.98	0.00	425.92	0.00	@ 3.516	@ 5.483	@ 3.516
284	395	3.25C	0.00	17.56	0.00	0.00	0.00	17.60	0.00	1.08
	466	3.25C	0.00	16.31	0.00	17.61	0.00	@ 1.040	@ 1.040	@ 1.725
285	397	5.97T	0.00	106.17	0.00	89.61	0.00	263.25	0.00	20.58
	400	5.97T	0.00	104.18	0.00	263.25	0.00	@ 2.173	@ 0.517	@ 3.047
286	398	5.88C	0.01	190.90	0.00	0.00	0.01	392.45		15.43
	405	5.88C	-0.01	188.55	0.00	297.49	0.00	@ 3.135		@ 3.088
287	400	6.33T	0.00	-6.97	0.00	263.25	0.00	263.25	0.00	20.58
	403	6.33T	0.00	-9.36	0.00	247.03	0.00	@ 2.173	@ 0.517	@ 3.047
288	401	4.62T	0.00	75.29	0.00	425.92	0.00	548.18	0.00	28.71
	404	4.62T	0.00	72.81	0.00	548.18	0.00	@ 3.516	@ 5.483	@ 3.516
289	402	6.40C	0.03	164.03	0.00	0.00	0.00	350.39	0.00	18.74
	406	6.40C	-0.03	162.86	0.00	128.14	0.00	@ 3.136	@ 5.123	@ 3.361
290	402	5.96C	0.02	6.58	0.00	0.00	0.01	1.24		0.02
	412	5.96C	-0.02	-6.72	0.00	0.00	0.01	@ 0.378		@ 0.378
291	403	6.58T	0.00	-123.12	0.00	247.03	0.00	263.25	0.00	20.58
	408	6.58T	0.00	-125.52	0.00	0.00	0.00	@ 2.173	@ 0.517	@ 3.047
292	404	4.73T	0.00	-86.28	0.00	548.18	0.00	548.18	0.00	28.71
	409	4.73T	0.00	-89.26	0.00	373.79	0.00	@ 3.516	@ 5.483	@ 3.516
293	405	5.15C	0.01	61.77	0.00	297.50	0.00	392.45		15.43
	410	5.15C	-0.01	59.42	0.00	392.45	0.00	@ 3.135		@ 3.088
294	406	6.39C	0.03	162.86	0.00	128.14	0.00	350.39	0.00	18.74
	411	6.39C	-0.03	137.41	0.00	245.98	0.00	@ 3.136	@ 5.123	@ 3.361
295	409	5.75T	0.00	-243.33	0.00	373.80	0.00	548.18	0.00	28.71
	418	5.75T	0.00	-245.62	0.00	0.00	0.00	@ 3.516	@ 5.483	@ 3.516
296	410	4.71C	0.01	-81.12	0.00	392.45	0.00	392.45		15.43
	414	4.71C	-0.01	-84.09	0.00	228.31	0.00	@ 3.135		@ 3.088
297	411	6.55C	0.03	94.30	0.00	245.97	0.00	350.39	0.00	18.74
	415	6.55C	-0.03	37.60	0.00	350.39	0.00	@ 3.136	@ 5.123	@ 3.361
298	412	13.34T	0.01	109.57	0.00	0.00	0.00	216.99		29.36

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Member Forces (Maximum Values)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	435	13.34T	-0.01	-63.27	0.00	170.53	0.01	@ 3.603		@ 3.497
299	414	4.81C	0.00	-198.04	0.00	228.33	0.00	392.45		15.43
	426	4.81C	0.00	-199.76	0.00	0.00	0.00	@ 3.135		@ 3.088
300	415	6.60C	0.03	-11.18	0.00	350.39	0.00	350.39	0.00	18.74
	423	6.60C	-0.03	-94.15	0.00	247.80	0.00	@ 3.136	@ 5.123	@ 3.361
301	417	1.79T	0.01	1.53	0.00	22.42	0.00	23.39	0.00	5.32
	421	1.79T	-0.01	-1.07	0.00	23.10	0.00	@ 3.436	@ 4.126	@ 3.238
302	419	0.00C	0.00	0.00	0.00	0.00	0.00			0.00
	429	0.00C	0.00	0.00	0.00	0.00	0.00			@ 0.396
303	420	4.03C	0.00	126.52	0.00	0.00	0.00	222.90		33.48
	445	4.03C	0.00	-127.31	0.00	0.00	0.00	@ 3.512		@ 3.512
304	421	1.25T	0.01	-8.41	0.00	23.11	0.00	23.39	0.00	5.32
	425	1.25T	-0.01	-11.25	0.00	0.00	0.00	@ 3.436	@ 4.126	@ 3.238
305	423	7.39T	0.03	-126.55	0.00	247.83	0.00	350.39	0.00	18.74
	431	7.39T	-0.03	-181.66	0.00	0.00	0.00	@ 3.136	@ 5.123	@ 3.361
306	424	4.80C	0.01	124.62	0.00	0.00	0.00	219.99		34.33
	450	4.80C	-0.01	-121.03	0.00	0.00	0.00	@ 3.545		@ 3.545
307	427	10.80C	0.00	100.14	0.00	0.00	0.00	181.39		17.14
	453	10.80C	0.00	-98.35	0.00	0.00	0.00	@ 3.618		@ 3.618
308	428	4.65C	0.10	-5.25	0.00	0.02	0.00	0.04	0.00	2.06
	430	4.65C	-0.10	-8.01	0.00	-15.14	0.00	@ 0.229	@ 2.745	@ 2.625
309	430	3.98T	0.10	-15.48	0.00	-15.12	0.00	0.04	0.00	2.06
	436	3.98T	-0.10	-16.04	0.00	-22.37	0.00	@ 0.229	@ 2.745	@ 2.625
310	432	3.78C	0.00	-23.63	0.00	10.66	0.00			1.66
	443	3.78C	0.00	-26.46	0.00	-67.71	0.00			@ 1.589
311	434	29.70T	0.01	74.21	0.00	0.00	0.01	94.27		4.90
	438	29.70T	-0.01	-74.10	0.00	0.00	0.01	@ 2.516		@ 2.516
312	435	13.34T	0.01	-63.27	0.00	170.53	0.01	216.99		29.36
	437	13.34T	-0.01	-133.34	0.00	0.00	0.01	@ 3.603		@ 3.497
313	436	1.10C	0.10	-30.20	0.00	-22.36	0.00	0.04	0.00	2.06
	439	1.10C	-0.10	-31.89	0.00	-65.98	0.00	@ 0.229	@ 2.745	@ 2.625
314	438	41.19C	-0.01	67.46	0.00	0.00	0.00	78.24		3.50
	486	41.19C	0.01	-67.35	0.00	0.00	-0.01	@ 2.298		@ 2.298
315	439	3.46T	-0.07	42.40	0.00	-71.57	0.00	16.80	0.00	1.24
	449	3.46T	0.07	41.77	0.00	-49.60	0.00	@ 4.160	@ 0.522	@ 1.034
316	441	7.14T	0.02	90.26	0.00	0.00	0.00	114.94		34.17
	447	7.14T	-0.02	-90.14	0.00	0.00	0.00	@ 2.548		@ 2.548
317	443	6.00C	-0.06	53.58	0.00	-91.72	0.00	46.57	0.00	8.72
	460	6.00C	0.06	51.34	0.00	6.12	0.00	@ 3.516	@ 1.846	@ 4.013
318	445	7.45C	0.00	83.37	0.00	0.00	0.00	106.45		19.17

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Member Forces (Maximum Values)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	451	7.45C	0.00	-83.37	0.00	0.00	0.00	@ 2.554		@ 2.554
319	447	11.32C	0.00	81.93	0.00	0.00	0.00	95.07		23.47
	488	11.32C	0.00	-81.83	0.00	0.00	0.00	@ 2.298		@ 2.298
320	449	2.69C	-0.07	30.71	0.00	-49.58	0.00	16.80	0.00	1.24
	452	2.69C	0.07	28.72	0.00	2.26	0.00	@ 4.160	@ 0.522	@ 1.034
321	450	7.62C	0.00	83.55	0.00	0.00	0.00	106.90		19.33
	454	7.62C	0.00	-83.55	0.00	0.00	0.00	@ 2.559		@ 2.559
322	451	8.37C	0.00	75.82	0.00	0.00	0.00	88.03		13.11
	490	8.37C	0.00	-75.82	0.00	0.00	0.00	@ 2.322		@ 2.322
323	452	2.47C	-0.07	9.94	0.00	2.26	0.00	16.80	0.00	1.24
	455	2.47C	0.07	7.55	0.00	16.84	0.00	@ 4.160	@ 0.522	@ 1.034
324	453	7.65C	0.00	65.74	0.00	0.00	0.00	84.30		18.70
	456	7.65C	0.00	-65.74	0.00	0.00	0.00	@ 2.564		@ 2.564
325	454	5.78C	0.00	75.83	0.00	0.00	0.00	88.06		13.12
	492	5.78C	0.00	-75.83	0.00	0.00	0.00	@ 2.323		@ 2.323
326	455	1.93C	-0.07	-7.07	0.00	16.80	0.00	16.80	0.00	1.24
	457	1.93C	0.07	-9.46	0.00	0.37	0.00	@ 4.160	@ 0.522	@ 1.034
327	456	11.26C	0.01	61.35	0.00	0.00	-0.01	71.25		3.19
	494	11.26C	-0.01	-61.35	0.00	0.00	-0.01	@ 2.323		@ 2.323
328	458	1.01C	0.02	-9.77	-0.01	0.07	0.00			0.58
	459	1.01C	-0.02	-10.40	-0.01	-17.68	0.00			@ 1.020
329	460	4.73C	-0.07	25.51	0.00	6.11	0.00	46.57	0.00	8.72
	461	4.73C	0.07	23.52	0.00	46.58	0.00	@ 3.516	@ 1.846	@ 4.013
330	461	4.32C	-0.07	-3.61	0.00	46.57	0.00	46.57	0.00	8.72
	462	4.32C	0.07	-5.86	0.00	37.31	0.00	@ 3.516	@ 1.846	@ 4.013
331	462	3.13C	-0.07	-23.51	0.00	37.26	0.00	46.57	0.00	8.72
	463	3.13C	0.07	-25.35	0.00	-0.10	0.00	@ 3.516	@ 1.846	@ 4.013
332	464	1.48C	0.03	-6.35	-0.02	0.02	0.02	0.03		0.19
	465	1.48C	-0.03	-6.86	-0.02	-9.26	-0.02	@ 0.351		@ 0.814
333	466	5.78C	0.00	-4.77	0.00	17.60	0.00	17.60	0.00	1.08
	467	5.78C	0.00	-8.08	0.00	0.00	0.00	@ 1.040	@ 1.040	@ 1.725
334	467	5.71C	0.00	37.68	0.00	0.00	0.00	78.21	0.00	15.86
	468	5.71C	0.00	35.80	0.00	57.61	0.00	@ 3.135	@ 1.552	@ 3.155
335	468	5.08C	0.00	14.08	0.00	57.61	0.00	78.21	0.00	15.86
	469	5.08C	0.00	12.19	0.00	78.20	0.00	@ 3.135	@ 1.552	@ 3.155
336	469	4.25C	0.00	-11.67	0.00	78.21	0.00	78.21	0.00	15.86
	470	4.25C	0.00	-14.06	0.00	52.64	0.00	@ 3.135	@ 1.552	@ 3.155
337	470	3.06C	0.00	-45.20	0.00	52.69	0.00	78.21	0.00	15.86
	471	3.06C	0.00	-46.58	0.00	0.00	0.00	@ 3.135	@ 1.552	@ 3.155
338	472	0.00C	0.00	0.00	0.00	0.00	0.00			0.00

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Member Forces (Maximum Values)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	473	0.00C	0.00	0.00	0.00	0.00	0.00			@ 0.825
339	474	3.95C	0.10	8.85	0.00	0.00	0.00	8.55	0.00	0.59
	475	3.95C	-0.10	7.59	0.00	8.55	0.00	@ 1.040	@ 1.040	@ 1.777
340	474	0.00C	0.00	9.44	0.00	-6.60	0.00	3.39		0.59
	489	0.00C	0.00	-10.48	0.00	-6.95	0.00	@ 2.061		@ 2.061
341	475	4.82C	0.10	-1.31	0.00	8.55	0.00	8.55	0.00	0.59
	476	4.82C	-0.10	-4.72	0.00	0.00	0.00	@ 1.040	@ 1.040	@ 1.777
342	476	4.87C	-0.13	37.57	0.00	-29.08	0.00	59.57	0.00	13.93
	477	4.87C	0.13	36.62	0.00	0.00	0.00	@ 3.935	@ 5.123	@ 3.546
343	476	7.59C	-1.50	-2.39	0.00	6.51	0.00			0.02
	479	7.59C	1.50	-4.50	0.00	5.40	0.00			@ 0.370
344	477	4.87C	-0.13	36.62	0.00	0.00	0.00	59.57	0.00	13.93
	478	4.87C	0.13	31.87	0.00	26.87	0.00	@ 3.935	@ 5.123	@ 3.546
345	478	4.90C	-0.13	24.47	0.00	26.87	0.00	59.57	0.00	13.93
	480	4.90C	0.13	14.06	0.00	57.24	0.00	@ 3.935	@ 5.123	@ 3.546
346	479	8.03C	-0.09	20.51	0.00	0.00	0.00	39.71		9.97
	493	8.03C	0.09	-11.59	0.00	31.01	0.00	@ 3.603		@ 3.444
347	480	5.16C	-0.13	5.78	0.00	57.24	0.00	59.57	0.00	13.93
	481	5.16C	0.13	-9.16	0.00	54.20	0.00	@ 3.935	@ 5.123	@ 3.546
348	481	6.12C	-0.14	-28.57	0.00	54.22	0.00	59.57	0.00	13.93
	482	6.12C	0.14	-38.78	0.00	0.00	0.00	@ 3.935	@ 5.123	@ 3.546
349	483	9.87C	0.00	8.60	0.00	0.00	0.00	10.92		4.95
	484	9.87C	0.00	-8.58	0.00	0.00	0.00	@ 2.516		@ 2.516
350	484	11.72C	0.00	7.80	0.00	0.00	0.00	9.05		3.42
	487	11.72C	0.00	-7.78	0.00	0.00	0.00	@ 2.298		@ 2.298
351	491	5.12C	0.00	2.22	0.00	0.00	0.00	0.53		0.01
	498	5.12C	0.00	-1.92	0.00	0.00	0.00	@ 0.497		@ 0.507
352	493	8.03C	-0.09	-11.59	0.00	31.01	0.00	39.71		9.97
	496	8.03C	0.09	-24.23	0.00	0.00	0.00	@ 3.603		@ 3.444
353	495	2.95C	0.00	20.99	0.00	0.00	0.00	36.96		31.99
	500	2.95C	0.00	-21.11	0.00	0.00	0.00	@ 3.512		@ 3.512
354	497	3.03C	0.00	20.71	0.00	0.00	0.00	36.59		32.94
	503	3.03C	0.00	-20.15	0.00	0.00	0.00	@ 3.545		@ 3.545
355	498	3.23C	0.00	12.49	0.00	-8.49	0.00	16.40		14.43
	505	3.23C	0.00	-9.89	0.00	0.00	0.00	@ 3.995		@ 3.844
356	499	7.49C	0.01	15.06	0.00	0.00	0.00	19.18		8.74
	501	7.49C	-0.01	-15.04	0.00	0.00	0.00	@ 2.548		@ 2.548
357	500	5.47C	0.00	13.98	0.00	0.00	0.00	17.85		8.17
	504	5.47C	0.00	-13.98	0.00	0.00	0.00	@ 2.554		@ 2.554
358	501	8.10C	0.00	13.67	0.00	0.00	0.00	15.86		6.00

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Job ref : GOA/A/1511
Sheet : / 61 -
Made By :
Date : JULY 2007
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Approved :

Member Forces (Maximum Values)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	502	8.10C	0.00	-13.65	0.00	0.00	0.00	@ 2.298		@ 2.298
359	503	3.48C	0.00	14.01	0.00	0.00	0.00	17.93		8.24
	506	3.48C	0.00	-14.01	0.00	0.00	0.00	@ 2.559		@ 2.559
360	504	5.21C	0.00	12.71	0.00	0.00	0.00	14.76		5.58
	507	5.21C	0.00	-12.71	0.00	0.00	0.00	@ 2.322		@ 2.322
361	505	1.93C	0.00	7.56	0.00	0.00	0.00	9.69		4.47
	508	1.93C	0.00	-7.56	0.00	0.00	0.00	@ 2.564		@ 2.564
362	506	2.60C	0.00	12.72	0.00	0.00	0.00	14.77		5.59
	509	2.60C	0.00	-12.72	0.00	0.00	0.00	@ 2.323		@ 2.323
363	508	0.21C	0.00	6.84	0.00	0.00	0.00	7.95		3.01
	510	0.21C	0.00	-6.84	0.00	0.00	0.00	@ 2.323		@ 2.323
364	9	18.26T	0.00	26.46	0.00	0.00	0.00	12.59		1.33
	12	18.26T	0.00	-26.28	0.00	0.00	0.00	@ 0.945		@ 0.945
365	12	17.68T	0.00	57.38	0.00	0.00	-0.01	60.02		30.32
	35	17.68T	0.00	-57.78	0.00	0.00	0.00	@ 2.106		@ 2.106
366	24	107.78T	0.00	31.15	0.00	0.00	-0.02	27.98		4.21
	62	107.78T	0.00	-31.15	0.00	0.00	-0.01	@ 1.796		@ 1.796
367	35	20.52T	0.00	65.12	0.01	0.00	-0.01	76.52		13.76
	68	20.52T	0.00	-64.18	0.00	0.00	0.01	@ 2.343		@ 2.343
368	49	16.19T	0.03	-35.15	0.00	0.00	0.00	-16.71		1.07
	52	16.19T	-0.03	34.76	0.00	0.00	0.00	@ 0.956		@ 0.956
369	50	14.06T	-0.02	-35.15	0.00	0.00	0.00	-16.75		1.08
	53	14.06T	0.02	34.77	0.00	0.00	0.00	@ 0.948		@ 0.948
370	51	0.00C	0.00	-18.34	-0.99	5.96	0.32	-3.02	-0.16	6944.33
	54	0.00C	0.00	19.38	0.99	6.13	0.32	@ 0.972	@ 0.952	@ 0.972
371	51	29.92T	0.03	10.95	0.18	0.00	-0.17	5.52		0.11
	55	29.92T	-0.03	-12.01	0.18	0.00	0.17	@ 0.980		@ 0.961
372	52	14.12T	-0.01	73.11	0.00	0.00	0.00	75.18		9.03
	56	14.12T	0.01	-71.09	0.00	0.00	0.00	@ 2.064		@ 2.064
373	53	12.02T	0.00	-71.70	0.00	0.00	0.00	-73.28		8.87
	57	12.02T	0.00	68.27	0.00	0.00	0.00	@ 2.072		@ 2.072
374	54	9.83T	0.03	-46.46	0.00	0.00	0.00	-49.71		6.05
	58	9.86T	-0.03	47.99	0.00	0.00	0.00	@ 2.127		@ 2.127
375	55	26.52T	0.29	-30.95	-1.36	0.00	0.94	-33.61	-0.47	3.14
	59	26.52T	-0.29	33.50	1.37	0.00	0.97	@ 2.107	@ 2.064	@ 2.107
376	56	21.42T	-0.01	-77.25	0.01	0.00	-0.01	-90.81		14.07
	94	21.42T	0.01	76.08	0.01	0.00	0.01	@ 2.344		@ 2.344
377	57	20.32T	0.01	-73.38	0.00	0.00	0.00	-86.80		13.45
	95	20.32T	-0.01	73.15	0.00	0.00	0.00	@ 2.345		@ 2.345
378	58	18.89T	0.01	-79.34	0.00	0.00	0.00	-92.67		14.37

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Job ref : GOA/A/1511
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Made By :
Date : JULY 2007
Checked :
Approved :

Member Forces (Maximum Values)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	98	18.89T	-0.01	77.09	0.00	0.00	0.00	@ 2.345		@ 2.345
379	60	16.64T	-0.01	-82.52	0.00	0.00	0.00	-97.06		15.25
	101	16.64T	0.01	80.27	0.00	0.00	0.00	@ 2.360		@ 2.360
380	61	13.92T	0.00	-64.59	0.00	0.00	0.00	-77.01		14.15
	105	13.92T	0.00	64.59	0.00	0.00	0.00	@ 2.385		@ 2.385
381	62	59.66T	-0.08	64.70	0.01	0.00	-0.03	105.04	0.00	33.88
	63	59.66T	0.08	46.77	0.01	104.94	-0.02	@ 1.883	@ 1.883	@ 2.997
382	63	16.65T	0.04	-6.49	0.01	105.04	-0.02	105.04	0.00	33.88
	64	16.65T	-0.04	-45.10	0.01	0.00	0.00	@ 1.883	@ 1.883	@ 2.997
383	63	27.95T	-0.15	52.60	0.00	0.00	0.00	44.73		8.50
	132	27.95T	0.15	-56.05	0.00	0.00	-0.01	@ 1.663		@ 1.663
384	65	10.20T	0.00	26.46	-0.83	0.00	1.00	12.59	0.76	1.33
	66	10.20T	0.00	-26.28	-2.55	0.00	-1.73	@ 0.945	@ 0.059	@ 0.945
385	66	12.57T	0.00	57.38	0.00	0.00	0.00	60.02		30.32
	67	12.57T	0.00	-57.78	0.00	0.00	0.00	@ 2.106		@ 2.106
386	67	27.36C	0.00	65.12	0.00	0.00	0.00	76.52		13.76
	93	27.36C	0.00	-64.18	0.00	0.00	0.01	@ 2.343		@ 2.343
387	68	139.19T	-0.01	142.44	-0.01	0.00	0.01	294.48	-0.03	29.03
	70	139.19T	0.01	65.18	-0.01	291.71	-0.03	@ 3.255	@ 2.782	@ 3.749
388	70	111.30T	-0.01	13.38	0.00	291.59	-0.01	294.48	-0.03	29.03
	71	111.30T	0.01	-134.97	0.00	0.00	-0.03	@ 3.255	@ 2.782	@ 3.749
389	71	112.79T	0.01	102.43	0.00	0.00	-0.03	171.71		18.78
	73	112.79T	-0.01	-102.43	0.00	0.00	-0.04	@ 3.353		@ 3.353
390	72	14.89T	0.00	31.15	0.00	0.00	0.00	27.98		10.49
	74	14.89T	0.00	-31.15	0.00	0.00	0.00	@ 1.796		@ 1.796
391	73	98.02T	0.00	52.26	0.00	0.00	-0.01	47.12		10.66
	75	98.02T	0.00	-52.69	0.00	0.00	0.00	@ 1.815		@ 1.815
392	74	18.23T	-0.01	64.71	0.00	0.00	0.00	104.99	0.00	33.88
	89	18.23T	0.01	46.78	0.00	104.97	0.00	@ 1.883	@ 1.883	@ 2.997
393	76	9.01T	0.02	-35.15	1.00	0.00	-0.95	-16.71		1.07
	79	9.01T	-0.02	34.76	1.00	0.00	0.96	@ 0.956		@ 0.956
394	77	8.60T	-0.02	-35.15	0.99	0.00	-0.94	-16.75		1.08
	80	8.60T	0.02	34.77	0.99	0.00	0.95	@ 0.948		@ 0.948
395	78	7.59T	-0.01	-26.53	0.57	0.00	-0.79	-12.71		0.83
	81	7.58T	0.01	26.35	1.39	0.00	1.07	@ 0.952		@ 0.952
396	79	8.11T	0.00	73.11	0.00	0.00	0.00	75.18		9.03
	83	8.11T	0.00	-71.09	0.00	0.00	-0.01	@ 2.064		@ 2.064
397	80	5.46T	0.00	-71.70	0.00	0.00	0.00	-73.28		8.87
	84	5.46T	0.00	68.27	0.00	0.00	0.00	@ 2.072		@ 2.072
208	81	3.39T	0.01	-46.46	0.00	0.00	0.00	-49.71		25.59

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Tel : 029 2045 1331 Fax : 029 2045 1344

Job ref : GOA/A/1511
Sheet : / 63 -
Made By :
Date : JULY 2007
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Approved .

Member Forces (Maximum Values)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
	85	3.40T	-0.01	47.99	0.00	0.00	0.00	@ 2.127		@ 2.127
399	82	7.32T	0.49	-32.29	-2.67	0.00	1.76	-35.01	-0.97	1.37
	86	7.32T	-0.49	34.84	2.79	0.00	2.02	@ 2.107	@ 2.021	@ 2.107
400	83	17.31C	-0.01	-77.25	0.01	0.00	-0.02	-90.81		14.07
	162	17.31C	0.01	76.08	0.01	0.00	0.01	@ 2.344		@ 2.344
401	84	11.49C	0.01	-73.38	0.00	0.00	-0.01	-86.80		13.45
	163	11.49C	-0.01	73.15	0.00	0.00	0.00	@ 2.345		@ 2.345
402	85	5.91C	0.01	-79.34	0.00	0.00	0.00	-92.67		14.37
	166	5.91C	-0.01	77.09	0.00	0.00	0.00	@ 2.345		@ 2.345
403	87	2.33C	-0.01	-82.52	0.00	0.00	0.00	-97.06		15.25
	169	2.33C	0.01	80.27	0.00	0.00	0.00	@ 2.360		@ 2.360
404	88	3.16T	0.00	-64.59	0.00	0.00	0.00	-77.01		14.15
	173	3.16T	0.00	64.59	0.00	0.00	0.00	@ 2.385		@ 2.385
405	89	8.01T	0.01	-6.49	0.00	104.99	0.00	104.99	0.00	33.88
	90	8.01T	-0.01	-45.09	0.00	0.00	0.00	@ 1.883	@ 1.883	@ 2.997
406	89	1.94T	-0.02	52.60	0.00	0.00	0.00	44.73		8.50
	204	1.94T	0.02	-56.05	0.00	0.00	0.00	@ 1.663		@ 1.663
407	91	3.32C	0.00	57.38	5.71	0.00	-3.98	60.02	1.98	30.32
	92	3.32C	0.00	-57.78	-5.75	0.00	-4.06	@ 2.106	@ 2.106	@ 2.106
408	92	39.74C	0.00	65.12	0.00	0.00	0.00	76.52		13.76
	161	39.74C	0.00	-64.18	0.00	0.00	0.01	@ 2.343		@ 2.343
409	93	43.51T	0.00	142.44	-0.01	0.00	0.01	294.49	-0.02	29.03
	97	43.51T	0.00	65.18	-0.01	291.71	-0.02	@ 3.255	@ 2.782	@ 3.749
410	94	41.89T	-0.02	44.46	0.01	0.00	-0.02	31.23		4.33
	96	41.89T	0.02	-44.46	0.01	0.00	0.01	@ 1.405		@ 1.405
411	95	34.51T	0.00	43.28	0.00	0.00	0.00	30.40		4.21
	102	34.51T	0.00	-43.28	0.00	0.00	0.00	@ 1.405		@ 1.405
412	97	26.64T	0.00	13.38	0.00	291.60	0.00	294.49	-0.02	29.03
	100	26.64T	0.00	-134.98	0.00	0.00	-0.01	@ 3.255	@ 2.782	@ 3.749
413	98	26.48T	0.00	44.47	0.00	0.00	0.00	31.25		4.33
	109	26.48T	0.00	-44.52	0.00	0.00	0.00	@ 1.419		@ 1.419
414	99	93.25T	0.21	-86.76	0.00	0.00	0.02	-103.76		4.94
	103	93.25T	-0.21	86.36	0.00	0.00	0.02	@ 2.373		@ 2.373
415	100	22.29T	0.02	102.43	0.00	0.00	-0.01	171.71		18.78
	108	22.29T	-0.02	-102.43	0.00	0.00	-0.01	@ 3.353		@ 3.353
416	101	19.93T	0.00	45.07	0.00	0.00	0.00	31.23		4.32
	113	19.93T	0.00	-43.83	0.00	0.00	0.00	@ 1.391		@ 1.391
417	103	81.69T	0.00	116.47	-0.01	0.00	-0.01	193.15		28.00
	107	81.69T	0.00	-113.98	-0.01	0.00	-0.05	@ 3.318		@ 3.318
418	104	5.57T	0.00	31.15	0.00	0.00	0.00	27.98		10.49

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Job ref	: GOA/A/1511
Sheet	: / 64 -
Made By	:
Date	. JULY 2007
Checked	:
Approved	.

Member Forces (Maximum Values)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	112	5.57T	0.00	-31.15	0.00	0.00	0.00	@ 1.796		@ 1.796
419	105	13.38T	0.00	-37.05	0.00	0.00	0.00	-25.78		6.00
	117	13.38T	0.00	35.77	0.00	0.00	0.00	@ 1.401		@ 1.401
420	106	27.96T	0.00	-65.18	0.00	0.00	0.00	-77.91		12.34
	110	27.96T	0.00	64.80	0.00	0.00	0.00	@ 2.373		@ 2.373
421	107	71.91T	0.01	59.40	-0.02	0.00	0.02	53.54		4.77
	111	71.91T	-0.01	-59.82	-0.02	0.00	-0.05	@ 1.815		@ 1.815
422	108	13.89T	0.00	52.26	0.00	0.00	0.00	47.12		10.66
	126	13.89T	0.00	-52.69	0.00	0.00	0.00	@ 1.815		@ 1.815
423	109	23.17T	-0.01	-66.63	0.00	0.00	0.00	-79.88		12.65
	114	23.17T	0.01	66.63	0.00	0.00	0.01	@ 2.398		@ 2.398
424	110	32.04T	0.00	-86.89	0.00	0.00	0.00	-143.10		44.34
	115	32.04T	0.00	83.67	0.00	0.00	0.01	@ 3.356		@ 3.356
425	112	3.68T	-0.01	64.71	0.00	0.00	0.00	104.99	0.00	33.88
	157	3.68T	0.01	46.78	0.00	104.97	0.00	@ 1.883	@ 1.883	@ 2.997
426	113	16.16T	-0.01	-69.93	0.00	0.00	0.00	-82.20		13.02
	118	16.16T	0.01	67.18	0.00	0.00	0.01	@ 2.373		@ 2.373
427	114	23.32T	0.00	-92.46	0.00	0.00	0.00	-154.64		48.03
	119	23.32T	0.00	91.76	0.00	0.00	0.01	@ 3.323		@ 3.323
428	115	45.93T	0.00	43.11	-0.01	0.00	-0.01	38.73		8.77
	120	45.93T	0.00	-43.11	-0.01	0.00	-0.03	@ 1.797		@ 1.797
429	116	0.00C	0.00	0.00	0.00	0.00	0.00			0.00
	121	0.00C	0.00	0.00	0.00	0.00	0.00			@ 0.278
430	117	9.39T	0.00	-56.05	0.00	0.00	0.00	-65.94		14.29
	122	9.39T	0.00	53.30	0.00	0.00	0.01	@ 2.387		@ 2.387
431	118	36.88T	0.05	-89.53	0.00	0.00	0.03	-147.64		13.61
	123	36.88T	-0.05	86.32	0.00	0.00	0.05	@ 3.323		@ 3.323
432	119	20.48T	0.00	48.78	0.00	0.00	-0.01	43.82		9.92
	124	20.48T	0.00	-48.78	0.00	0.00	-0.02	@ 1.797		@ 1.797
433	121	59.07C	-31.64	-196.55	0.00	0.00	0.02	-434.08	0.00	45.74
	125	59.07C	31.64	-194.14	0.00	-391.61	0.01	@ 2.666	@ 4.654	@ 3.485
434	122	6.10T	0.00	-67.48	0.00	0.00	0.01	-111.16		53.34
	127	6.10T	0.00	64.28	0.00	0.00	0.01	@ 3.339		@ 3.339
435	123	14.54C	0.00	41.58	0.00	0.00	-0.02	37.20		8.47
	128	14.54C	0.00	0.39	0.00	37.20	-0.02	@ 1.821		@ 1.802
436	125	59.14C	11.96	-127.22	0.00	-391.63	0.01	-434.08	0.00	45.74
	129	59.14C	-11.96	-126.82	0.00	-434.06	0.01	@ 2.666	@ 4.654	@ 3.485
437	127	41.92C	0.00	-15.20	0.00	0.00	0.03	-6.53		0.59
	130	41.92C	0.00	14.50	0.00	0.00	0.02	@ 0.871		@ 0.871
438	128	14.54C	0.00	0.39	0.00	37.20	-0.02	37.20		8.47

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Made By :
Date : JULY 2007
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Approved .

Member Forces (Maximum Values)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	131	14.54C	0.00	-43.67	0.00	0.00	-0.02	@ 1.821		@ 1.802
439	129	55.40C	12.87	-1.23	0.00	-434.01	0.00	-434.08	0.00	45.74
	132	55.40C	-12.87	2.43	0.00	-431.64	0.00	@ 2.666	@ 4.654	@ 3.485
440	130	22.59C	0.00	17.43	0.00	0.00	-0.02	9.28		1.11
	133	22.59C	0.00	-19.17	0.00	0.00	-0.02	@ 1.045		@ 1.024
441	132	18.91C	12.57	183.10	0.00	-431.51	0.01	-434.08	0.00	45.74
	134	18.91C	-12.57	185.91	0.00	0.00	0.00	@ 2.666	@ 4.654	@ 3.485
442	133	70.75C	0.00	27.18	0.01	0.00	-0.04	13.29		1.63
	136	70.75C	0.00	-24.49	0.01	0.00	-0.01	@ 0.996		@ 1.017
443	133	0.00C	0.00	0.00	0.00	0.00	0.00			0.00
	137	0.00C	0.00	0.00	0.00	0.00	0.00			@ 3.132
444	134	4.90T	0.00	12.82	0.00	0.00	-0.01	23.26		15.58
	142	4.90T	0.00	-24.62	0.00	0.00	0.00	@ 2.767		@ 2.525
445	135	15.28T	0.01	73.11	0.28	0.00	-0.58	75.18		22.93
	151	15.28T	-0.01	-71.09	0.28	0.00	0.59	@ 2.064		@ 2.064
446	136	62.14C	-0.02	-1.86	0.00	0.00	0.00	-0.94		0.01
	139	62.14C	0.02	1.86	0.00	0.00	0.00	@ 1.008		@ 1.008
447	138	1.61T	0.00	-61.75	0.00	0.00	0.00	-110.31	0.00	8.95
	140	1.61T	0.00	-41.38	0.00	-110.30	0.00	@ 2.139	@ 2.118	@ 2.139
448	139	103.42C	0.16	-283.73	0.00	0.00	-0.01	-549.87	-0.01	22.32
	141	103.42C	-0.16	-282.80	0.00	-141.63	-0.01	@ 2.642	@ 2.642	@ 3.456
449	140	1.95T	-0.02	41.41	0.00	-110.31	0.00	-110.31	0.00	8.95
	142	1.95T	0.02	61.77	0.00	0.00	0.00	@ 2.139	@ 2.118	@ 2.139
450	141	69.15C	0.03	-192.54	0.00	-141.61	-0.01	-549.87	-0.01	22.32
	143	69.15C	-0.03	-188.58	0.00	-549.83	-0.01	@ 2.642	@ 2.642	@ 3.456
451	143	59.51C	-0.08	22.10	0.00	-549.87	-0.01	-549.87	-0.01	22.32
	145	59.51C	0.08	26.05	0.00	-498.32	-0.01	@ 2.642	@ 2.642	@ 3.456
452	144	19.57C	0.00	-71.70	-0.28	0.00	0.59	-73.28		22.54
	152	19.57C	0.00	68.27	-0.28	0.00	-0.60	@ 2.072		@ 2.072
453	145	49.62C	0.02	230.63	0.00	-498.30	-0.01	-549.87	-0.01	22.32
	146	49.62C	-0.02	234.59	0.00	0.00	-0.01	@ 2.642	@ 2.642	@ 3.456
454	146	9.12C	0.02	-86.15	0.00	0.00	0.00	-176.88	0.00	2.31
	147	9.12C	-0.02	-82.27	0.00	-176.89	0.00	@ 2.101	@ 2.080	@ 2.101
455	147	9.64C	-0.03	82.30	0.00	-176.88	0.00	-176.88	0.00	2.31
	148	9.64C	0.03	86.18	0.00	0.00	0.00	@ 2.101	@ 2.080	@ 2.101
456	149	28.04C	0.01	-46.46	-0.29	0.00	0.60	-49.71		15.45
	153	28.04C	-0.01	47.99	-0.29	0.00	-0.61	@ 2.127		@ 2.127
457	150	35.01T	-0.04	-30.95	-3.43	0.00	5.92	-33.61	-1.38	3.14
	154	35.01T	0.04	33.50	3.09	0.00	-5.66	@ 2.107	@ 3.053	@ 2.107
458	151	25.36C	-0.01	-77.25	0.00	0.00	-0.01	-90.81		14.07

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Member Forces (Maximum Values)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	170	25.36C	0.01	76.08	0.00	0.00	0.01	@ 2.344		@ 2.344
459	152	15.94C	0.01	-73.38	0.00	0.00	-0.01	-86.80		13.45
	177	15.94C	-0.01	73.15	0.00	0.00	0.00	@ 2.345		@ 2.345
460	153	7.59C	0.01	-79.34	0.00	0.00	-0.01	-92.67		14.37
	197	7.59C	-0.01	77.09	0.00	0.00	0.01	@ 2.345		@ 2.345
461	155	4.28C	-0.01	-82.52	0.00	0.00	-0.01	-97.06		15.25
	212	4.28C	0.01	80.27	0.00	0.00	0.01	@ 2.360		@ 2.360
462	156	5.34T	0.00	-64.59	0.00	0.00	0.00	-77.01		14.15
	230	5.34T	0.00	64.59	0.00	0.00	0.00	@ 2.385		@ 2.385
463	157	2.01C	0.01	-6.49	0.00	104.99	0.00	104.99	0.00	33.88
	158	2.01C	-0.01	-45.09	0.00	0.00	0.00	@ 1.883	@ 1.883	@ 2.997
464	157	5.47C	-0.02	52.60	0.00	0.00	0.00	44.73		8.50
	277	5.47C	0.02	-56.05	0.00	0.00	0.00	@ 1.663		@ 1.663
465	159	9.14C	0.00	57.38	3.18	0.00	-3.12	60.02	1.06	30.32
	160	9.14C	0.00	-57.78	-2.70	0.00	2.42	@ 2.106	@ 2.665	@ 2.106
466	160	39.89C	0.00	65.12	0.00	0.00	0.00	76.52		13.76
	164	39.89C	0.00	-64.18	0.00	0.00	0.02	@ 2.343		@ 2.343
467	161	8.73T	0.01	142.45	0.00	0.00	0.01	294.49	0.00	29.03
	168	8.73T	-0.01	65.18	0.00	291.72	-0.01	@ 3.255	@ 2.782	@ 3.749
468	162	10.43T	-0.02	44.46	0.01	0.00	-0.02	31.23		4.33
	165	10.43T	0.02	-44.46	0.01	0.00	0.01	@ 1.405		@ 1.405
469	163	6.05T	0.00	43.28	0.00	0.00	0.00	30.40		4.21
	171	6.05T	0.00	-43.28	0.00	0.00	0.00	@ 1.405		@ 1.405
470	164	55.21C	0.01	142.45	0.00	0.00	0.02	294.50	0.01	29.03
	308	55.21C	-0.01	65.18	0.00	291.72	0.01	@ 3.255	@ 2.810	@ 3.749
471	166	2.52T	0.00	44.47	0.00	0.00	0.00	31.25		4.33
	178	2.52T	0.00	-44.52	0.00	0.00	0.00	@ 1.419		@ 1.419
472	167	21.05T	0.21	-86.76	0.00	0.00	0.01	-103.76		4.94
	172	21.05T	-0.21	86.36	0.00	0.00	0.00	@ 2.373		@ 2.373
473	168	2.93T	0.01	13.38	0.00	291.61	-0.01	294.49	0.00	29.03
	175	2.93T	-0.01	-134.98	0.00	0.00	-0.01	@ 3.255	@ 2.782	@ 3.749
474	169	1.01C	0.00	45.07	0.00	0.00	0.00	31.23		4.32
	181	1.01C	0.00	-43.83	0.00	0.00	0.00	@ 1.391		@ 1.391
475	170	1.27T	-0.02	44.46	0.01	0.00	-0.01	31.23		4.33
	182	1.27T	0.02	-44.46	0.01	0.00	0.01	@ 1.405		@ 1.405
476	172	15.95T	0.00	116.47	0.00	0.00	-0.01	193.15		28.00
	176	15.95T	0.00	-113.98	0.00	0.00	0.00	@ 3.318		@ 3.318
477	173	1.97C	0.00	-37.05	0.00	0.00	0.00	-25.78		6.00
	186	1.97C	0.00	35.77	0.00	0.00	0.00	@ 1.401		@ 1.401
478	174	5.65T	0.00	-65.18	0.00	0.00	0.00	-77.91		12.34

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Member Forces (Maximum Values)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	179	5.65T	0.00	64.80	0.00	0.00	0.00	@ 2.373		@ 2.373
479	175	6.41C	0.02	102.43	0.00	0.00	-0.01	171.71		18.78
	189	6.41C	-0.02	-102.43	0.00	0.00	-0.01	@ 3.353		@ 3.353
480	176	10.52T	0.00	59.40	0.00	0.00	0.00	53.54		4.77
	180	10.52T	0.00	-59.82	0.00	0.00	0.00	@ 1.815		@ 1.815
481	177	4.39C	0.00	43.28	0.00	0.00	0.00	30.40		4.21
	215	4.39C	0.00	-43.28	0.00	0.00	0.00	@ 1.405		@ 1.405
482	178	3.98T	-0.01	-66.63	0.00	0.00	0.00	-79.88		12.65
	183	3.98T	0.01	66.63	0.00	0.00	0.00	@ 2.398		@ 2.398
483	179	6.44T	0.00	-86.89	0.00	0.00	0.00	-143.10		44.34
	184	6.44T	0.00	83.67	0.00	0.00	0.00	@ 3.356		@ 3.356
484	181	1.82T	-0.01	-69.93	0.00	0.00	0.00	-82.20		13.02
	187	1.82T	0.01	67.18	0.00	0.00	0.00	@ 2.373		@ 2.373
485	183	4.87T	0.00	-92.46	0.00	0.00	0.00	-154.64		48.03
	188	4.87T	0.00	91.76	0.00	0.00	0.00	@ 3.323		@ 3.323
486	184	7.78T	0.01	43.11	0.00	0.00	0.00	38.73		8.77
	190	7.78T	-0.01	-43.11	0.00	0.00	0.00	@ 1.797		@ 1.797
487	185	0.00C	0.00	0.00	0.00	0.00	0.00			0.00
	191	0.00C	0.00	0.00	0.00	0.00	0.00			@ 0.354
488	186	1.18C	0.00	-56.05	0.00	0.00	0.00	-65.94		14.29
	192	1.18C	0.00	53.30	0.00	0.00	0.00	@ 2.387		@ 2.387
489	187	3.05C	0.00	-86.89	0.00	0.00	0.00	-143.21		44.42
	193	3.05C	0.00	83.69	0.00	0.00	0.00	@ 3.323		@ 3.323
490	188	5.11T	0.00	48.78	0.00	0.00	0.00	43.82		9.92
	195	5.11T	0.00	-48.78	0.00	0.00	0.00	@ 1.797		@ 1.797
491	189	3.52T	0.00	52.26	0.00	0.00	0.00	47.12		10.66
	206	3.52T	0.00	-52.69	0.00	0.00	0.00	@ 1.815		@ 1.815
492	191	43.13T	-31.63	-200.52	0.00	0.00	0.00	-440.82	-0.01	15.55
	196	43.13T	31.63	-195.83	0.00	-397.27	0.00	@ 3.064	@ 2.339	@ 3.485
493	192	3.24C	0.00	-67.48	0.00	0.00	0.00	-111.16		53.34
	198	3.24C	0.00	64.28	0.00	0.00	0.00	@ 3.339		@ 3.339
494	193	5.88C	-0.01	41.58	0.00	0.00	0.00	37.20		8.47
	199	5.88C	0.01	0.39	0.00	37.20	0.00	@ 1.821		@ 1.802
495	194	15.02C	0.00	31.15	0.00	0.00	0.00	27.98		10.49
	314	15.02C	0.00	-31.15	0.00	0.00	0.00	@ 1.796		@ 1.796
496	196	43.18T	11.96	-128.93	0.00	-397.29	0.00	-440.82	-0.01	15.55
	200	43.18T	-11.96	-128.15	0.00	-440.23	0.00	@ 3.064	@ 2.339	@ 3.485
497	197	8.70C	0.00	44.47	0.00	0.00	0.00	31.25		4.33
	247	8.70C	0.00	-44.52	0.00	0.00	0.00	@ 1.419		@ 1.419
498	198	6.26C	0.00	-15.20	0.00	0.00	0.00	-6.53		0.59

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Cardiff Bay, Cardiff CF24 5EA
Tel . 029 2045 1331 Fax : 029 2045 1344

Job ref : GOA/A/1511
Sheet : / 68 -
Made By :
Date : JULY 2007
Checked :
Approved :

Member Forces (Maximum Values)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	202	6.26C	0.00	14.50	0.00	0.00	0.00	@ 0.871		@ 0.871
499	199	5.88C	-0.01	0.39	0.00	37.20	0.00	37.20		8.47
	203	5.88C	0.01	-43.67	0.00	0.00	0.00	@ 1.821		@ 1.802
500	200	43.34T	12.89	-2.55	0.00	-440.20	-0.01	-440.82	-0.01	15.55
	204	43.34T	-12.89	3.77	0.00	-437.78	-0.01	@ 3.064	@ 2.339	@ 3.485
501	201	4.46C	0.20	-86.76	0.00	0.00	0.01	-103.76		4.94
	220	4.46C	-0.20	86.36	0.00	0.00	-0.01	@ 2.373		@ 2.373
502	202	7.42C	0.00	17.43	0.00	0.00	0.00	9.28		1.11
	205	7.42C	0.00	-19.17	0.00	0.00	0.00	@ 1.045		@ 1.024
503	204	56.91T	12.63	184.44	0.00	-437.76	0.00	-440.82	-0.01	15.55
	207	56.91T	-12.63	189.91	0.00	0.00	0.00	@ 3.064	@ 2.339	@ 3.485
504	205	16.04C	0.00	27.18	0.00	0.00	0.00	13.29		1.63
	209	16.04C	0.00	-24.49	0.00	0.00	0.00	@ 0.996		@ 1.017
505	205	0.00C	0.00	0.00	0.00	0.00	0.00			0.00
	210	0.00C	0.00	0.00	0.00	0.00	0.00			@ 2.968
506	207	19.96T	0.00	12.82	-0.01	0.00	0.01	23.26		15.58
	217	19.96T	0.00	-24.62	-0.01	0.00	-0.02	@ 2.767		@ 2.525
507	209	6.43T	-0.01	-1.86	0.00	0.00	0.00	-0.94		0.01
	213	6.43T	0.01	1.86	0.00	0.00	0.00	@ 1.008		@ 1.008
508	211	18.70T	-0.01	-41.32	0.00	0.00	0.00	-66.62	0.00	5.43
	214	18.70T	0.01	-20.96	0.00	-66.62	0.00	@ 2.139	@ 2.139	@ 2.139
509	212	12.23C	0.00	45.07	0.00	0.00	0.00	31.23		4.32
	254	12.23C	0.00	-43.83	0.00	0.00	0.00	@ 1.391		@ 1.391
510	213	10.42T	0.17	-283.73	0.00	0.00	0.01	-549.85	0.01	22.31
	216	10.42T	-0.17	-282.80	0.00	-141.63	0.01	@ 2.642	@ 0.495	@ 3.456
511	214	29.82T	-0.01	20.98	0.00	-66.62	0.00	-66.62	0.00	5.43
	217	29.82T	0.01	41.34	0.00	0.00	0.00	@ 2.139	@ 2.139	@ 2.139
512	216	26.04T	0.04	-192.54	0.00	-141.62	0.01	-549.85	0.01	22.31
	224	26.04T	-0.04	-188.58	0.00	-549.84	0.01	@ 2.642	@ 0.495	@ 3.456
513	219	13.66C	-0.01	-1.28	0.01	0.00	-0.02	-0.80		0.02
	222	13.66C	0.01	1.28	0.01	0.00	0.00	@ 1.249		@ 1.249
514	220	2.99C	0.00	116.47	0.00	0.00	-0.01	193.15		28.00
	244	2.99C	0.00	-113.98	0.00	0.00	0.01	@ 3.318		@ 3.318
515	222	15.51C	0.02	-162.54	0.01	0.00	-0.02	-346.34	0.00	25.22
	225	15.51C	-0.02	-160.35	0.01	-345.69	0.00	@ 3.277	@ 2.120	@ 3.213
516	223	5.61T	0.00	-1.28	0.01	0.00	-0.02	-0.80		0.02
	227	5.61T	0.00	1.28	0.01	0.00	0.02	@ 1.249		@ 1.249
517	224	34.42T	-0.08	22.10	0.00	-549.85	0.01	-549.85	0.01	22.31
	233	34.42T	0.08	26.05	0.00	-498.30	0.01	@ 2.642	@ 0.495	@ 3.456
518	225	17.74C	-0.05	-1.16	0.01	-345.68	-0.01	-346.34	0.00	25.22

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Tel : 029 2045 1331 Fax : 029 2045 1344

Job ref : GOA/A/1511
Sheet : / 69 -
Made By :
Date : JULY 2007
Checked :
Approved .

Member Forces (Maximum Values)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	228	17.74C	0.05	1.07	0.01	-345.82	0.00	@ 3.277	@ 2.120	@ 3.213
519	226	4.06C	-0.01	-26.99	0.00	20.99	-0.01	-6.27		0.09
	229	4.06C	0.01	21.15	0.00	15.84	-0.01	@ 0.074		@ 1.737
520	227	10.23T	0.03	-162.54	0.01	0.00	0.00	-346.34	0.02	25.22
	236	10.23T	-0.03	-160.35	0.01	-345.69	0.02	@ 3.277	@ 4.262	@ 3.213
521	228	17.59C	0.03	160.41	0.00	-345.82	0.00	-346.34	0.00	25.22
	231	17.59C	-0.03	162.60	0.00	0.00	0.00	@ 3.277	@ 2.120	@ 3.213
522	229	3.33T	-0.02	-109.87	0.00	0.00	-0.01	-217.05	-0.01	10.54
	232	3.33T	0.02	-87.17	0.00	-210.96	-0.01	@ 3.212	@ 2.141	@ 3.212
523	230	15.56C	0.00	-37.05	0.00	0.00	0.00	-25.78		6.00
	260	15.56C	0.00	35.77	0.00	0.00	0.00	@ 1.401		@ 1.401
524	231	8.19C	-0.03	-80.47	0.00	0.00	0.00	-166.73	0.00	10.51
	234	8.19C	0.03	-78.32	0.00	-166.73	0.00	@ 2.100	@ 2.079	@ 2.100
525	232	11.49C	0.03	-11.36	0.00	-210.96	-0.01	-217.05	-0.01	10.54
	235	11.49C	-0.03	11.35	0.00	-210.97	-0.01	@ 3.212	@ 2.141	@ 3.212
526	233	41.40T	0.03	230.63	0.00	-498.30	0.01	-549.85	0.01	22.31
	241	41.40T	-0.03	234.59	0.00	0.00	0.01	@ 2.642	@ 0.495	@ 3.456
527	234	8.01C	0.04	78.33	0.00	-166.73	0.00	-166.73	0.00	10.51
	237	8.01C	-0.04	80.48	0.00	0.00	0.00	@ 2.100	@ 2.079	@ 2.100
528	235	16.07C	-0.02	87.18	0.00	-210.97	-0.01	-217.05	-0.01	10.54
	238	16.07C	0.02	109.87	0.00	0.00	-0.01	@ 3.212	@ 2.141	@ 3.212
529	236	10.30T	-0.05	-1.16	0.01	-345.68	0.01	-346.34	0.02	25.22
	243	10.30T	0.05	1.07	0.01	-345.82	0.02	@ 3.277	@ 4.262	@ 3.213
530	238	10.27C	0.02	-59.45	0.00	0.00	-0.01	-101.46		2.00
	240	10.27C	-0.02	-37.19	0.00	-101.46	0.00	@ 2.100		@ 2.100
531	239	3.78C	0.00	-65.18	0.00	0.00	0.00	-77.91		12.34
	250	3.78C	0.00	64.80	0.00	0.00	0.00	@ 2.373		@ 2.373
532	240	10.11C	-0.02	37.18	0.00	-101.46	0.00	-101.46		2.00
	242	10.11C	0.02	59.44	0.00	0.00	0.00	@ 2.100		@ 2.100
533	241	47.30T	0.02	-65.85	0.00	0.00	0.03	-134.25		2.10
	245	47.30T	-0.02	-61.97	0.00	-134.25	0.03	@ 2.101		@ 2.101
534	243	9.90T	0.03	160.41	0.00	-345.82	0.01	-346.34	0.02	25.22
	246	9.90T	-0.03	162.60	0.00	0.00	0.02	@ 3.277	@ 4.262	@ 3.213
535	244	1.44C	0.00	59.40	0.00	0.00	0.00	53.54		4.77
	252	1.44C	0.00	-59.82	0.00	0.00	0.00	@ 1.815		@ 1.815
536	245	44.76T	-0.02	62.00	0.00	-134.25	0.02	-134.25		2.10
	248	44.76T	0.02	65.88	0.00	0.00	0.02	@ 2.101		@ 2.101
537	246	8.43T	-0.03	-80.47	0.00	0.00	0.01	-166.73	0.01	10.51
	249	8.43T	0.03	-78.32	0.00	-166.73	0.01	@ 2.100	@ 2.079	@ 2.100
538	247	6.29C	-0.01	-66.63	0.00	0.00	0.00	-79.88		12.65

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Job ref : GOA/A/1511
Sheet : / 70 -
Made By :
Date : JULY 2007
Checked :
Approved :

Member Forces (Maximum Values)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
	255	6.29C	0.01	66.63	0.00	0.00	0.00	@ 2.398		@ 2.398
539	249	5.47T	0.04	78.33	0.00	-166.73	0.01	-166.73	0.01	10.51
	251	5.47T	-0.04	80.48	0.00	0.00	0.01	@ 2.100	@ 2.079	@ 2.100
540	250	4.01C	0.00	-86.89	0.00	0.00	0.00	-143.10		44.34
	256	4.01C	0.00	83.67	0.00	0.00	0.00	@ 3.356		@ 3.356
541	253	43.71T	0.01	73.11	0.79	0.00	-1.63	75.18		22.93
	274	43.71T	-0.01	-71.09	0.79	0.00	1.65	@ 2.064		@ 2.064
542	254	9.76C	-0.01	-69.93	0.00	0.00	0.00	-82.20		13.02
	261	9.76C	0.01	67.18	0.00	0.00	0.00	@ 2.373		@ 2.373
543	255	6.52C	0.00	-92.46	0.00	0.00	0.00	-154.64		48.03
	262	6.52C	0.00	91.76	0.00	0.00	0.00	@ 3.323		@ 3.323
544	256	4.44C	0.00	43.11	0.00	0.00	0.00	38.73		8.77
	263	4.44C	0.00	-43.11	0.00	0.00	0.00	@ 1.797		@ 1.797
545	257	0.00C	0.00	0.00	0.00	0.00	0.00			0.00
	264	0.00C	0.00	0.00	0.00	0.00	0.00			@ 0.351
546	259	51.96C	0.00	-71.70	-0.77	0.00	1.61	-73.28		22.54
	278	51.96C	0.00	68.27	-0.77	0.00	-1.63	@ 2.072		@ 2.072
547	260	12.94C	0.00	-56.05	0.00	0.00	0.00	-65.94		14.29
	266	12.94C	0.00	53.30	0.00	0.00	0.00	@ 2.387		@ 2.387
548	261	9.78C	0.00	-86.89	0.00	0.00	0.00	-143.21		44.42
	267	9.78C	0.00	83.69	0.00	0.00	0.00	@ 3.323		@ 3.323
549	262	7.25C	0.00	48.78	0.00	0.00	0.00	43.82		9.92
	268	7.25C	0.00	-48.78	0.00	0.00	0.00	@ 1.797		@ 1.797
550	264	5.44C	-31.62	-200.52	0.00	0.00	0.00	-440.82	-0.01	15.55
	269	5.44C	31.62	-195.83	0.00	-397.27	-0.01	@ 3.064	@ 4.654	@ 3.485
551	265	73.75C	0.01	-46.46	-0.76	0.00	1.58	-49.71		15.45
	281	73.75C	-0.01	47.99	-0.76	0.00	-1.60	@ 2.127		@ 2.127
552	266	12.02C	0.00	-67.48	0.00	0.00	0.00	-111.16		53.34
	271	12.02C	0.00	64.28	0.00	0.00	0.00	@ 3.339		@ 3.339
553	267	10.84C	0.00	41.58	0.00	0.00	0.00	37.20		8.47
	272	10.84C	0.00	0.39	0.00	37.20	0.00	@ 1.821		@ 1.802
554	269	5.47C	11.97	-128.95	0.00	-397.28	-0.01	-440.82	-0.01	15.55
	273	5.47C	-11.97	-128.17	0.00	-440.23	0.00	@ 3.064	@ 4.654	@ 3.485
555	270	89.90T	0.02	-30.95	-6.98	0.00	14.98	-33.61	-1.02	3.15
	287	89.90T	-0.02	33.50	-6.98	0.00	-14.14	@ 2.107	@ 3.397	@ 2.064
556	271	15.02C	0.00	-15.20	0.00	0.00	0.00	-6.53		0.59
	275	15.02C	0.00	14.50	0.00	0.00	0.00	@ 0.871		@ 0.871
557	272	10.84C	0.00	0.39	0.00	37.20	0.00	37.20		8.47
	276	10.84C	0.00	-43.67	0.00	0.00	0.00	@ 1.821		@ 1.802
[illegible]	273	5.11C	12.90	-2.55	0.00	-440.20	0.00	-440.82	-0.01	15.55

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Job ref : GOA/A/1511
Sheet : / 71 -
Made By :
Date : JULY 2007
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Approved :

Member Forces (Maximum Values)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	277	5.11C	-12.90	3.77	0.00	-437.78	-0.01	@ 3.064	@ 4.654	@ 3.485
559	274	25.40C	-0.01	-77.25	0.00	0.00	-0.01	-90.81		14.07
	319	25.40C	0.01	76.08	0.00	0.00	-0.01	@ 2.344		@ 2.344
560	275	10.80C	0.00	17.43	0.00	0.00	0.00	9.28		1.11
	279	10.80C	0.00	-19.17	0.00	0.00	0.00	@ 1.045		@ 1.024
561	277	2.79C	12.64	184.44	0.00	-437.76	0.00	-440.82	-0.01	15.55
	280	2.79C	-12.64	189.91	0.00	0.00	0.00	@ 3.064	@ 4.654	@ 3.485
562	278	16.15C	0.01	-73.38	0.00	0.00	-0.01	-86.80		13.45
	320	16.15C	-0.01	73.15	0.00	0.00	0.00	@ 2.345		@ 2.345
563	279	16.66C	0.00	27.18	0.00	0.00	0.00	13.29		1.63
	282	16.66C	0.00	-24.49	0.00	0.00	0.00	@ 0.996		@ 1.017
564	279	0.00C	0.00	0.00	0.00	0.00	0.00			0.00
	283	0.00C	0.00	0.00	0.00	0.00	0.00			@ 2.251
565	280	6.35C	0.00	24.62	3.64	0.00	-3.20	23.26	1.65	15.58
	296	6.35C	0.00	-12.82	-3.00	0.00	-1.63	@ 2.088	@ 2.670	@ 2.330
566	281	6.98C	0.01	-79.34	0.00	0.00	0.00	-92.67		14.37
	322	6.98C	-0.01	77.09	0.00	0.00	-0.01	@ 2.345		@ 2.345
567	282	12.71T	0.01	-1.86	0.00	0.00	0.00	-0.94		0.01
	285	12.71T	-0.01	1.86	0.00	0.00	0.00	@ 1.008		@ 1.008
568	284	4.15T	0.01	-124.60	0.23	0.00	-0.17	-146.08	0.44	41.34
	290	4.15T	-0.01	-14.93	0.23	-146.07	0.33	@ 2.139	@ 2.139	@ 2.073
569	285	8.72C	0.17	-283.73	0.00	0.00	0.00	-549.85	0.00	22.31
	291	8.72C	-0.17	-282.81	0.00	-141.63	0.00	@ 2.642	@ 0.495	@ 3.456
570	286	2.51T	0.00	-1.28	0.01	0.00	-0.01	-0.80		0.02
	299	2.51T	0.00	1.28	0.01	0.00	0.01	@ 1.249		@ 1.249
571	288	15.62T	0.00	-65.94	-0.01	70.38	0.01	-2.36		0.21
	289	15.62T	0.00	-42.48	-0.01	-62.99	-0.02	@ 1.489		@ 1.910
572	289	25.02T	-0.02	-109.87	0.00	0.00	-0.01	-217.05	-0.02	10.54
	292	25.02T	0.02	-87.17	0.00	-210.96	-0.02	@ 3.212	@ 2.120	@ 3.212
573	290	4.14T	-0.03	67.87	-0.88	-146.08	0.44	-146.08	0.44	41.34
	296	4.14T	0.03	68.77	-0.88	0.00	-1.44	@ 2.139	@ 2.139	@ 2.073
574	291	5.29T	0.04	-192.54	0.00	-141.62	0.00	-549.85	0.00	22.31
	297	5.29T	-0.04	-188.58	0.00	-549.84	0.00	@ 2.642	@ 0.495	@ 3.456
575	292	16.59T	0.03	-11.36	0.00	-210.96	-0.01	-217.05	-0.02	10.54
	294	16.59T	-0.03	11.35	0.00	-210.97	-0.02	@ 3.212	@ 2.120	@ 3.212
576	293	5.77T	-0.01	-82.52	0.00	0.00	0.00	-97.06		15.25
	325	5.77T	0.01	80.27	0.00	0.00	-0.01	@ 2.360		@ 2.360
577	294	10.35T	-0.01	87.18	0.00	-210.97	-0.01	-217.05	-0.02	10.54
	295	10.35T	0.01	109.87	0.00	0.00	-0.01	@ 3.212	@ 2.120	@ 3.212
[illegible]	295	7.19T	0.03	-59.45	0.00	0.00	-0.01	-101.46		2.00

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Cardiff Bay, Cardiff CF24 5EA
Tel : 029 2045 1331 Fax : 029 2045 1344

Job ref : GOA/A/1511
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Made By :
Date : JULY 2007
Checked :
Approved :

Member Forces (Maximum Values)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	298	7.19T	-0.03	-37.19	0.00	-101.46	-0.01	@ 2.100		@ 2.100
579	297	5.41T	-0.08	22.10	0.00	-549.85	0.00	-549.85	0.00	22.31
	302	5.41T	0.08	26.05	0.00	-498.30	0.00	@ 2.642	@ 0.495	@ 3.456
580	298	1.66T	-0.02	37.18	0.00	-101.46	0.00	-101.46		2.00
	300	1.66T	0.02	59.44	0.00	0.00	0.00	@ 2.100		@ 2.100
581	299	1.36C	0.03	-162.54	0.01	0.00	0.00	-346.34	0.01	25.22
	303	1.36C	-0.03	-160.35	0.01	-345.69	0.01	@ 3.277	@ 2.120	@ 3.213
582	301	10.85T	0.00	-64.59	0.00	0.00	0.00	-77.01		14.15
	329	10.85T	0.00	64.59	0.00	0.00	-0.01	@ 2.385		@ 2.385
583	302	4.64T	0.03	230.63	0.00	-498.30	0.00	-549.85	0.00	22.31
	304	4.64T	-0.03	234.59	0.00	0.00	0.00	@ 2.642	@ 0.495	@ 3.456
584	303	1.50C	-0.05	-1.16	0.00	-345.68	0.01	-346.34	0.01	25.22
	305	1.50C	0.05	1.07	0.00	-345.82	0.01	@ 3.277	@ 2.120	@ 3.213
585	304	3.25T	0.03	-86.15	-0.65	0.00	0.34	-176.88	-1.04	5.66
	307	3.25T	-0.03	-82.27	-0.65	-176.89	-1.03	@ 2.101	@ 2.101	@ 2.101
586	305	2.23T	0.03	160.41	0.00	-345.82	0.01	-346.34	0.01	25.22
	306	2.23T	-0.03	162.60	0.00	0.00	0.01	@ 3.277	@ 2.120	@ 3.213
587	306	2.01T	-0.03	-80.47	-0.26	0.00	0.06	-166.73	-0.61	10.51
	309	2.01T	0.03	-78.32	-0.26	-166.73	-0.49	@ 2.100	@ 2.100	@ 2.100
588	307	3.27T	-0.01	82.30	1.36	-176.88	-1.04	-176.88	-1.04	5.66
	310	3.27T	0.01	86.18	1.36	0.00	1.81	@ 2.101	@ 2.101	@ 2.101
589	308	39.09C	0.01	13.38	0.00	291.61	0.02	294.50	0.01	29.03
	311	39.09C	-0.01	-134.98	0.00	0.00	0.01	@ 3.255	@ 2.810	@ 3.749
590	309	2.01T	0.04	78.33	0.66	-166.73	-0.61	-166.73	-0.61	10.51
	312	2.01T	-0.04	80.48	0.66	0.00	0.79	@ 2.100	@ 2.100	@ 2.100
591	311	29.84C	0.02	102.43	0.00	0.00	0.02	171.71		18.78
	313	29.84C	-0.02	-102.43	0.00	0.00	0.01	@ 3.353		@ 3.353
592	313	12.44C	0.01	52.26	0.00	0.00	0.00	47.12		10.66
	315	12.44C	-0.01	-52.69	0.00	0.00	0.00	@ 1.815		@ 1.815
593	314	6.73C	-0.01	64.71	0.00	0.00	0.00	104.99	0.00	33.88
	316	6.73C	0.01	46.78	0.00	104.97	0.00	@ 1.883	@ 1.883	@ 2.997
594	316	3.95C	0.01	-6.49	0.00	104.99	0.00	104.99	0.00	33.88
	317	3.95C	-0.01	-45.09	0.00	0.00	0.00	@ 1.883	@ 1.883	@ 2.997
595	316	8.16C	-0.02	52.60	0.00	0.00	0.00	44.73		8.50
	354	8.16C	0.02	-56.05	0.00	0.00	0.00	@ 1.663		@ 1.663
596	318	5.76C	0.00	142.45	0.00	0.00	0.00	294.52	0.00	29.03
	355	5.76C	0.00	65.19	0.00	291.74	0.00	@ 3.255	@ 2.782	@ 3.749
597	319	15.22C	-0.02	44.46	0.00	0.00	0.00	31.23		4.33
	321	15.22C	0.02	-44.46	0.00	0.00	0.01	@ 1.405		@ 1.405
598	320	9.95C	0.00	43.28	0.00	0.00	0.00	30.40		4.21

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Made By	.
Date	· JULY 2007
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Member Forces (Maximum Values)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	326	9.95C	0.00	-43.28	0.00	0.00	0.00	@ 1.405		@ 1.405
599	322	10.94T	0.00	44.47	0.00	0.00	0.00	31.25		4.33
	332	10.94T	0.00	-44.52	0.00	0.00	0.00	@ 1.419		@ 1.419
600	323	27.27C	0.19	-86.76	0.00	0.00	-0.02	-103.76		4.94
	327	27.27C	-0.19	86.36	0.00	0.00	-0.02	@ 2.373		@ 2.373
601	324	19.01C	0.04	32.56	0.00	0.00	0.00	29.24		2.03
	380	19.01C	-0.04	-32.56	0.00	0.00	0.00	@ 1.796		@ 1.796
602	325	15.46T	0.00	45.07	0.00	0.00	0.00	31.23		4.32
	335	15.46T	0.00	-43.83	0.00	0.00	0.00	@ 1.391		@ 1.391
603	327	20.27C	0.00	116.47	0.00	0.00	0.02	193.15		28.00
	331	20.27C	0.00	-113.98	0.00	0.00	0.01	@ 3.318		@ 3.318
604	329	20.15T	0.00	-37.05	0.00	0.00	0.00	-25.78		6.00
	340	20.15T	0.00	35.77	0.00	0.00	-0.01	@ 1.401		@ 1.401
605	330	6.33C	0.00	-65.18	0.00	0.00	0.00	-77.91		12.34
	333	6.33C	0.00	64.80	0.00	0.00	0.00	@ 2.373		@ 2.373
606	331	9.72C	0.00	59.40	0.00	0.00	0.00	53.54		4.77
	334	9.72C	0.00	-59.82	0.00	0.00	0.00	@ 1.815		@ 1.815
607	332	9.15T	-0.01	-66.63	0.00	0.00	0.00	-79.88		12.65
	336	9.15T	0.01	66.63	0.00	0.00	0.00	@ 2.398		@ 2.398
608	333	10.15C	-0.01	-87.50	0.00	0.00	-0.01	-144.13		19.62
	337	10.15C	0.01	84.28	0.00	0.00	0.00	@ 3.356		@ 3.356
609	335	13.23T	-0.01	-69.93	0.00	0.00	0.00	-82.20		13.02
	341	13.23T	0.01	67.18	0.00	0.00	0.00	@ 2.373		@ 2.373
610	336	9.44T	0.00	-92.46	0.00	0.00	0.00	-154.64		48.03
	342	9.44T	0.00	91.76	0.00	0.00	0.00	@ 3.323		@ 3.323
611	337	7.93C	0.01	43.11	0.00	0.00	0.00	38.73		8.77
	343	7.93C	-0.01	-43.11	0.00	0.00	0.00	@ 1.797		@ 1.797
612	338	0.00C	0.00	0.00	0.00	0.00	0.00			0.00
	344	0.00C	0.00	0.00	0.00	0.00	0.00			@ 0.354
613	340	16.99T	0.00	-56.05	0.00	0.00	0.00	-65.94		14.29
	345	16.99T	0.00	53.30	0.00	0.00	-0.01	@ 2.387		@ 2.387
614	341	13.63T	0.00	-86.89	0.00	0.00	0.00	-143.21		44.42
	346	13.63T	0.00	83.69	0.00	0.00	0.00	@ 3.323		@ 3.323
615	342	11.53T	0.00	48.78	0.00	0.00	0.00	43.82		9.92
	347	11.53T	0.00	-48.78	0.00	0.00	0.00	@ 1.797		@ 1.797
616	344	9.89C	-31.62	-200.52	0.00	0.00	-0.01	-440.82	0.00	15.55
	348	9.89C	31.62	-195.83	0.00	-397.27	-0.01	@ 3.064	@ 2.339	@ 3.485
617	345	16.46T	0.00	-67.48	0.00	0.00	0.00	-111.16		53.34
	349	16.46T	0.00	64.28	0.00	0.00	0.00	@ 3.339		@ 3.339
618	346	16.59T	-0.01	41.58	0.00	0.00	0.00	37.20		8.47

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Made By	:
Date	. JULY 2007
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Member Forces (Maximum Values)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	350	16.59T	0.01	0.39	0.00	37.20	0.00	@ 1.821		@ 1.802
619	348	9.83C	11.97	-128.94	0.00	-397.28	-0.01	-440.82	0.00	15.55
	351	9.83C	-11.97	-128.16	0.00	-440.23	-0.01	@ 3.064	@ 2.339	@ 3.485
620	349	22.06T	0.00	-15.20	0.00	0.00	-0.01	-6.53		0.59
	352	22.06T	0.00	14.50	0.00	0.00	0.00	@ 0.871		@ 0.871
621	350	16.59T	-0.01	0.39	0.00	37.20	0.00	37.20		8.47
	353	16.59T	0.01	-43.67	0.00	0.00	0.00	@ 1.821		@ 1.802
622	351	10.56C	12.90	-2.55	0.00	-440.20	-0.01	-440.82	0.00	15.55
	354	10.56C	-12.90	3.77	0.00	-437.78	-0.01	@ 3.064	@ 2.339	@ 3.485
623	352	17.18T	0.00	17.43	0.00	0.00	0.00	9.28		1.11
	356	17.18T	0.00	-19.17	0.00	0.00	0.00	@ 1.045		@ 1.024
624	354	7.04C	12.63	184.44	0.00	-437.76	0.00	-440.82	0.00	15.55
	357	7.04C	-12.63	189.91	0.00	0.00	0.00	@ 3.064	@ 2.339	@ 3.485
625	355	10.45C	0.00	13.37	0.00	291.64	0.00	294.52	0.00	29.03
	358	10.45C	0.00	-134.98	0.00	0.00	0.01	@ 3.255	@ 2.782	@ 3.749
626	356	28.04T	0.00	27.18	0.00	0.00	0.01	13.29		1.63
	360	28.04T	0.00	-24.49	0.00	0.00	0.00	@ 0.996		@ 1.017
627	356	0.00C	0.00	0.00	0.00	0.00	0.00			0.00
	361	0.00C	0.00	0.00	0.00	0.00	0.00			@ 2.414
628	358	16.25C	0.10	103.66	0.00	0.00	0.01	173.76		14.24
	379	16.25C	-0.10	-103.66	0.00	0.00	0.01	@ 3.353		@ 3.353
629	360	19.54T	0.01	-1.86	0.00	0.00	0.00	-0.94		0.01
	362	19.54T	-0.01	1.86	0.00	0.00	0.00	@ 1.008		@ 1.008
630	362	11.95T	0.17	-283.73	0.00	0.00	0.00	-549.85	0.00	22.31
	364	11.95T	-0.17	-282.81	0.00	-141.63	0.00	@ 2.642	@ 0.495	@ 3.456
631	363	3.00T	0.00	-1.28	0.01	0.00	0.00	-0.80		0.02
	368	3.00T	0.00	1.28	0.01	0.00	0.01	@ 1.249		@ 1.249
632	364	7.60T	0.04	-192.54	0.00	-141.62	0.00	-549.85	0.00	22.31
	366	7.60T	-0.04	-188.58	0.00	-549.84	0.00	@ 2.642	@ 0.495	@ 3.456
633	365	5.72T	0.01	-98.39	-0.01	110.27	0.01	-2.59		0.32
	367	5.72T	-0.01	-74.15	-0.01	-102.09	-0.02	@ 1.563		@ 1.935
634	366	6.39T	-0.07	22.10	0.00	-549.85	0.00	-549.85	0.00	22.31
	370	6.39T	0.07	26.05	0.00	-498.30	0.00	@ 2.642	@ 0.495	@ 3.456
635	367	4.11T	-0.01	-109.87	-0.01	0.00	0.00	-217.05	-0.02	10.54
	369	4.11T	0.01	-87.17	-0.01	-210.96	-0.02	@ 3.212	@ 2.120	@ 3.212
636	368	2.16C	0.03	-162.54	0.00	0.00	0.00	-346.34	0.01	25.22
	372	2.16C	-0.03	-160.35	0.00	-345.69	0.01	@ 3.277	@ 2.120	@ 3.213
637	369	4.36T	0.04	-11.36	0.00	-210.96	-0.01	-217.05	-0.02	10.54
	371	4.36T	-0.04	11.35	0.00	-210.97	-0.02	@ 3.212	@ 2.120	@ 3.212
638	370	5.06T	0.03	230.63	0.00	-498.30	0.00	-549.85	0.00	22.31

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Job ref : GOA/A/1511
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Made By .
Date : JULY 2007
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Member Forces (Maximum Values)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	374	5.06T	-0.03	234.59	0.00	0.00	0.00	@ 2.642	@ 0.495	@ 3.456
639	371	5.24T	-0.01	87.18	0.00	-210.97	-0.01	-217.05	-0.02	10.54
	373	5.24T	0.01	109.87	0.00	0.00	-0.01	@ 3.212	@ 2.120	@ 3.212
640	372	2.48C	-0.05	-1.16	0.00	-345.68	0.00	-346.34	0.01	25.22
	376	2.48C	0.05	1.07	0.00	-345.82	0.01	@ 3.277	@ 2.120	@ 3.213
641	373	3.95T	0.02	-40.34	-0.59	0.00	-0.30	-81.39	-0.92	3.37
	375	3.95T	-0.02	-37.19	0.79	-81.40	-0.07	@ 2.100	@ 3.654	@ 2.100
642	375	3.95T	-0.01	37.18	-1.02	-81.39	-0.14	-81.39	-0.92	3.37
	377	3.95T	0.01	40.33	0.36	0.00	-0.83	@ 2.100	@ 3.654	@ 2.100
643	376	1.53C	0.03	160.41	0.00	-345.82	0.00	-346.34	0.01	25.22
	378	1.53C	-0.03	162.60	0.00	0.00	0.00	@ 3.277	@ 2.120	@ 3.213
644	379	4.37C	-0.01	52.26	0.00	0.00	0.00	47.12		10.66
	381	4.37C	0.01	-52.69	0.00	0.00	0.00	@ 1.815		@ 1.815
645	380	9.96C	-0.04	67.95	0.00	0.00	0.01	109.18	0.00	10.45
	382	9.96C	0.04	47.99	0.00	109.16	0.00	@ 1.883	@ 1.883	@ 2.832
646	382	10.49C	-0.01	-6.49	0.00	109.18	0.00	109.18	0.00	10.45
	383	10.49C	0.01	-48.33	0.00	0.00	0.00	@ 1.883	@ 1.883	@ 2.832
647	382	9.01C	-0.04	52.60	0.00	0.00	0.00	44.73		8.50
	424	9.01C	0.04	-56.05	0.00	0.00	0.00	@ 1.663		@ 1.663
648	384	0.68C	-0.01	9.37	0.00	0.00	0.00	18.65	0.00	18.32
	428	0.68C	0.01	0.60	0.00	14.01	0.00	@ 4.392	@ 2.810	@ 3.947
649	385	1.48C	-0.02	44.46	0.00	0.00	0.00	31.23		4.33
	388	1.48C	0.02	-44.46	0.00	0.00	0.00	@ 1.405		@ 1.405
650	386	0.82C	0.00	43.28	0.00	0.00	0.00	30.40		4.21
	393	0.82C	0.00	-43.28	0.00	0.00	0.00	@ 1.405		@ 1.405
651	387	0.45C	-0.01	7.47	0.00	0.00	0.00	5.25		0.73
	430	0.45C	0.01	-7.47	0.00	0.00	0.00	@ 1.405		@ 1.405
652	389	0.21T	0.01	44.47	0.00	0.00	0.00	31.25		4.33
	400	0.21T	-0.01	-44.52	0.00	0.00	0.00	@ 1.419		@ 1.419
653	390	0.23C	0.00	7.29	0.00	0.00	0.00	5.12		0.71
	439	0.23C	0.00	-7.29	0.00	0.00	0.00	@ 1.405		@ 1.405
654	391	4.97C	0.14	-86.76	0.00	0.00	0.00	-103.76		4.94
	394	4.97C	-0.14	86.36	0.00	0.00	-0.01	@ 2.373		@ 2.373
655	392	0.51T	-0.01	45.07	0.00	0.00	0.00	31.23		4.32
	403	0.51T	0.01	-43.83	0.00	0.00	0.00	@ 1.391		@ 1.391
656	394	5.27C	0.00	116.47	0.00	0.00	0.00	193.15		28.00
	398	5.27C	0.00	-113.98	0.00	0.00	0.01	@ 3.318		@ 3.318
657	395	3.27C	0.04	2.96	0.00	0.00	0.00	2.66		0.60
	474	3.27C	-0.04	-2.96	0.00	0.00	0.00	@ 1.796		@ 1.796
	396	2.81T	0.00	-38.16	0.00	0.00	0.00	-26.56		1.14

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Made By :
Date : JULY 2007
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Member Forces (Maximum Values)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	408	2.83T	0.00	36.88	0.00	0.00	0.00	@ 1.401		@ 1.401
659	397	0.51C	0.00	-65.18	0.00	0.00	0.00	-77.91		12.34
	401	0.51C	0.00	64.80	0.00	0.00	0.00	@ 2.373		@ 2.373
660	398	1.71C	0.00	59.40	0.00	0.00	0.00	53.54		4.77
	402	1.71C	0.00	-59.82	0.00	0.00	0.00	@ 1.815		@ 1.815
661	400	0.55T	-0.01	-66.63	0.00	0.00	0.00	-79.88		12.65
	404	0.55T	0.01	66.63	0.00	0.00	0.00	@ 2.398		@ 2.398
662	401	0.90C	0.00	-86.89	0.00	0.00	0.00	-143.10		44.34
	405	0.90C	0.00	83.67	0.00	0.00	0.00	@ 3.356		@ 3.356
663	403	1.69T	-0.01	-69.93	0.00	0.00	0.00	-82.20		13.02
	409	1.69T	0.01	67.18	0.00	0.00	0.00	@ 2.373		@ 2.373
664	404	1.07T	0.00	-92.46	0.00	0.00	0.00	-154.64		48.03
	410	1.07T	0.00	91.76	0.00	0.00	0.00	@ 3.323		@ 3.323
665	405	1.06T	0.00	43.11	0.00	0.00	0.00	38.73		8.77
	411	1.06T	0.00	-43.11	0.00	0.00	0.00	@ 1.797		@ 1.797
666	406	0.00C	0.00	0.00	0.00	0.00	0.00			0.00
	412	0.00C	0.00	0.00	0.00	0.00	0.00			@ 0.362
667	408	7.02T	0.10	-78.23	0.00	0.00	0.00			2.80
	413	7.01T	-0.10	-19.59	0.00	-117.15	-0.01			@ 1.343
668	409	3.14T	0.00	-86.89	0.00	0.00	0.00	-143.21		44.42
	414	3.14T	0.00	83.69	0.00	0.00	0.00	@ 3.323		@ 3.323
669	410	2.35T	0.00	48.78	0.00	0.00	0.00	43.82		9.92
	415	2.35T	0.00	-48.78	0.00	0.00	0.00	@ 1.797		@ 1.797
670	412	5.94C	-31.59	-200.52	0.00	0.00	0.00	-440.83	-0.01	15.55
	416	5.94C	31.59	-195.83	0.00	-397.27	-0.01	@ 3.064	@ 4.654	@ 3.485
671	413	8.62T	-0.10	21.32	0.00	-117.94	-0.01			2.77
	418	8.61T	0.10	75.81	0.00	0.00	-0.01			@ 1.044
672	414	4.37T	0.02	30.25	0.00	0.00	0.00	20.08		4.79
	419	4.37T	-0.02	-13.64	0.00	16.79	0.00	@ 2.320		@ 1.803
673	416	5.89C	12.00	-128.96	0.00	-397.28	-0.01	-440.83	-0.01	15.55
	420	5.89C	-12.00	-128.17	0.00	-440.23	-0.01	@ 3.064	@ 4.654	@ 3.485
674	417	0.11T	0.01	7.47	0.00	0.00	0.00	5.25		0.73
	452	0.11T	-0.01	-7.48	0.00	0.00	0.00	@ 1.419		@ 1.419
675	418	10.48T	0.09	-91.64	0.00	0.00	-0.01			2.87
	422	10.48T	-0.09	-44.01	0.00	-151.56	-0.01			@ 1.270
676	419	4.63T	-0.03	14.02	0.00	17.03	0.00	20.08		4.79
	423	4.63T	0.03	-32.41	0.00	0.00	0.00	@ 2.320		@ 1.803
677	420	6.90C	12.93	-2.55	0.00	-440.21	0.00	-440.83	-0.01	15.55
	424	6.90C	-12.93	3.77	0.00	-437.79	-0.01	@ 3.064	@ 4.654	@ 3.485
678	421	0.47T	0.01	7.57	0.00	0.00	0.00	5.25		0.73

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Job ref : GOA/A/1511
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Made By :
Date : JULY 2007
Checked :
Approved .

Member Forces (Maximum Values)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
	455	0.47T	-0.01	-7.37	0.00	0.00	0.00	@ 1.391		@ 1.391
679	422	14.27T	-0.04	-13.70	0.00	-143.02	-0.01	-147.55		15.03
	426	14.27T	0.04	75.73	0.00	0.00	-0.01	@ 0.651		@ 2.045
680	424	0.81T	12.66	184.44	0.00	-437.76	0.00	-440.83	-0.01	15.55
	427	0.81T	-12.66	189.91	0.00	0.00	0.00	@ 3.064	@ 4.654	@ 3.485
681	425	0.92T	0.01	-12.02	0.00	0.00	0.00			2.30
	457	0.94T	-0.01	-3.64	0.00	-21.88	0.00			@ 1.606
682	426	19.90T	0.00	-15.89	0.00	0.00	-0.01	-6.84		0.11
	429	19.90T	0.00	15.19	0.00	0.00	-0.01	@ 0.871		@ 0.871
683	428	2.80C	0.01	5.86	0.00	13.96	0.00	18.65	0.00	18.32
	432	2.80C	-0.01	-11.68	0.00	0.00	0.00	@ 4.392	@ 2.810	@ 3.947
684	429	12.85T	0.00	18.23	0.00	0.00	0.01	9.68		0.21
	431	12.85T	0.00	-19.96	0.00	0.00	0.01	@ 1.045		@ 1.024
685	431	21.89T	0.00	27.18	0.00	0.00	0.01	13.29		1.63
	434	21.89T	0.00	-24.49	0.00	0.00	0.01	@ 0.996		@ 1.017
686	431	0.00C	0.00	0.00	0.00	0.00	0.00			0.00
	435	0.00C	0.00	0.00	0.00	0.00	0.00			@ 2.479
687	432	5.17C	0.00	12.25	0.00	0.00	0.00	20.53		16.19
	466	5.17C	0.00	-12.25	0.00	0.00	0.00	@ 3.353		@ 3.353
688	434	10.54T	0.01	-1.86	0.00	0.00	0.01	-0.94		0.01
	437	10.54T	-0.01	1.86	0.00	0.00	0.01	@ 1.008		@ 1.008
689	436	1.38C	0.01	-14.17	0.00	0.00	0.00	-16.94		6.83
	443	1.38C	-0.01	14.10	0.00	0.00	0.00	@ 2.373		@ 2.373
690	437	9.48T	0.17	-283.73	0.00	0.00	0.00	-549.85	0.00	22.31
	441	9.48T	-0.17	-282.81	0.00	-141.63	0.00	@ 2.642	@ 0.495	@ 3.456
691	438	3.99T	0.00	-1.28	0.00	0.00	0.00	-0.80		0.02
	447	3.99T	0.00	1.28	0.00	0.00	0.00	@ 1.249		@ 1.249
692	440	3.39T	0.01	-92.48	-0.01	103.17	0.01	-2.38		0.29
	442	3.39T	-0.01	-68.11	-0.01	-94.40	-0.01	@ 1.538		@ 1.935
693	441	3.96T	0.04	-192.54	0.00	-141.62	0.00	-549.85	0.00	22.31
	445	3.96T	-0.04	-188.58	0.00	-549.84	0.00	@ 2.642	@ 0.495	@ 3.456
694	442	3.19C	-0.01	-109.87	-0.01	0.00	0.00	-217.05	-0.01	10.54
	444	3.19C	0.01	-87.17	-0.01	-210.96	-0.02	@ 3.212	@ 2.120	@ 3.212
695	443	2.56C	-0.01	19.24	0.00	0.00	0.00	31.91		25.16
	467	2.56C	0.01	-18.84	0.00	0.00	0.00	@ 3.318		@ 3.318
696	444	1.05C	0.04	-11.36	0.00	-210.96	-0.01	-217.05	-0.01	10.54
	446	1.05C	-0.04	11.35	0.00	-210.97	-0.01	@ 3.212	@ 2.120	@ 3.212
697	445	2.14T	-0.07	22.10	0.00	-549.85	0.00	-549.85	0.00	22.31
	450	2.14T	0.07	26.05	0.00	-498.30	0.00	@ 2.642	@ 0.495	@ 3.456
698	446	0.46T	-0.01	87.18	0.00	-210.97	-0.01	-217.05	-0.01	10.54

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Job ref : GOA/A/1511
Sheet : / 78 -
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Member Forces (Maximum Values)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	448	0.46T	0.01	109.87	0.00	0.00	-0.01	@ 3.212	@ 2.120	@ 3.212
699	447	1.05C	0.03	-162.54	0.00	0.00	0.00	-346.34	0.00	25.22
	451	1.05C	-0.03	-160.35	0.00	-345.69	0.00	@ 3.277	@ 2.120	@ 3.213
700	449	0.43C	0.01	-11.07	0.00	0.00	0.00	-13.23		5.34
	460	0.43C	-0.01	11.01	0.00	0.00	0.00	@ 2.373		@ 2.373
701	450	1.11T	0.03	230.63	0.00	-498.30	0.00	-549.85	0.00	22.31
	453	1.11T	-0.03	234.59	0.00	0.00	0.00	@ 2.642	@ 0.495	@ 3.456
702	451	2.10C	-0.05	-1.16	0.00	-345.68	0.00	-346.34	0.00	25.22
	454	2.10C	0.05	1.07	0.00	-345.82	0.00	@ 3.277	@ 2.120	@ 3.213
703	452	0.47T	0.00	-11.30	0.00	0.00	0.00	-13.54		5.46
	461	0.47T	0.00	11.30	0.00	0.00	0.00	@ 2.398		@ 2.398
704	454	1.84C	0.03	160.41	0.00	-345.82	0.00	-346.34	0.00	25.22
	456	1.84C	-0.03	162.60	0.00	0.00	0.00	@ 3.277	@ 2.120	@ 3.213
705	455	1.38T	-0.04	-7.24	0.00	0.00	0.00	-5.19		0.55
	458	1.38T	0.04	4.99	0.00	-2.87	0.00	@ 1.442		@ 1.268
706	457	2.85T	-0.03	5.83	0.00	-21.80	0.00			2.58
	459	2.84T	0.03	12.14	0.00	0.00	0.00			@ 1.044
707	458	1.36T	0.03	-4.77	0.00	-2.86	0.00	-4.93		0.51
	462	1.36T	-0.03	6.75	0.00	0.00	0.00	@ 0.934		@ 1.130
708	459	1.37T	0.02	-17.60	0.00	0.00	0.00			2.40
	463	1.37T	-0.02	-11.94	0.00	-35.49	0.00			@ 1.367
709	460	1.07C	0.00	-14.82	0.00	0.00	0.00	-24.44		19.31
	468	1.07C	0.00	14.31	0.00	0.00	0.00	@ 3.356		@ 3.356
710	461	0.29T	-0.01	-15.69	0.00	0.00	0.00	-26.25		20.76
	469	0.29T	0.01	15.58	0.00	0.00	0.00	@ 3.323		@ 3.323
711	462	1.95T	-0.02	-10.90	0.00	0.00	0.00	-8.42		0.95
	464	1.95T	0.02	-0.85	0.00	-13.10	0.00	@ 2.147		@ 1.247
712	463	5.12T	-0.01	13.41	0.00	-35.47	0.00			2.04
	465	5.12T	0.01	18.20	0.00	0.00	0.00			@ 0.947
713	464	1.90T	-0.01	-6.73	0.00	-13.09	0.00	-18.26		6.54
	470	1.90T	0.01	12.35	0.00	0.00	0.00	@ 1.523		@ 2.077
714	465	2.07T	0.01	-4.43	0.00	0.00	0.00	-4.86		1.73
	471	2.07T	-0.01	4.20	0.00	0.00	0.00	@ 2.231		@ 2.231
715	466	2.74C	0.00	8.83	0.00	0.00	0.00	7.96		1.80
	475	2.74C	0.00	-8.90	0.00	0.00	0.00	@ 1.815		@ 1.815
716	467	1.22C	0.02	9.95	0.00	0.00	0.00	8.97		2.03
	476	1.22C	-0.02	-10.02	0.00	0.00	0.00	@ 1.815		@ 1.815
717	468	0.33C	0.00	7.40	0.00	0.00	0.00	6.65		1.51
	478	0.33C	0.00	-7.40	0.00	0.00	0.00	@ 1.797		@ 1.797
718	469	0.59T	0.00	8.29	0.00	0.00	0.00	7.44		1.69

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Member Forces (Maximum Values)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
	480	0.59T	0.00	-8.29	0.00	0.00	0.00	@ 1.797		@ 1.797
719	470	1.97T	0.04	18.78	0.00	0.00	0.00	27.74		5.29
	472	1.97T	-0.04	13.79	0.00	27.37	0.00	@ 1.803		@ 1.803
720	471	3.49T	0.00	-1.44	0.00	0.00	0.00	-0.61		0.03
	473	3.49T	0.00	1.33	0.00	0.00	0.00	@ 0.871		@ 0.871
721	472	1.58T	-0.03	-13.87	0.00	27.74	0.00	27.74		5.29
	481	1.58T	0.03	-19.40	0.00	0.00	0.00	@ 1.803		@ 1.803
722	473	1.72C	0.00	1.65	0.00	0.00	0.00	0.90		0.07
	482	1.72C	0.00	-1.92	0.00	0.00	0.00	@ 1.045		@ 1.024
723	474	2.29C	-0.29	9.68	0.00	0.00	0.00			0.20
	485	2.29C	0.29	7.41	0.00	16.09	0.00			@ 1.073
724	477	0.00C	0.00	0.00	0.00	0.00	0.00			0.00
	479	0.00C	0.00	0.00	0.00	0.00	0.00			@ 0.354
725	479	1.91C	-4.91	-35.74	0.00	0.00	0.00	-77.66	0.00	21.12
	489	1.91C	4.91	-33.32	0.00	-69.22	0.00	@ 3.555	@ 4.654	@ 3.485
726	482	6.52C	0.00	3.16	0.00	0.00	0.00	1.52		0.11
	483	6.52C	0.00	-2.74	0.00	0.00	0.00	@ 0.996		@ 1.017
727	482	0.00C	0.00	0.00	0.00	0.00	0.00			0.00
	493	0.00C	0.00	0.00	0.00	0.00	0.00			@ 2.577
728	483	5.86T	0.01	-1.21	0.00	0.00	0.00	-0.61		0.01
	496	5.86T	-0.01	1.21	0.00	0.00	0.00	@ 1.008		@ 1.008
729	484	1.55T	0.01	-1.51	0.00	0.00	0.00	0.00	0.00	3.94
	501	1.55T	-0.01	1.51	0.00	0.00	0.00	@ 2.499	@ 2.499	@ 2.499
730	485	2.97C	-0.26	-1.42	0.00	16.12	0.00	6.11		1.14
	491	2.97C	0.26	-6.39	0.00	0.00	0.00	@ 0.949		@ 1.815
731	485	2.25C	-0.04	8.83	0.00	0.00	0.00	7.50		1.43
	497	2.25C	0.04	-9.38	0.00	0.00	0.00	@ 1.663		@ 1.663
732	486	2.78T	0.01	-53.56	-0.01	54.83	0.01	-7.72		0.31
	488	2.78T	-0.01	-30.37	0.00	-46.33	0.00	@ 2.134		@ 1.886
733	487	0.32T	0.01	-9.32	0.00	10.12	0.00	1.06		4.03
	502	0.32T	-0.01	-6.94	0.00	-9.74	0.00	@ 2.456		@ 2.481
734	488	8.84C	-0.01	-108.92	0.00	0.00	0.01	-215.53		16.15
	490	8.84C	0.01	-86.86	0.00	-209.61	0.00	@ 3.212		@ 3.212
735	489	1.90C	1.92	-22.84	0.00	-69.22	0.00	-77.66	0.00	21.12
	495	1.90C	-1.92	-22.44	0.00	-76.79	0.00	@ 3.555	@ 4.654	@ 3.485
736	490	5.30C	0.03	-11.04	0.00	-209.61	0.00	-215.53		16.15
	492	5.30C	-0.03	11.04	0.00	-209.62	0.00	@ 3.212		@ 3.212
737	492	3.41C	-0.01	86.86	0.00	-209.62	0.00	-215.53		16.15
	494	3.41C	0.01	108.93	0.00	0.00	-0.01	@ 3.212		@ 3.212
738	495	3.06C	2.08	-1.65	0.00	-76.78	0.00	-77.66	0.00	21.12

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Member Forces (Maximum Values)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	497	3.06C	-2.08	1.36	0.00	-76.89	0.00	@ 3.555	@ 4.654	@ 3.485
739	496	5.14C	0.01	-54.31	0.00	27.01	0.00	-80.42	0.00	20.00
	499	5.14C	-0.01	-53.71	0.00	0.00	0.00	@ 3.456	@ 0.495	@ 3.584
740	497	1.67C	2.02	31.45	0.00	-76.85	0.00	-77.66	0.00	21.12
	498	1.67C	-2.02	34.27	0.00	0.00	0.00	@ 3.555	@ 4.654	@ 3.485
741	499	2.95C	0.01	-38.65	0.00	0.01	0.00	-80.42	0.00	20.00
	500	2.95C	-0.01	-36.07	0.00	-80.02	0.00	@ 3.456	@ 0.495	@ 3.584
742	500	1.76C	-0.01	-1.30	0.00	-80.02	0.00	-80.42	0.00	20.00
	503	1.76C	0.01	1.60	0.00	-79.36	0.00	@ 3.456	@ 0.495	@ 3.584
743	501	1.38C	0.01	-30.58	0.00	0.00	0.00	0.00	0.00	3.94
	504	1.38C	-0.01	-28.00	0.00	-62.71	0.00	@ 2.499	@ 2.499	@ 2.499
744	502	2.45C	0.00	-16.58	0.00	0.00	0.00	1.06		4.03
	507	2.45C	0.00	-14.00	0.00	-32.75	0.00	@ 2.456		@ 2.481
745	503	1.02C	0.01	35.76	0.00	-79.37	0.00	-80.42	0.00	20.00
	505	1.02C	-0.01	38.34	0.00	0.00	0.00	@ 3.456	@ 0.495	@ 3.584
746	504	1.45C	0.00	-1.30	0.00	-62.71	0.00	-63.41		6.29
	506	1.45C	0.00	1.29	0.00	-62.73	0.00	@ 1.071		@ 1.971
747	506	1.04C	0.01	28.01	0.00	-62.73	0.00	-63.41		6.29
	508	1.04C	-0.01	30.59	0.00	0.00	0.00	@ 1.071		@ 1.971
748	507	0.95C	0.01	-1.29	0.00	-32.75	0.00	-33.44	0.00	3.31
	509	0.95C	-0.01	1.29	0.00	-32.75	0.00	@ 1.071	@ 2.121	@ 1.971
749	509	0.32C	0.00	14.01	0.00	-32.75	0.00	-33.44	0.00	3.31
	510	0.32C	0.00	16.59	0.00	0.00	0.00	@ 1.071	@ 2.121	@ 1.971
750	2	0.00C	0.00	0.78	0.00	0.00	0.00	1.00	0.00	2.39
	68	0.00C	0.00	-0.78	0.00	0.00	0.00	@ 2.570	@ 0.925	@ 2.570
751	3	435.70T	0.00	0.38	0.00	0.00	0.00	0.36	0.00	0.46
	94	436.41T	0.00	-0.38	0.00	0.00	0.00	@ 1.886	@ 3.696	@ 1.886
752	35	30.44T	0.00	0.78	0.00	0.00	0.00	1.00	0.00	2.39
	36	29.97T	0.00	-0.78	0.00	0.00	0.00	@ 2.570	@ 3.444	@ 2.570
753	35	3.52T	0.00	0.78	0.00	0.00	0.00	1.08	0.00	3.02
	93	3.52T	0.00	-0.78	0.00	0.00	0.00	@ 2.776	@ 1.832	@ 2.776
754	67	171.99T	0.00	0.78	0.00	0.00	0.00	1.08	0.00	3.02
	68	171.31T	0.00	-0.78	0.00	0.00	0.00	@ 2.776	@ 0.666	@ 2.776
755	67	25.73T	0.00	0.78	0.00	0.00	0.00	1.08	0.00	3.02
	161	26.69T	0.00	-0.78	0.00	0.00	0.00	@ 2.776	@ 5.441	@ 2.776
756	68	0.00C	0.00	0.38	0.00	0.00	0.00	0.36	0.00	0.46
	69	0.00C	0.00	-0.38	0.00	0.00	0.00	@ 1.886	@ 3.130	@ 1.886
757	68	382.19T	0.00	0.38	0.00	0.00	0.00	0.35	0.00	0.43
	162	383.15T	0.00	-0.38	0.00	0.00	0.00	@ 1.846	@ 2.252	@ 1.846
[illegible]	92	153.82T	0.00	0.78	0.00	0.00	0.00	1.08	0.00	3.02

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The Maltings, East Tyndall Street
Cardiff Bay, Cardiff CF24 5EA
Tel : 029 2045 1331 Fax : 029 2045 1344

Job ref : GOA/A/1511
Sheet : / 81 -
Made By :
Date : JULY 2007
Checked :
Approved :

Member Forces (Maximum Values)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	93	153.14T	0.00	-0.78	0.00	0.00	0.00	@ 2.776	@ 1.999	@ 2.776
759	92	79.19T	0.00	0.78	0.00	0.00	0.00	1.08	0.00	3.02
	164	80.14T	0.00	-0.78	0.00	0.00	0.00	@ 2.776	@ 1.055	@ 2.776
760	93	0.00C	0.00	0.38	0.00	0.00	0.00	0.35	0.00	0.43
	94	0.00C	0.00	-0.38	0.00	0.00	0.00	@ 1.846	@ 1.255	@ 1.846
761	93	249.33T	0.00	0.38	0.00	0.00	0.00	0.35	0.00	0.43
	170	250.29T	0.00	-0.38	0.00	0.00	0.00	@ 1.846	@ 2.880	@ 1.846
762	160	123.69T	0.00	0.78	0.00	0.00	0.00	1.08	0.00	3.02
	161	123.01T	0.00	-0.78	0.00	0.00	0.00	@ 2.776	@ 1.222	@ 2.776
763	161	1.28T	0.00	0.38	0.00	0.00	0.00	0.35	0.00	0.43
	162	1.28T	0.00	-0.38	0.00	0.00	0.00	@ 1.846	@ 3.544	@ 1.846
764	161	121.35T	0.00	0.38	0.00	0.00	0.00	0.35	0.00	0.43
	319	122.03T	0.00	-0.38	0.00	0.00	0.00	@ 1.846	@ 0.701	@ 1.846
765	164	90.03T	0.00	0.38	0.00	0.00	0.00	0.35	0.00	0.43
	170	89.08T	0.00	-0.38	0.00	0.00	0.00	@ 1.846	@ 0.295	@ 1.846
766	164	105.29T	0.00	0.38	0.00	0.00	0.00	0.35	0.00	0.43
	385	106.25T	0.00	-0.38	0.00	0.00	0.00	@ 1.846	@ 1.034	@ 1.846
767	217	180.02C	0.00	-1.56	3.11	4.44	-9.02	-2.51	4.75	83.19
	218	182.29C	0.00	1.59	-3.14	4.56	-9.09	@ 8.531	@ 8.531	@ 8.531
768	218	21.30T	0.00	0.77	0.00	0.00	0.00	1.01		2.53
	226	21.89T	0.00	-0.77	0.00	0.00	0.00	@ 2.637		@ 2.637
769	219	0.00C	0.00	0.77	0.00	0.00	0.00	1.01	0.00	2.53
	221	0.00C	0.00	-0.77	0.00	0.00	0.00	@ 2.637	@ 4.272	@ 2.637
770	219	178.17T	0.00	0.77	0.00	0.00	0.00	1.05		2.84
	288	178.85T	0.00	-0.77	0.00	0.00	0.00	@ 2.737		@ 2.737
771	223	8.95T	0.00	0.77	0.00	0.00	0.00	1.05	0.00	2.84
	226	8.00T	0.00	-0.77	0.00	0.00	0.00	@ 2.737	@ 0.109	@ 2.737
772	223	243.06T	0.00	0.77	0.00	0.00	0.00	1.05		2.84
	365	243.74T	0.00	-0.77	0.00	0.00	0.00	@ 2.737		@ 2.737
773	286	31.46T	0.00	0.77	0.00	0.00	0.00	1.05	0.00	2.84
	288	30.51T	0.00	-0.77	0.00	0.00	0.00	@ 2.737	@ 2.518	@ 2.737
774	286	195.52T	0.00	0.77	0.00	0.00	0.00	1.05	0.00	2.84
	440	196.21T	0.00	-0.77	0.00	0.00	0.00	@ 2.737	@ 0.219	@ 2.737
775	318	0.77T	0.00	0.38	0.00	0.00	0.00	0.35	0.00	0.43
	319	0.77T	0.00	-0.38	0.00	0.00	0.00	@ 1.846	@ 3.212	@ 1.846
776	318	25.46T	0.00	0.38	0.00	0.00	0.00	0.35	0.00	0.43
	387	26.28T	0.00	-0.38	0.00	0.00	0.00	@ 1.846	@ 3.471	@ 1.846
777	363	35.81T	0.00	0.77	0.00	0.00	0.00	1.05	0.00	2.84
	365	34.85T	0.00	-0.77	0.00	0.00	0.00	@ 2.737	@ 0.712	@ 2.737
778	363	108.45T	0.00	0.77	0.00	0.00	0.00	1.05		2.84

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Job ref : GOA/A/1511
Sheet . / 82 -
Made By .
Date . JULY 2007
Checked :
Approved .

Member Forces (Maximum Values)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	486	109.14T	0.00	-0.77	0.00	0.00	0.00	@ 2.737		@ 2.737
779	384	0.00C	0.00	0.38	0.00	0.00	0.00	0.35	0.00	0.43
	385	0.00C	0.00	-0.38	0.00	0.00	0.00	@ 1.846	@ 3.397	@ 1.846
780	438	27.23T	0.00	0.77	0.00	0.00	0.00	1.05	0.00	2.84
	440	26.27T	0.00	-0.77	0.00	0.00	0.00	@ 2.737	@ 0.547	@ 2.737
781	438	38.50T	0.00	0.77	0.00	0.00	0.00	1.05	0.00	2.84
	487	39.32T	0.00	-0.77	0.00	0.00	0.00	@ 2.737	@ 1.204	@ 2.737
782	484	0.00C	0.00	0.77	0.00	0.00	0.00	1.05		2.84
	486	0.00C	0.00	-0.77	0.00	0.00	0.00	@ 2.737		@ 2.737
783	1	1037.02C	0.00	1.51	0.32	0.00	0.00			0.00
	2	1036.14C	0.00	1.51	0.32	1.51	0.32			@ 0.580
784	2	1035.34C	0.00	1.51	0.40	1.51	0.32			0.08
	35	1033.58C	0.00	1.51	0.40	4.52	1.12			@ 1.080
785	3	1125.01C	0.00	-2.12	15.89	0.00	0.00			0.13
	36	1123.99C	0.00	-2.12	15.89	-2.12	15.89			@ 0.580
786	4	0.00C	0.00	0.00	0.00	0.00	0.00			0.56
	218	0.75T	0.00	0.00	0.00	0.00	0.00			@ 0.000
787	5	956.39C	0.00	10.91	-1.58	0.00	0.00			0.00
	221	955.64C	0.00	10.91	-1.58	5.45	-0.79			@ 0.290
788	6	0.00C	0.00	0.00	0.00	0.00	0.00			0.67
	7	0.75T	0.00	0.00	0.00	0.00	0.00			@ 0.000
789	7	983.74C	0.00	17.45	-1.89	0.00	0.00			0.51
	229	979.99C	0.00	17.45	-1.89	43.62	-4.72			@ 1.450
790	8	204.79C	0.00	2.20	0.35	0.00	0.00			0.17
	9	201.72C	0.00	2.20	0.35	6.59	1.06			@ 1.740
791	9	102.34C	0.00	-2.27	-0.37	6.59	1.06			0.16
	65	99.38C	0.00	-2.27	-0.37	0.00	-0.01			@ 1.218
792	10	207.69C	0.00	2.27	1.26	0.00	0.00			0.29
	51	204.62C	0.00	2.27	1.26	6.80	3.79			@ 1.740
793	11	746.09C	0.00	1.97	0.30	0.00	0.00			0.15
	12	743.02C	0.00	1.97	0.30	5.90	0.91			@ 1.740
794	12	537.43C	0.00	2.00	-0.47	5.90	1.27			0.28
	66	534.47C	0.00	2.00	-0.47	8.86	-0.75			@ 1.537
795	13	824.47C	0.00	-1.85	-1.86	0.00	0.00			0.40
	55	821.40C	0.00	-1.85	-1.86	-5.55	-5.58			@ 1.740
796	14	1457.66C	0.00	1.64	-1.22	0.00	0.00			0.26
	58	1454.60C	0.00	1.64	-1.22	4.92	-3.66			@ 1.740
797	15	588.35C	0.00	1.58	-1.86	0.00	0.00			0.40
	61	585.28C	0.00	1.58	-1.86	4.75	-5.57			@ 1.740
798	16	1112.65C	0.00	-2.36	-0.97	0.00	0.00			0.27

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Tel : 029 2045 1331 Fax : 029 2045 1344

Job ref : GOA/A/1511
Sheet : / 83 -
Made By :
Date : JULY 2007
Checked :
Approved :

Member Forces (Maximum Values)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	95	1109.58C	0.00	-2.36	-0.97	-7.08	-2.91			@ 1.740
799	17	1059.44C	0.00	-2.33	-1.86	0.00	0.00			0.43
	105	1056.37C	0.00	-2.33	-1.86	-6.98	-5.57			@ 1.740
800	18	1596.08C	0.00	-3.41	-1.08	0.00	0.00			0.34
	102	1593.01C	0.00	-3.41	-1.08	-10.24	-3.25			@ 1.740
801	19	1124.92C	0.00	-3.39	-1.87	0.00	0.00			0.47
	117	1121.85C	0.00	-3.39	-1.87	-10.16	-5.60			@ 1.740
802	20	1208.58C	0.00	-4.90	-0.79	0.00	0.00			0.40
	71	1205.51C	0.00	-4.90	-0.79	-14.69	-2.37			@ 1.740
803	21	2302.92C	0.00	-7.77	-1.67	0.00	0.00			0.44
	103	2298.43C	0.00	-7.77	-1.67	-23.31	-5.01			@ 1.740
804	22	1902.78C	0.00	-7.63	-2.84	0.00	0.00			0.54
	122	1898.28C	0.00	-7.63	-2.84	-22.88	-8.51			@ 1.740
805	23	808.39C	0.00	-6.64	-1.19	0.00	0.00			0.55
	24	805.32C	0.00	-6.64	-1.19	-19.91	-3.57			@ 1.740
806	24	651.03C	0.00	6.74	1.62	-19.91	-3.58			0.50
	72	648.07C	0.00	6.74	1.62	1.65	1.15			@ 1.218
807	25	2160.02C	0.00	-10.70	-2.19	0.00	0.00			0.60
	107	2155.52C	0.00	-10.70	-2.19	-32.09	-6.56			@ 1.740
808	26	1515.97C	0.00	-6.58	-1.86	0.00	0.00			0.63
	127	1512.90C	0.00	-6.58	-1.86	-19.74	-5.59			@ 1.740
809	27	1028.65C	0.00	-8.85	2.82	0.00	0.00			0.60
	28	1025.68C	0.00	-8.85	2.82	-25.67	8.17			@ 1.682
810	28	1025.68C	0.00	-8.85	2.82	-25.67	8.17			0.00
	62	1025.59C	0.00	-8.85	2.82	-26.56	8.45			@ 0.050
811	29	0.00C	0.00	0.00	0.00	0.00	0.00	0.00	0.00	22.01
	30	2.97T	0.00	0.00	0.00	0.00	0.00	@ 2.523	@ 2.784	@ 0.000
812	30	1321.33C	0.00	515.96	436.07	0.00	0.00			0.01
	111	1321.25C	0.00	515.96	436.07	51.60	43.61			@ 0.058
813	31	1234.34C	0.00	1.71	-2.69	0.00	0.00			0.54
	32	1231.38C	0.00	1.71	-2.69	4.97	-7.81			@ 1.682
814	32	1231.37C	0.00	1.73	-2.68	5.02	-7.78			0.00
	133	1231.29C	0.00	1.73	-2.68	5.19	-8.05			@ 0.050
815	33	180.29C	0.00	-6.73	-1.75	0.00	0.00			0.62
	130	177.22C	0.00	-6.73	-1.75	-20.20	-5.26			@ 1.740
816	34	1662.00C	0.00	12.65	4.05	0.00	0.00			0.62
	121	1657.51C	0.00	12.65	4.05	37.96	12.15			@ 1.740
817	35	809.71C	0.00	1.34	-0.42	4.52	1.12			0.14
	67	807.16C	0.00	1.34	-0.42	3.58	-0.75			@ 1.276
818	36	1123.06C	0.00	-2.12	-11.93	-2.12	15.89			0.30

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Job ref : GOA/A/1511
Sheet : / 84 -
Made By :
Date : JULY 2007
Checked :
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Member Forces (Maximum Values)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	68	1121.02C	0.00	-2.12	-11.93	-6.35	-7.96			@ 0.680
819	37	523.57C	0.00	6.92	-1.40	0.00	0.00			0.59
	136	520.50C	0.00	6.92	-1.40	20.76	-4.21			@ 1.740
820	38	2202.63C	0.00	13.43	-2.47	0.00	0.00			0.57
	139	2197.09C	0.00	13.43	-2.47	40.29	-7.41			@ 1.740
821	39	341.86C	0.00	-6.13	-1.88	0.00	0.00			0.61
	64	338.79C	0.00	-6.13	-1.88	-18.39	-5.63			@ 1.740
822	40	1920.21C	0.00	11.67	1.59	0.00	0.00			0.57
	134	1915.71C	0.00	11.67	1.59	35.02	4.76			@ 1.740
823	41	1756.42C	0.00	5.90	-1.08	0.00	0.00			0.49
	222	1753.35C	0.00	5.90	-1.08	17.69	-3.25			@ 1.740
824	42	2575.74C	0.00	12.32	-1.72	0.00	0.00			0.50
	146	2570.19C	0.00	12.32	-1.72	36.96	-5.15			@ 1.740
825	43	374.91C	0.00	-2.25	-2.19	0.00	0.00			0.50
	142	371.84C	0.00	-2.25	-2.19	-6.74	-6.57			@ 1.740
826	44	1886.47C	0.00	5.63	-0.83	0.00	0.00			0.45
	231	1883.40C	0.00	5.63	-0.83	16.90	-2.49			@ 1.740
827	45	550.32C	0.00	6.10	-0.70	0.00	0.00			0.48
	148	547.25C	0.00	6.10	-0.70	18.30	-2.11			@ 1.740
828	46	1114.53C	0.00	5.24	-0.80	0.00	0.00			0.42
	238	1111.46C	0.00	5.24	-0.80	15.72	-2.39			@ 1.740
829	47	577.86C	0.00	5.54	-0.71	0.00	0.00			0.44
	237	574.79C	0.00	5.54	-0.71	16.61	-2.13			@ 1.740
830	48	323.48C	0.00	5.15	-0.72	0.00	0.00			0.41
	242	320.41C	0.00	5.15	-0.72	15.46	-2.16			@ 1.740
831	51	102.41C	0.00	-2.15	2.00	6.25	-5.79			0.41
	78	99.44C	0.00	-2.15	2.00	0.01	0.00			@ 1.218
832	55	611.11C	0.00	17.06	-1.56	-5.35	3.87			0.93
	82	608.14C	0.00	17.06	-1.56	44.11	-1.26			@ 1.711
833	58	1082.74C	0.00	-1.69	1.22	4.90	-3.65			0.25
	85	1079.77C	0.00	-1.69	1.22	-0.01	-0.11			@ 1.247
834	61	450.50C	0.00	-1.60	1.65	4.75	-5.57			0.43
	88	447.53C	0.00	-1.60	1.65	2.95	-0.94			@ 1.276
835	62	830.19C	0.00	-15.22	9.00	26.42	-15.22			0.55
	74	827.23C	0.00	-15.22	9.00	-17.71	11.53			@ 1.218
836	64	276.01C	0.00	3.44	2.71	-18.41	-5.63			0.65
	90	273.04C	0.00	3.44	2.71	-8.55	2.25			@ 1.305
837	66	339.13C	0.00	4.23	0.45	8.86	-0.75			0.64
	91	336.16C	0.00	4.23	0.45	19.54	0.82			@ 1.537
838	67	525.87C	0.00	3.52	0.47	3.58	-0.75			0.29

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Cardiff Bay, Cardiff CF24 5EA
Tel : 029 2045 1331 Fax : 029 2045 1344

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Approved	:

Member Forces (Maximum Values)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	92	523.33C	0.00	3.52	0.47	11.33	0.89			@ 1.653
839	68	910.25C	0.00	2.99	3.19	-6.35	-7.96			0.47
	93	907.29C	0.00	2.99	3.19	3.12	1.31			@ 1.160
840	69	1303.70C	0.00	-3.64	-1.09	0.00	0.00			0.23
	94	1299.84C	0.00	-3.64	-1.09	-10.92	-3.27			@ 1.740
841	71	967.53C	0.00	5.57	0.89	-14.69	-2.37			0.34
	100	964.56C	0.00	5.57	0.89	2.47	0.34			@ 1.189
842	72	493.78C	0.00	0.56	-0.19	1.65	1.15			0.14
	104	490.81C	0.00	0.56	-0.19	1.96	0.84			@ 1.450
843	74	631.81C	0.00	-12.78	7.56	18.43	-9.94			0.33
	112	628.84C	0.00	-12.78	7.56	-18.63	11.98			@ 2.030
844	82	387.31C	0.00	29.73	0.44	-37.34	-1.27			0.45
	150	384.34C	0.00	29.73	0.44	48.86	-0.89			@ 2.117
845	86	833.27C	0.00	-46.85	-0.35	152.54	-0.12			3.87
	154	830.30C	0.00	-46.85	-0.35	42.80	-0.96			@ 1.276
846	88	174.98C	0.00	4.43	-0.94	2.95	-0.93			0.32
	156	172.02C	0.00	4.43	-0.94	12.94	-2.11			@ 1.682
847	90	210.28C	0.00	3.18	-0.62	-8.55	2.25			0.26
	158	207.31C	0.00	3.18	-0.62	0.69	0.62			@ 1.247
848	91	169.56C	0.00	-6.74	-0.29	19.54	0.83			0.45
	159	166.60C	0.00	-6.74	-0.29	0.00	-0.01			@ 1.218
849	92	270.66C	0.00	-3.90	-0.31	11.32	0.89			0.27
	160	267.70C	0.00	-3.90	-0.31	0.00	-0.01			@ 1.218
850	93	695.71C	0.00	3.07	0.26	3.12	1.31			0.28
	161	692.74C	0.00	3.07	0.26	10.11	0.98			@ 1.537
851	94	918.21C	0.00	4.86	0.91	-10.94	-3.27			0.22
	162	914.49C	0.00	4.86	0.91	4.44	-0.88			@ 1.247
852	95	862.59C	0.00	3.30	0.84	-7.09	-2.92			0.26
	163	859.62C	0.00	3.30	0.84	2.92	-0.64			@ 1.247
853	100	726.58C	0.00	1.07	0.23	2.47	0.34			0.17
	175	723.61C	0.00	1.07	0.23	4.91	1.00			@ 1.537
854	102	1293.34C	0.00	4.29	1.06	-10.24	-3.34			0.31
	171	1290.37C	0.00	4.29	1.06	2.88	-0.35			@ 1.218
855	103	1864.67C	0.00	8.94	1.77	-23.42	-5.02			0.39
	172	1860.33C	0.00	8.94	1.77	3.91	0.33			@ 1.189
856	104	336.53C	0.00	0.77	-0.95	1.96	0.84			0.15
	194	333.56C	0.00	0.77	-0.95	3.53	-2.22			@ 1.711
857	105	830.18C	0.00	3.23	1.71	-6.98	-5.56			0.43
	173	827.22C	0.00	3.23	1.71	2.75	-0.84			@ 1.276
858	107	1741.99C	0.01	11.23	2.61	-32.08	-6.56			0.54

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Job ref : GOA/A/1511
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Made By .
Date : JULY 2007
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Approved :

Member Forces (Maximum Values)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	176	1737.64C	-0.01	11.23	2.61	2.42	1.08			@ 1.218
859	111	1073.15C	0.00	-24.99	-19.05	51.56	43.43			2.35
	180	1070.19C	0.00	-24.99	-19.05	-21.02	-11.81			@ 1.102
860	112	433.43C	0.00	-10.00	5.89	17.52	-9.49			0.32
	208	430.56C	0.00	-10.00	5.89	-10.49	6.99			@ 0.924
861	117	904.51C	0.00	4.24	1.73	-10.16	-5.59			0.45
	186	901.54C	0.00	4.24	1.73	2.77	-0.68			@ 1.247
862	121	1344.67C	0.01	-14.13	12.66	37.90	-20.42			0.66
	191	1340.32C	-0.01	-14.13	12.66	-3.68	17.22			@ 1.131
863	122	1529.82C	0.00	8.60	2.73	-22.88	-8.50			0.51
	192	1525.47C	0.00	8.60	2.73	3.51	-0.68			@ 1.218
864	127	1222.27C	0.00	6.63	1.88	-19.74	-5.58			0.60
	198	1219.31C	0.00	6.63	1.88	1.57	-0.16			@ 1.247
865	130	145.29C	0.00	6.48	1.72	-20.20	-5.26			0.62
	202	142.32C	0.00	6.48	1.72	-1.50	-0.27			@ 1.247
866	133	994.72C	0.00	-1.54	2.39	5.04	-8.04			0.62
	205	991.76C	0.00	-1.54	2.39	0.80	-1.17			@ 1.276
867	134	1516.26C	0.01	-12.12	5.06	35.03	-9.27			0.67
	207	1511.91C	-0.01	-12.12	5.06	-1.21	6.87			@ 1.276
868	136	421.93C	0.00	-5.52	1.23	20.76	-4.23			0.66
	209	418.96C	0.00	-5.52	1.23	4.81	-0.70			@ 1.305
869	139	1778.15C	0.02	-10.54	1.61	40.28	-7.37			0.67
	213	1772.79C	-0.02	-10.54	1.61	9.90	-2.74			@ 1.305
870	142	220.26C	0.00	-2.08	1.30	-6.73	-6.57			0.76
	217	217.30C	0.00	-2.08	1.30	-11.90	-3.34			@ 1.421
871	146	2018.74C	0.02	-8.25	-0.71	36.95	-5.15			0.71
	241	2013.39C	-0.02	-8.25	-0.71	13.12	-7.18			@ 1.392
872	148	330.95C	0.00	-3.90	-0.98	18.30	-2.08			0.73
	248	327.98C	0.00	-3.90	-0.98	7.06	-4.93			@ 1.421
873	150	193.65C	0.00	30.94	0.32	-20.46	-0.90			1.19
	270	190.69C	0.00	30.94	0.32	69.26	0.01			@ 1.798
874	154	417.52C	0.00	98.55	0.33	-137.86	-0.96			1.13
	287	414.55C	0.00	98.55	0.33	147.92	0.00			@ 2.175
875	156	86.61C	0.00	-4.46	0.73	12.94	-2.11			0.33
	301	83.64C	0.00	-4.46	0.73	0.00	0.00			@ 1.218
876	158	144.54C	0.00	1.58	-0.84	0.69	0.62			0.17
	317	141.58C	0.00	1.58	-0.84	5.26	-2.03			@ 1.682
877	161	468.61C	0.00	-6.07	-1.21	10.12	0.98			0.17
	164	465.65C	0.00	-6.07	-1.21	-7.49	-2.87			@ 1.711
878	162	558.70C	0.00	3.92	0.79	4.42	-0.87			0.27

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Job ref : GOA/A/1511
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Member Forces (Maximum Values)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
	170	554.98C	0.00	3.92	0.79	13.71	1.48			@ 1.566
879	163	612.63C	0.00	3.52	0.49	2.91	-0.64			0.27
	177	609.66C	0.00	3.52	0.49	10.97	0.79			@ 1.653
880	164	144.34C	0.00	2.63	1.05	-7.48	-2.87			0.19
	318	141.38C	0.00	2.63	1.05	1.06	0.51			@ 1.247
881	170	292.82C	-0.01	-7.84	-1.89	13.71	1.48			0.18
	319	289.09C	0.01	-7.84	-1.89	-9.85	-4.07			@ 1.218
882	171	990.70C	0.00	2.52	0.40	2.88	-0.44			0.23
	215	987.73C	0.00	2.52	0.40	8.60	0.72			@ 1.624
883	172	1427.14C	0.00	2.08	0.30	3.70	0.33			0.17
	220	1422.80C	0.00	2.08	0.30	8.45	0.96			@ 1.537
884	173	601.03C	0.00	3.70	-1.23	2.75	-0.84			0.31
	230	598.06C	0.00	3.70	-1.23	11.32	-2.80			@ 1.682
885	175	485.62C	0.00	-2.72	-1.12	4.93	1.00			0.16
	311	482.66C	0.00	-2.72	-1.12	3.22	-2.49			@ 1.711
886	176	1324.60C	0.00	0.36	-0.14	2.42	1.08			0.10
	244	1320.25C	0.00	0.36	-0.14	2.64	0.66			@ 1.421
887	177	362.67C	0.00	-6.65	-1.11	10.97	0.79			0.13
	320	359.71C	0.00	-6.65	-1.11	-8.31	-2.43			@ 1.711
888	180	802.85C	0.00	9.31	5.27	-21.01	-11.77			0.69
	252	799.89C	0.00	9.31	5.27	6.21	3.57			@ 1.102
889	186	684.21C	0.00	2.58	-0.97	2.77	-0.68			0.26
	260	681.24C	0.00	2.58	-0.97	8.68	-2.28			@ 1.653
890	191	1023.87C	-0.01	0.73	10.71	-3.66	-14.41			0.24
	264	1019.53C	0.01	0.73	10.71	-1.55	16.67			@ 2.175
891	192	1159.07C	0.00	1.75	-0.93	3.51	-0.68			0.18
	266	1154.72C	0.00	1.75	-0.93	7.71	-2.38			@ 1.624
892	194	179.27C	0.00	-1.06	0.79	3.53	-2.22			0.17
	324	176.31C	0.00	-1.06	0.79	0.46	0.50			@ 1.218
893	198	930.83C	0.00	0.62	-0.23	1.57	-0.16			0.09
	271	927.86C	0.00	0.62	-0.23	2.04	-0.70			@ 1.537
894	202	110.39C	0.00	0.85	-0.13	-1.50	-0.27			0.07
	275	107.42C	0.00	0.85	-0.13	1.61	-0.46			@ 1.479
895	205	754.86C	0.00	0.17	0.50	0.80	-1.18			0.07
	279	751.90C	0.00	0.17	0.50	1.29	0.34			@ 1.160
896	207	1122.74C	-0.01	-0.75	5.09	-1.21	-9.58			0.25
	280	1118.39C	0.01	-0.75	5.09	-2.68	6.50			@ 1.073
897	208	430.56C	0.00	-10.00	5.89	-10.49	6.99			0.01
	314	430.52C	0.00	-10.00	5.89	-11.49	7.58			@ 0.050
898	209	320.39C	0.00	-1.68	0.33	4.81	-0.71			0.11

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Member Forces (Maximum Values)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	282	317.42C	0.00	-1.68	0.33	0.44	0.29			@ 1.218
899	213	1353.86C	-0.01	-3.33	1.05	9.89	-2.70			0.14
	285	1348.50C	0.01	-3.33	1.05	1.59	0.37			@ 1.218
900	215	688.06C	0.00	-5.27	-0.99	8.60	0.63			0.14
	326	685.09C	0.00	-5.27	-0.99	-6.68	-2.24			@ 1.653
901	217	126.49C	0.02	2.07	2.25	-6.01	-6.52			0.44
	296	123.52C	-0.02	2.07	2.25	0.00	-0.02			@ 1.218
902	218	791.37C	-0.01	9.87	3.52	7.98	-6.30			0.53
	219	787.63C	0.01	9.87	3.52	30.40	-4.52			@ 1.300
903	219	646.76C	0.01	-5.54	0.93	30.40	-4.53			0.71
	223	642.42C	-0.01	-5.54	0.93	14.52	-1.85			@ 1.363
904	220	989.61C	-0.01	-5.38	-1.48	8.27	0.96			0.14
	327	985.27C	0.01	-5.38	-1.48	-7.32	-3.38			@ 1.682
905	221	954.77C	0.00	10.91	-1.58	5.45	-0.79			0.46
	226	951.03C	0.00	10.91	-1.58	32.72	-4.74			@ 1.400
906	222	1417.45C	0.00	-2.61	0.50	17.70	-3.25			0.71
	227	1414.49C	0.00	-2.61	0.50	10.12	-1.83			@ 1.392
907	223	497.07C	-0.01	-4.60	0.88	14.52	-1.85			0.24
	286	492.72C	0.01	-4.60	0.88	1.23	0.70			@ 1.247
908	226	898.22C	0.01	-11.18	0.89	28.51	-4.75			0.51
	288	893.87C	-0.01	-11.18	0.89	-13.17	-2.19			@ 1.247
909	227	1078.59C	0.00	-3.30	0.71	10.13	-1.82			0.27
	299	1075.63C	0.00	-3.30	0.71	0.60	0.24			@ 1.247
910	229	788.99C	0.01	-9.96	0.57	27.78	-4.73			0.56
	289	784.64C	-0.01	-9.96	0.57	-7.92	-3.10			@ 1.305
911	230	371.87C	0.00	-6.87	2.31	11.32	-2.81			0.12
	329	368.90C	0.00	-6.87	2.31	-8.61	3.89			@ 0.957
912	231	1482.30C	0.00	-2.07	-0.42	16.90	-2.51			0.75
	246	1479.34C	0.00	-2.07	-0.42	10.90	-3.70			@ 1.421
913	237	370.31C	0.00	-1.86	-0.88	16.61	-2.14			0.77
	251	367.35C	0.00	-1.86	-0.88	11.23	-4.69			@ 1.450
914	238	867.05C	0.00	0.56	-0.50	15.72	-2.37			0.79
	295	864.08C	0.00	0.56	-0.50	14.59	-3.81			@ 1.450
915	241	1488.38C	-0.01	-5.02	2.44	13.11	-7.18			0.29
	304	1483.02C	0.01	-5.02	2.44	-1.55	-0.30			@ 1.218
916	242	202.17C	0.00	0.61	-0.84	15.46	-2.14			0.81
	300	199.20C	0.00	0.61	-0.84	15.05	-4.57			@ 1.479
917	244	907.21C	-0.01	1.40	-1.22	2.64	0.66			0.15
	331	902.86C	0.01	1.40	-1.22	5.72	-2.97			@ 1.682
918	246	1078.24C	0.00	-3.66	1.23	10.90	-3.71			0.37

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Job ref : GOA/A/1511
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Member Forces (Maximum Values)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	306	1075.28C	0.00	-3.66	1.23	0.51	-0.17			@ 1.247
919	248	172.59C	0.00	-2.42	1.70	7.03	-4.95			0.37
	310	169.62C	0.00	-2.42	1.70	0.00	-0.01			@ 1.218
920	251	162.87C	0.00	-3.87	1.62	11.23	-4.70			0.41
	312	159.91C	0.00	-3.87	1.62	0.00	0.04			@ 1.218
921	252	551.79C	0.00	-1.66	-1.92	6.21	3.56			0.21
	258	548.93C	0.00	-1.66	-1.92	1.68	-1.88			@ 1.120
922	258	548.93C	0.00	-1.67	-1.92	1.68	-1.88			0.00
	334	548.88C	0.00	-1.67	-1.92	1.53	-2.07			@ 0.050
923	260	463.90C	0.00	-5.13	1.98	8.68	-2.29			0.12
	340	460.93C	0.00	-5.13	1.98	-6.21	3.46			@ 1.073
924	264	702.73C	-0.01	1.48	9.16	-1.56	-14.95			0.26
	344	698.38C	0.01	1.48	9.16	-4.93	12.14			@ 0.783
925	266	788.32C	-0.01	-4.25	2.27	7.71	-2.38			0.13
	345	783.98C	0.01	-4.25	2.27	-4.61	4.21			@ 1.508
926	271	639.38C	0.00	0.75	0.88	2.04	-0.71			0.14
	349	636.41C	0.00	0.75	0.88	3.51	1.83			@ 1.624
927	275	75.48C	0.00	0.95	0.70	1.61	-0.46			0.14
	352	72.52C	0.00	0.95	0.70	3.86	1.57			@ 1.624
928	279	515.33C	0.00	-1.67	0.25	1.30	0.34			0.14
	356	512.36C	0.00	-1.67	0.25	5.25	1.07			@ 1.624
929	280	671.25C	-0.01	1.91	3.83	-2.69	-6.14			0.16
	357	666.90C	0.01	1.91	3.83	-4.84	6.32			@ 1.827
930	282	218.85C	0.00	-1.39	0.52	0.44	0.30			0.14
	360	215.88C	0.00	-1.39	0.52	-3.58	1.78			@ 1.624
931	285	929.57C	-0.01	-4.17	1.15	1.60	0.46			0.14
	362	924.21C	0.01	-4.17	1.15	-10.50	3.74			@ 1.624
932	286	335.47C	-0.01	-2.05	0.55	1.24	0.70			0.13
	363	331.13C	0.01	-2.05	0.55	-5.15	2.23			@ 1.566
933	288	696.40C	-0.01	-41.38	0.88	68.73	-2.19			0.42
	365	692.05C	0.01	-41.38	0.88	-51.29	0.41			@ 0.812
934	289	599.73C	-0.01	-37.94	1.12	63.56	-3.09			0.41
	367	595.38C	0.01	-37.94	1.12	-46.87	0.20			@ 0.841
935	295	619.67C	0.00	-4.63	1.26	14.59	-3.80			0.45
	373	616.70C	0.00	-4.63	1.26	1.19	-0.18			@ 1.247
936	299	739.73C	0.00	-1.31	0.52	0.61	0.25			0.13
	368	736.77C	0.00	-1.31	0.52	-3.22	1.76			@ 1.624
937	300	80.96C	0.00	-5.19	1.56	15.05	-4.55			0.46
	377	78.00C	0.00	-5.19	1.56	0.00	-0.01			@ 1.218
938	304	866.17C	-0.01	-2.47	1.70	-1.55	-0.30			0.16

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Cardiff Bay, Cardiff CF24 5EA
Tel : 029 2045 1331 Fax . 029 2045 1344

Job ref : GOA/A/1511
Sheet : / 90 -
Made By :
Date . JULY 2007
Checked :
Approved :

Member Forces (Maximum Values)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	374	860.81C	0.01	-2.47	1.70	-6.79	4.80			@ 1.682
939	306	629.71C	0.00	-1.26	0.93	0.51	-0.22			0.16
	378	626.74C	0.00	-1.26	0.93	-3.15	2.51			@ 1.711
940	311	244.67C	0.00	-2.49	0.90	3.21	-2.49			0.16
	358	241.70C	0.00	-2.49	0.90	-4.02	0.51			@ 1.218
941	314	235.10C	0.00	-18.13	10.85	24.66	-13.89			0.38
	328	232.24C	0.00	-18.13	10.85	-26.11	16.50			@ 2.100
942	317	78.81C	0.00	-1.76	0.72	5.26	-2.03			0.18
	383	75.84C	0.00	-1.76	0.72	0.17	0.48			@ 1.218
943	318	12.58C	0.00	-0.36	-0.18	1.06	0.51			0.24
	384	11.36C	0.00	-0.36	-0.18	0.01	0.00			@ 1.218
944	319	157.15C	0.00	16.18	1.45	-9.86	-4.07			0.51
	385	153.43C	0.00	16.18	1.45	37.07	0.49			@ 1.624
945	320	135.09C	0.00	2.96	0.87	-8.31	-2.42			0.24
	386	132.55C	0.00	2.96	0.87	1.15	0.43			@ 1.247
946	324	21.74C	0.00	-0.17	-0.17	0.48	0.50			0.24
	395	20.52C	0.00	-0.17	-0.17	-0.04	0.00			@ 1.218
947	326	385.43C	0.00	3.17	0.85	-6.68	-2.34			0.18
	393	382.46C	0.00	3.17	0.85	2.53	0.50			@ 1.218
948	327	551.63C	-0.01	6.37	1.18	-7.50	-3.38			0.16
	394	547.29C	0.01	6.37	1.18	10.98	0.48			@ 1.247
949	328	232.24C	0.00	-18.13	10.85	-26.11	16.50			0.02
	380	232.19C	0.00	-18.13	10.85	-27.92	17.58			@ 0.050
950	329	142.72C	0.00	3.08	-1.25	-8.61	3.88			0.34
	396	139.75C	0.00	3.08	-1.25	1.24	0.26			@ 1.247
951	331	489.36C	-0.01	-1.82	1.04	5.72	-2.97			0.16
	398	485.02C	0.01	-1.82	1.04	0.43	0.51			@ 1.218
952	334	301.78C	0.00	3.05	0.75	1.53	-2.07			0.17
	339	298.91C	0.00	3.05	0.75	7.46	0.23			@ 1.372
953	339	298.91C	0.00	3.05	0.75	7.46	0.23			0.02
	402	298.88C	0.00	3.05	0.75	7.76	0.21			@ 0.050
954	340	243.60C	0.00	2.11	-1.19	-6.21	3.45			0.27
	408	240.63C	0.00	2.11	-1.19	-0.10	0.01			@ 1.218
955	344	381.58C	-0.01	-1.36	17.09	-4.94	-20.02			0.59
	412	377.23C	0.01	-1.36	17.09	-2.02	29.55			@ 2.059
956	345	417.41C	-0.01	1.53	-1.44	-4.61	4.20			0.20
	418	413.07C	0.01	1.53	-1.44	-0.18	0.02			@ 1.218
957	349	347.78C	0.00	-1.07	0.52	3.51	1.82			0.15
	426	344.82C	0.00	-1.07	0.52	0.40	0.50			@ 1.305
958	352	40.58C	0.00	-1.20	0.50	3.86	1.57			0.14

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Cardiff Bay, Cardiff CF24 5EA
Tel : 029 2045 1331 Fax : 029 2045 1344

Job ref : GOA/A/1511
Sheet : / 91 -
Made By :
Date : JULY 2007
Checked :
Approved :

Member Forces (Maximum Values)

Member No.	Node End1	End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
	429		37.62C	0.00	-1.20	0.50	0.37	0.52			@ 1.247
959	356		276.78C	0.00	-1.73	-0.31	5.26	1.06			0.13
	359		273.92C	0.00	-1.73	-0.31	-1.63	0.20			@ 1.204
960	357		360.04C	-0.01	-1.29	8.12	-4.84	-8.96			0.37
	427		355.69C	0.01	-1.29	8.12	-1.48	14.59			@ 1.827
961	358		6.63T	0.00	5.06	-0.18	-4.01	0.51			1.09
	432		7.85T	0.00	5.06	-0.18	10.66	0.00			@ 1.856
962	359		273.92C	0.00	-1.73	-0.33	-1.63	0.19			0.00
	431		273.88C	0.00	-1.73	-0.33	-1.56	0.17			@ 0.050
963	360		117.31C	0.00	0.75	-0.58	-3.58	1.78			0.13
	434		114.34C	0.00	0.75	-0.58	-1.41	-0.30			@ 1.247
964	362		505.27C	-0.01	7.44	-1.28	-10.49	3.78			0.15
	437		499.92C	0.01	7.44	-1.28	11.07	-0.43			@ 1.334
965	363		171.58C	-0.01	1.24	-0.70	-5.15	2.23			0.11
	438		167.24C	0.01	1.24	-0.70	-1.56	-0.25			@ 1.247
966	365		428.49C	-0.01	-40.63	0.52	58.98	0.42			0.24
	440		424.14C	0.01	-40.63	0.52	-58.98	1.88			@ 0.638
967	367		417.21C	-0.01	-38.24	0.77	55.22	0.21			0.23
	442		412.86C	0.01	-38.24	0.77	-55.67	2.43			@ 2.262
968	368		400.87C	0.00	0.63	-0.57	-3.20	1.76			0.13
	447		397.91C	0.00	0.63	-0.57	-1.50	-0.26			@ 1.247
969	373		370.26C	0.00	-1.54	0.91	1.19	-0.17			0.16
	448		367.30C	0.00	-1.54	0.91	-3.28	2.50			@ 1.711
970	374		461.05C	-0.01	1.81	-1.65	-6.78	4.79			0.17
	453		455.70C	0.01	1.81	-1.65	-1.54	-0.23			@ 1.218
971	378		338.87C	0.00	0.62	-0.88	-3.15	2.51			0.17
	456		335.90C	0.00	0.62	-0.88	-1.50	-0.21			@ 1.218
972	380		32.14C	0.00	-4.65	2.47	8.15	-3.89			0.86
	399		30.96C	0.00	-4.65	2.47	-4.88	3.03			@ 0.784
973	383		9.83C	0.00	-0.13	-0.17	0.17	0.49			0.23
	491		8.61C	0.00	-0.13	-0.17	-0.26	0.00			@ 1.247
974	385		33.16C	0.00	-7.93	-0.17	9.54	0.49			0.88
	387		31.94C	0.00	-7.93	-0.17	-13.46	0.00			@ 2.059
975	386		20.55C	0.00	-0.40	-0.15	1.15	0.43			0.21
	390		19.33C	0.00	-0.40	-0.15	0.00	0.00			@ 1.218
976	393		82.80C	0.00	-2.80	-0.11	2.53	0.40			0.59
	439		81.58C	0.00	-2.80	-0.11	-5.58	0.17			@ 1.798
977	394		114.10C	0.00	-12.02	-0.15	10.86	0.48			2.23
	443		112.89C	0.00	-12.02	-0.15	-23.99	0.07			@ 1.914
078	396		24.48C	0.00	-0.43	-0.09	1.25	0.26			0.19

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REVISED STRUCTURAL CALCULATIONS FOR SUPERSTRUCTURE (PAGES 2-199)

PROPOSED OFFICE DEVELOPMENT AT 18 ORCHARD STREET NEATH

PART II

THOMAS PARRY DESIGN PARTNERSHIP
THE OLD SKETTY COACH HOUSE
GOWER ROAD
SWANSEA

STRUCTURAL ENGINEERS
SLOWIKOWSKI, BLACKSHAW AND PARTNERS

The Maltings, East Tyndall Street
Cardiff Bay, Cardiff CF24 5EA
Tel : 029 2045 1331 Fax : 029 2045 1344

PROJECT NO: GOA/A/1511

JULY 2007

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The Maltings, East Tyndall Street
Cardiff Bay, Cardiff CF24 5EA
Tel : 029 2045 1331 Fax : 029 2045 1344

Job ref : GOA/A/1511
Sheet : / 92 -
Made By :
Date : JULY 2007
Checked :
Approved :

Member Forces (Maximum Values)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
	425	23.26C	0.00	-0.43	-0.09	-0.01	0.01			@ 1.218
979	398	75.77C	0.00	-0.15	-0.18	0.43	0.52			0.25
	467	74.55C	0.00	-0.15	-0.18	-0.02	0.00			@ 1.218
980	399	30.96C	0.00	-4.13	-3.27	-4.73	-3.26			0.21
	474	30.92C	0.00	-4.13	-3.27	-5.14	-3.59			@ 0.050
981	402	53.49C	0.00	-10.49	-0.63	7.77	0.25			2.16
	407	52.31C	0.00	-10.49	-0.63	-21.59	-1.52			@ 1.764
982	407	52.31C	0.00	-10.49	-0.63	-21.59	-1.52			0.10
	476	52.28C	0.00	-10.49	-0.63	-22.64	-1.58			@ 0.050
983	412	60.43C	0.00	1.25	0.74	-2.02	-2.04			1.14
	479	59.21C	0.00	1.25	0.74	1.60	0.75			@ 1.305
984	413	40.91C	0.00	6.22	1.05	-0.45	-2.93			2.74
	459	39.69C	0.00	6.22	1.05	17.65	0.17			@ 1.624
985	419	27.66T	0.00	-0.36	0.14	0.54	-0.21			1.53
	472	27.66T	0.00	-0.36	0.14	-0.50	0.21			@ 0.725
986	422	30.31C	0.00	3.62	3.41	-1.24	-9.79			4.67
	465	29.09C	0.00	3.62	3.41	9.25	0.10			@ 1.247
987	426	53.45C	0.00	-0.15	-0.17	0.44	0.49			0.23
	471	52.23C	0.00	-0.15	-0.17	0.00	0.00			@ 1.218
988	427	49.90C	0.00	0.64	-2.89	-1.48	1.93			2.24
	498	48.68C	0.00	0.64	-2.89	0.37	-6.46			@ 1.798
989	429	4.20C	0.00	-0.13	-0.18	0.37	0.52			0.25
	473	2.98C	0.00	-0.13	-0.18	0.00	0.00			@ 1.218
990	431	45.07C	0.00	0.57	-0.08	-1.54	0.17			0.21
	433	43.90C	0.00	0.57	-0.08	0.09	-0.05			@ 1.148
991	433	43.90C	0.00	0.57	-0.08	0.09	-0.05			0.00
	482	43.85C	0.00	0.57	-0.08	0.12	-0.05			@ 0.050
992	434	13.77C	0.00	0.49	0.10	-1.42	-0.29			0.25
	483	12.55C	0.00	0.49	0.10	0.00	-0.01			@ 1.218
993	437	80.98C	0.00	-13.10	0.08	11.08	-0.27			2.62
	496	79.76C	0.00	-13.10	0.08	-26.92	-0.03			@ 1.885
994	438	20.01C	0.00	0.54	0.08	-1.56	-0.25			0.26
	484	18.79C	0.00	0.54	0.08	0.00	-0.01			@ 1.218
995	440	191.30C	-0.01	-31.85	-0.56	45.55	1.89			0.20
	486	186.96C	0.01	-31.85	-0.56	-46.81	0.30			@ 2.233
996	442	232.38C	-0.01	-27.24	-0.78	39.92	2.44			0.18
	488	228.04C	0.01	-27.24	-0.78	-39.48	-0.21			@ 0.725
997	447	62.01C	0.00	0.51	0.08	-1.49	-0.23			0.25
	501	60.80C	0.00	0.51	0.08	-0.02	0.00			@ 1.218
998	448	197.89C	0.00	1.18	-0.88	-3.28	2.51			0.17

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Job ref : GOA/A/1511
Sheet : / 93 -
Made By :
Date : JULY 2007
Checked :
Approved

Member Forces (Maximum Values)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	494	194.93C	0.00	1.18	-0.88	-1.50	-0.23			@ 1.218
999	453	57.01C	0.00	0.53	0.09	-1.54	-0.26			0.26
	505	55.79C	0.00	0.53	0.09	0.00	0.01			@ 1.218
1000	456	46.21C	0.00	0.52	0.09	-1.50	-0.24			0.25
	508	44.99C	0.00	0.52	0.09	0.00	0.01			@ 1.218
1001	486	36.94C	0.00	-6.32	-0.11	8.22	0.30			0.55
	487	35.89C	0.00	-6.32	-0.11	-10.12	-0.01			@ 2.146
1002	488	33.63C	0.00	-6.00	0.08	7.68	-0.22			0.55
	502	32.41C	0.00	-6.00	0.08	-9.73	0.00			@ 2.117
1003	494	24.65C	0.00	0.52	0.08	-1.50	-0.23			0.25
	510	23.43C	0.00	0.52	0.08	0.00	0.00			@ 1.218

Support Reactions (Maximum Values)

Node	Directional Reactions (kN)			Moment Reactions (kN.m)		
	Rx→(kN)	Ry↑(kN)	Rz↗(kN)	Mx→(kN.m)	My↑(kN.m)	Mz↗(kN.m)
1	-1.505	1037.015	0.323	0.000	0.000	0.000
3	-262.102	1125.630	15.894	0.000	0.000	0.000
5	6.303	956.391	-9.041	0.000	0.000	0.000
7	9.496	984.485	-14.755	0.000	0.000	0.000
8	-2.196	204.790	0.354	0.000	0.000	0.000
10	-2.267	207.686	1.264	0.000	0.000	0.000
11	-1.965	746.087	0.303	0.000	0.000	0.000
13	1.850	824.468	-1.859	0.000	0.000	0.000
14	-1.641	1457.664	-1.219	0.000	0.000	0.000
15	-1.582	588.353	-1.857	0.000	0.000	0.000
16	2.360	1112.651	-0.970	0.000	0.000	0.000
17	2.327	1059.442	-1.856	0.000	0.000	0.000
18	3.412	1596.082	-1.082	0.000	0.000	0.000
19	3.386	1124.918	-1.867	0.000	0.000	0.000
20	4.898	1208.584	-0.791	0.000	0.000	0.000
21	7.769	2302.922	-1.672	0.000	0.000	0.000
22	7.626	1902.779	-2.837	0.000	0.000	0.000
23	6.637	808.389	-1.190	0.000	0.000	0.000
25	10.695	2160.020	-2.185	0.000	0.000	0.000
26	6.581	1515.968	-1.863	0.000	0.000	0.000
27	8.853	1028.645	2.818	0.000	0.000	0.000
30	-515.963	1324.300	436.065	0.000	0.000	0.000
31	1.787	1234.342	-2.659	0.000	0.000	0.000
33	6.734	180.292	-1.752	0.000	0.000	0.000
34	7.196	1662.002	-10.624	0.000	0.000	0.000
37	4.373	523.572	-5.541	0.000	0.000	0.000
38	8.272	2202.628	-10.864	0.000	0.000	0.000
39	6.131	341.861	-1.877	0.000	0.000	0.000
40	6.648	1920.208	-9.673	0.000	0.000	0.000
41	3.611	1756.416	-4.785	0.000	0.000	0.000
42	7.109	2575.737	-10.207	0.000	0.000	0.000
43	3.003	374.907	-0.910	0.000	0.000	0.000

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Support Reactions (Maximum Values)

Node	Directional Reactions (kN)			Moment Reactions (kN.m)		
	Rx→(kN)	Ry↑(kN)	Rz↗(kN)	Mx→(kN.m)	My↑(kN.m)	Mz↗(kN.m)
44	3.268	1886.467	-4.663	0.000	0.000	0.000
45	3.389	550.321	-5.121	0.000	0.000	0.000
46	3.062	1114.531	-4.328	0.000	0.000	0.000
47	3.117	577.856	-4.631	0.000	0.000	0.000
48	2.953	323.480	-4.284	0.000	0.000	0.000
69	3.640	1304.228	-1.088	0.000	0.000	0.000
218	-167.813	799.789	57.635	0.000	0.000	0.000
Total	-796.438	43417.630	378.164	0.000	0.000	0.000

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Design of Composite and Non- Composite FloorsBeams Levels 1-5

UNPROPPED NON-COMPOSITE SECONDARY EDGE BEAM
Member 17 (A2-H2) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]		
Floor Area Supported	1.025 m Span and 2.312 m to LH Beam		
Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick		
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m		
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame		

Section Properties

Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³		

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 17.68 kN, RH Support 15.74 kN	< 169.03 kN	OK
Check @ 0.497 m (Max. Moment)	M = 4.28 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 4.48 kN, RH Support 3.83 kN	< 169.03 kN	OK
Check @ 0.497 m (Max. Moment)	M = 1.07 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 5.1 kN, RH Support 4.33 kN		
Super Imposed Dead Load	LH Support 4.08 kN, RH Support 3.97 kN		
Dead Load (Self Weight)	LH Support 2.71 kN, RH Support 2.33 kN		
Maximum Deflection			
Live Loads	0.04 (0.04) mm @ 0.507 m < L / 360 = 2.8 mm	0.04 mm	OK
Super Imposed Dead Loads	0.03 mm @ 0.507 m	0.03 mm	
Dead Loads (Self Weight)	0.02 mm @ 0.507 m	0.02 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 5.5, Super Dead 4.6, SW 2.9 < 275	13.02 N/mm²	OK
TOTAL (Compression)	Live 5.5, Super Dead 4.6, SW 2.9 < 275	13.02 N/mm²	OK

Vibration Analysis

Beam Deflection		0.06 mm	
Natural Frequency	18/√(0.06) = 75.83 > 4 Hz	75.83 Hz	OK

UNPROPPED NON-COMPOSITE PRIMARY INTERNAL BEAM
Member 23 (B9-D9) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	2.74 m Span, 6.705 m to LH Beam and 4.795 m to RH Beam
Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick

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Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m		
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame		

Section Properties

Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³		

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	0.58 kN each side	< 169.03 kN	OK
Check @ 1.37 m (Max. Moment)	M = 0.4 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Lateral Torsional Buckling (Final Stage)

Check between 0 and 2.74 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 0, 1	0 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.74 m, 3.83 cm, 1, 0.849, 0.84	58.324 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	0.58 kN each side	< 169.03 kN	OK
Check @ 1.37 m (Max. Moment)	M = 0.4 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.74 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 0, 1	0 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.74 m, 3.83 cm, 1, 0.849, 0.84	58.324 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	0 kN each side		
Super Imposed Dead Load	0 kN each side		
Dead Load (Self Weight)	0.41 kN each side		
Maximum Deflection			
Live Loads	0.00 (0.00) mm @ 1.48 m < L / 360 = 7.6 mm	0.00 mm	OK
Super Imposed Dead Loads	0.00 mm @ 1.671 m	0.00 mm	
Dead Loads (Self Weight)	0.06 mm @ 1.37 m	0.06 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 0, Super Dead 0, SW 1.3 < 275	1.27 N/mm²	OK
TOTAL (Compression)	Live 0, Super Dead 0, SW 1.3 < 275	1.27 N/mm²	OK

Vibration Analysis

Beam Deflection		0.06 mm	
Natural Frequency	18/√(0.06) = 72.82 > 4 Hz	72.82 Hz	OK

UNPROPPED NON-COMPOSITE SECONDARY EDGE BEAM
Member 39 (A2-H2) @ Level 2

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	1.025 m Span and 2.312 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³

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Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 17.68 kN, RH Support 15.74 kN	< 169.03 kN	OK
Check @ 0.497 m (Max. Moment)	M = 4.28 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 4.48 kN, RH Support 3.83 kN	< 169.03 kN	OK
Check @ 0.497 m (Max. Moment)	M = 1.07 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 5.1 kN, RH Support 4.33 kN		
Super Imposed Dead Load	LH Support 4.08 kN, RH Support 3.97 kN		
Dead Load (Self Weight)	LH Support 2.71 kN, RH Support 2.33 kN		
Maximum Deflection			
Live Loads	0.04 (0.04) mm @ 0.507 m < L / 360 = 2.8 mm	0.04 mm	OK
Super Imposed Dead Loads	0.03 mm @ 0.507 m	0.03 mm	
Dead Loads (Self Weight)	0.02 mm @ 0.507 m	0.02 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 5.5, Super Dead 4.6, SW 2.9 < 275	13.02 N/mm²	OK
TOTAL (Compression)	Live 5.5, Super Dead 4.6, SW 2.9 < 275	13.02 N/mm²	OK

Vibration Analysis

Beam Deflection		0.06 mm	
Natural Frequency	$18/\sqrt{(0.06)} = 75.83 > 4$ Hz	75.83 Hz	OK

UNPROPPED NON-COMPOSITE PRIMARY INTERNAL BEAM
Member 49 (B9-D9) @ Level 2

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	2.74 m Span, 6.705 m to LH Beam and 4.795 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	0.58 kN each side	< 169.03 kN	OK
Check @ 1.37 m (Max. Moment)	M = 0.4 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Lateral Torsional Buckling (Final Stage)

Check between 0 and 2.74 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 0, 1	0 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.74 m, 3.83 cm, 1, 0.849, 0.84	58.324 kN.m	OK

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Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	0.58 kN each side	< 169.03 kN	OK
Check @ 1.37 m (Max. Moment)	M = 0.4 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.74 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 0, 1	0 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.74 m, 3.83 cm, 1, 0.849, 0.84	58.324 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	0 kN each side		
Super Imposed Dead Load	0 kN each side		
Dead Load (Self Weight)	0.41 kN each side		
Maximum Deflection			
Live Loads	0.00 (0.00) mm @ 2.028 m < L / 360 = 7.6 mm	0.00 mm	OK
Super Imposed Dead Loads	0.00 mm @ 1.288 m	0.00 mm	
Dead Loads (Self Weight)	0.06 mm @ 1.37 m	0.06 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 0, Super Dead 0, SW 1.3 < 275	1.27 N/mm²	OK
TOTAL (Compression)	Live 0, Super Dead 0, SW 1.3 < 275	1.27 N/mm²	OK

Vibration Analysis

Beam Deflection		0.06 mm	
Natural Frequency	18/√(0.06) = 72.83 > 4 Hz	72.83 Hz	OK

UNPROPPED NON-COMPOSITE SECONDARY INTERNAL BEAM
Member 60 (D4-H5) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m) 152x152 UC 30 [S 275]
1.002 m to LH Beam and .188 m to RH Beam
Spacing 152, Height 51, Average Width 128 in 1 mm thick
with 252 mm²/m IMPORTANT: Beam Loads
obtained directly from MasterFrame

Floor Area Supported .748 m Span,
Non-Continuous Holorib Z35 Trough
Concrete Slab 130 mm Thick @ 2350 kg/m³
All internal forces and deflection values are

Section Properties

Steel Section Elastic Properties ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 6.58 kN, RH Support 6.72 kN	< 169.03 kN	OK
Check @ 0.378 m (Max. Moment)	M = 1.24 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 2.3 kN, RH Support 2.34 kN	< 169.03 kN	OK
Check @ 0.378 m (Max. Moment)	M = 0.43 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 2.56 kN, RH Support 2.62 kN		

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Super Imposed Dead Load	0.38 kN each side		
Dead Load (Self Weight)	LH Support 1.4 kN, RH Support 1.43 kN		
Maximum Deflection			
Live Loads	0.01 (0.01) mm @ 0.378 m < L / 360 = 2 mm	0.01 mm	OK
Super Imposed Dead Loads	0.00 mm @ 0.378 m	0.00 mm	
Dead Loads (Self Weight)	0.01 mm @ 0.378 m	0.01 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 2.2, Super Dead 0.3, SW 1.2 < 275	3.69 N/mm²	OK
TOTAL (Compression)	Live 2.2, Super Dead 0.3, SW 1.2 < 275	3.69 N/mm²	OK

Vibration Analysis

Beam Deflection		0.01 mm	
Natural Frequency	18/√(0.01) = 217.59 > 4 Hz	217.59 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 75 (N.129-N.143) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (43 kg/m)	254x146 UB 43 [S 275]
Floor Area Supported	7.025 m Span, 2.135 m to LH Beam and 2.339 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1756 mm², b1= 878 mm and b2= 878 mm
Steel Section Elastic Properties	ye 129.8 mm, A 54.8 cm², Ix 6545 cm⁴, Zt 504 cm³, Zb 504 cm³
Composite Section Elastic Properties	ye 101.9 mm, Ix 26324 cm⁴, Zs.t 9377 cm³, Zs.b 917 cm³, Zc.t 25914 cm³
Headed Stud Connector	23 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 126.52 kN, RH Support 127.31 kN	< 308.40 kN	OK
Check @ 3.512 m (Max. Moment)	M = 222.9 kN.m, Fv = 0.2 kN		
Shear Connection	No of shear connectors from nearest support 11 < 17.3	Partial	
Axial Resistance (kN)	Rc 2497.39 kN, Rs 1506.18 kN, Rq 959.2 kN	959.2 kN	
Degree of Shear Connection	Na/Np = 11 / 17.3 > 0.4	0.637	OK
Reduced Concrete Area	Area required to resist 959.2 kN	30.3x1756.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 136.6 mm	302.13 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.88/(0.88+0.88)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 43.58 kN, RH Support 43.84 kN	< 308.40 kN	OK
Check @ 3.512 m (Max. Moment)	M = 76.77 kN.m, Fv = 0.07 kN		
Moment Capacity	Plastic neutral axis in web @ 129.8 mm	155.73 kN.m	OK

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Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 49.61 kN, RH Support 49.92 kN		
Super Imposed Dead Load	LH Support 7.28 kN, RH Support 7.32 kN		
Dead Load (Self Weight)	LH Support 26.4 kN, RH Support 26.56 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	8.32 (11.06) mm @ 3.512 m < L / 360 = 19.5 mm	11.06 mm	OK
Super Imposed Dead Loads	1.22 (1.62) mm @ 3.512 m	1.62 mm	
Dead Loads (Self Weight)	17.82 mm @ 3.512 m	17.82 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 95.3, Super Dead 14, SW 92.2 < 275	201.50 N/mm²	OK
TOTAL (Compression)	Live 9.3, Super Dead 1.4, SW 92.2 < 275	102.94 N/mm²	OK
Maximum Concrete Stress	Live 3.37, Super Dead 0.49, SW 0 < 20	3.87 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	7.16 mm	
Natural Frequency	18/√(7.16/1.1) = 7.06 > 4 Hz	7.06 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 77 (N.132-N.145) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (43 kg/m) 254x146 UB 43 [S 275] Floor Area Supported 7.164 m Span, 2.139 m to LH Beam and 2.139 m to RH Beam Non-Continuous Holorib Z35 Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick Concrete Slab 130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m Headed Stud Connector 19x95 mm Placed One per Alternate Trough IMPORTANT: Beam Loads All internal forces and deflection values are obtained directly from MasterFrame

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	5.085 m Span and 2.498 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 712 mm², b1= 636 mm and b2= 76 mm
Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³
Composite Section Elastic Properties	ye 108 mm, Ix 8569 cm⁴, Zs.t 3927 cm³, Zs.b 480 cm³, Zc.t 7985 cm³
Headed Stud Connector	16 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 72.22 kN, RH Support 72.1 kN	< 169.03 kN	OK
Check @ 2.516 m (Max. Moment)	M = 91.73 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 8 < 11.6	Partial	
Axial Resistance (kN)	Rc 1012.57 kN, Rs 1052.15 kN, Rq 697.6 kN	697.6 kN	
Degree of Shear Connection	Na/Np = 8 / 11.6 > 0.4	0.689	OK
Reduced Concrete Area	Area required to resist 697.6 kN	54.4x712.1mm²	
Moment Capacity	Plastic neutral axis in top flange @ 134.1 mm	152.85 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	

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Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.64/(0.64+0.08)	256.05 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 17.07 kN, RH Support 17.03 kN	< 169.03 kN	OK
Check @ 2.516 m (Max. Moment)	M = 21.68 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 19.14 kN, RH Support 19.1 kN		
Super Imposed Dead Load	19.34 kN each side		
Dead Load (Self Weight)	LH Support 10.37 kN, RH Support 10.35 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	3.73 (5.46) mm @ 2.516 m < L / 360 = 14.1 mm	5.46 mm	OK
Super Imposed Dead Loads	3.77 (5.52) mm @ 2.516 m	5.52 mm	
Dead Loads (Self Weight)	9.89 mm @ 2.516 m	9.89 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 50.6, Super Dead 51.2, SW 59.3 < 275	161.09 N/mm²	OK
TOTAL (Compression)	Live 6.2, Super Dead 6.3, SW 59.3 < 275	71.79 N/mm²	OK
Maximum Concrete Stress	Live 3.04, Super Dead 3.08, SW 0 < 20	6.12 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	8.08 mm	
Natural Frequency	18/√(8.08/1.1) = 6.64 > 4 Hz	6.64 Hz	OK

UNPROPPED COMPOSITE SECONDARY EDGE BEAM

Member 150 (N6-Q6) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	4.643 m Span and 2.481 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 657 mm², b1= 580 mm and b2= 76 mm
Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³
Composite Section Elastic Properties	ye 111.4 mm, Ix 8331 cm⁴, Zs.t 4507 cm³, Zs.b 477 cm³, Zc.t 7548 cm³
Headed Stud Connector	15 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 65.64 kN, RH Support 65.53 kN	< 169.03 kN	OK
Check @ 2.298 m (Max. Moment)	M = 76.13 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 7 < 10.7	Partial	
Axial Resistance (kN)	Rc 934.01 kN, Rs 1052.15 kN, Rq 610.4 kN	610.4 kN	
Degree of Shear Connection	Na/Np = 7 / 10.7 > 0.4	0.654	OK
Reduced Concrete Area	Area required to resist 610.4 kN	51.6x656.8mm²	
Moment Capacity	Plastic neutral axis in top flange @ 135.1 mm	144.35 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN

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Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.58/(0.58+0.08)	253.46 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 15.49 kN, RH Support 15.45 kN	< 169.03 kN	OK
Check @ 2.298 m (Max. Moment)	M = 17.96 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 17.36 kN, RH Support 17.32 kN		
Super Imposed Dead Load	17.64 kN each side		
Dead Load (Self Weight)	LH Support 9.41 kN, RH Support 9.39 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	2.65 (3.68) mm @ 2.298 m < L / 360 = 12.8 mm	3.68 mm	OK
Super Imposed Dead Loads	2.69 (3.74) mm @ 2.298 m	3.74 mm	
Dead Loads (Self Weight)	6.83 mm @ 2.298 m	6.83 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 42.2, Super Dead 42.9, SW 49.2 < 275	134.29 N/mm²	OK
TOTAL (Compression)	Live 4.5, Super Dead 4.5, SW 49.2 < 275	58.17 N/mm²	OK
Maximum Concrete Stress	Live 2.67, Super Dead 2.71, SW 0 < 20	5.38 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	5.55 mm	
Natural Frequency	18/√(5.55/1.1) = 8.02 > 4 Hz	8.02 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 83 (N.140-N.147) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	5.11 m Span, 2.099 m to LH Beam and 2.1 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1278 mm², b1= 639 mm and b2= 639 mm
Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³
Composite Section Elastic Properties	ye 92.8 mm, Ix 13842 cm⁴, Zs.t 3719 cm³, Zs.b 568 cm³, Zc.t 14936 cm³
Headed Stud Connector	16 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 82.8 kN, RH Support 82.3 kN	< 218.38 kN	OK
Check @ 2.529 m (Max. Moment)	M = 105.45 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 8 < 12.1	Partial	
Axial Resistance (kN)	Rc 1816.61 kN, Rs 1050.78 kN, Rq 697.6 kN	697.6 kN	
Degree of Shear Connection	Na/Np = 8 / 12.1 > 0.4	0.664	OK
Reduced Concrete Area	Area required to resist 697.6 kN	30.3x1277.5mm²	
Moment Capacity	Plastic neutral axis in top flange @ 134.6 mm	186.57 kN.m	OK

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Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.64/(0.64+0.64)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 28.31 kN, RH Support 28.15 kN	< 218.38 kN	OK
Check @ 2.529 m (Max. Moment)	M = 36.06 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 32.59 kN, RH Support 32.39 kN		
Super Imposed Dead Load	LH Support 4.78 kN, RH Support 4.75 kN		
Dead Load (Self Weight)	LH Support 17.12 kN, RH Support 17.02 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	3.98 (5.87) mm @ 2.529 m < L / 360 = 14.1 mm	5.87 mm	OK
Super Imposed Dead Loads	0.58 (0.86) mm @ 2.529 m	0.86 mm	
Dead Loads (Self Weight)	9.99 mm @ 2.529 m	9.99 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 73.1, Super Dead 10.7, SW 77.9 < 275	161.69 N/mm²	OK
TOTAL (Compression)	Live 11.2, Super Dead 1.6, SW 77.9 < 275	90.65 N/mm²	OK
Maximum Concrete Stress	Live 2.78, Super Dead 0.41, SW 0 < 20	3.19 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	3.54 mm	
Natural Frequency	18/√(3.54/1.1) = 10.04 > 4 Hz	10.04 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 84 (N.141-N3) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	5.097 m Span, 2.141 m to LH Beam and 2.498 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1274 mm², b1= 637 mm and b2= 637 mm
Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³
Composite Section Elastic Properties	ye 86.1 mm, Ix 10219 cm⁴, Zs.t 2329 cm³, Zs.b 507 cm³, Zc.t 11867 cm³
Headed Stud Connector	16 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 90.26 kN, RH Support 90.14 kN	< 169.03 kN	OK
Check @ 2.548 m (Max. Moment)	M = 114.94 kN.m, Fv = 0.03 kN		
Shear Connection	No of shear connectors from nearest support 8 < 12.1	Partial	
Axial Resistance (kN)	Rc 1811.98 kN, Rs 1052.15 kN, Rq 697.6 kN	697.6 kN	
Degree of Shear Connection	Na/Np = 8 / 12.1 > 0.4	0.663	OK

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Reduced Concrete Area	Area required to resist 697.6 kN	30.4x1274.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 134.1 mm	161.23 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.64/(0.64+0.64)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 30.8 kN, RH Support 30.76 kN	< 169.03 kN	OK
Check @ 2.548 m (Max. Moment)	M = 39.22 kN.m, Fv = 0.01 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 35.56 kN, RH Support 35.51 kN		
Super Imposed Dead Load	5.22 kN each side		
Dead Load (Self Weight)	LH Support 18.61 kN, RH Support 18.59 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	5.85 (9.42) mm @ 2.548 m < L / 360 = 14.1 mm	9.42 mm	OK
Super Imposed Dead Loads	0.86 (1.38) mm @ 2.548 m	1.38 mm	
Dead Loads (Self Weight)	17.88 mm @ 2.548 m	17.88 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 89.3, Super Dead 13.1, SW 106.8 < 275	209.18 N/mm²	OK
TOTAL (Compression)	Live 19.4, Super Dead 2.9, SW 106.8 < 275	129.11 N/mm²	OK
Maximum Concrete Stress	Live 3.82, Super Dead 0.56, SW 0 < 20	4.38 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	5.38 mm	
Natural Frequency	18/√(5.38/1.1) = 8.14 > 4 Hz	8.14 Hz	OK

UNPROPPED COMPOSITE SECONDARY EDGE BEAM
Member 85 (J1-M1) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	5.11 m Span and 2.1 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 715 mm², b1= 639 mm and b2= 76 mm
Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³
Composite Section Elastic Properties	ye 107.9 mm, Ix 8581 cm⁴, Zs.t 3901 cm³, Zs.b 481 cm³, Zc.t 8009 cm³
Headed Stud Connector (+1)	17 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 65.18 kN, RH Support 64.93 kN	< 169.03 kN	OK
Check @ 2.529 m (Max. Moment)	M = 83.12 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 9 < 11.7	Partial	

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Axial Resistance (kN)	Rc 1017.01 kN, Rs 1052.15 kN, Rq 784.8 kN	784.8 kN	
Degree of Shear Connection	Na/Np = 9 / 11.7 > 0.4	0.772	OK
Reduced Concrete Area	Area required to resist 784.8 kN	61x715.2mm²	
Moment Capacity	Plastic neutral axis in top flange @ 133 mm	159.56 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.64/(0.64+0.08)	256.18 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 14.69 kN, RH Support 14.61 kN	< 169.03 kN	OK
Check @ 2.529 m (Max. Moment)	M = 18.72 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 16.29 kN, RH Support 16.19 kN		
Super Imposed Dead Load	LH Support 19 kN, RH Support 18.98 kN		
Dead Load (Self Weight)	LH Support 8.94 kN, RH Support 8.89 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	3.21 (4.39) mm @ 2.529 m < L / 360 = 14.1 mm	4.39 mm	OK
Super Imposed Dead Loads	3.75 (5.13) mm @ 2.529 m	5.13 mm	
Dead Loads (Self Weight)	8.64 mm @ 2.529 m	8.64 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 43.2, Super Dead 50.5, SW 51.3 < 275	145.00 N/mm²	OK
TOTAL (Compression)	Live 5.3, Super Dead 6.2, SW 51.3 < 275	62.88 N/mm²	OK
Maximum Concrete Stress	Live 2.59, Super Dead 3.03, SW 0 < 20	5.62 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	7.33 mm	
Natural Frequency	18/√(7.33/1.1) = 6.97 > 4 Hz	6.97 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 86 (N.143-N.225) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	5.107 m Span, 2.141 m to LH Beam and 2.141 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1277 mm², b1= 638 mm and b2= 638 mm
Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³
Composite Section Elastic Properties	ye 92.8 mm, Ix 13840 cm⁴, Zs.t 3721 cm³, Zs.b 568 cm³, Zc.t 14930 cm³
Headed Stud Connector	16 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

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Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	83.37 kN each side	< 218.38 kN	OK
Check @ 2.554 m (Max. Moment)	M = 106.45 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 8 < 12.1	Partial	
Axial Resistance (kN)	Rc 1815.54 kN, Rs 1050.78 kN, Rq 697.6 kN	697.6 kN	
Degree of Shear Connection	Na/Np = 8 / 12.1 > 0.4	0.664	OK
Reduced Concrete Area	Area required to resist 697.6 kN	30.4x1276.8mm²	
Moment Capacity	Plastic neutral axis in top flange @ 134.6 mm	186.56 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.64/(0.64+0.64)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	28.5 kN each side	< 218.38 kN	OK
Check @ 2.554 m (Max. Moment)	M = 36.39 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	32.81 kN each side		
Super Imposed Dead Load	4.81 kN each side		
Dead Load (Self Weight)	17.23 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	4.01 (5.92) mm @ 2.554 m < L / 360 = 14.1 mm	5.92 mm	OK
Super Imposed Dead Loads	0.59 (0.87) mm @ 2.554 m	0.87 mm	
Dead Loads (Self Weight)	10.07 mm @ 2.554 m	10.07 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 73.8, Super Dead 10.8, SW 78.6 < 275	163.20 N/mm²	OK
TOTAL (Compression)	Live 11.3, Super Dead 1.7, SW 78.6 < 275	91.47 N/mm²	OK
Maximum Concrete Stress	Live 2.81, Super Dead 0.41, SW 0 < 20	3.22 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	3.57 mm	
Natural Frequency	18/√(3.57/1.1) = 10 > 4 Hz	10.00 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 152 (N3-Q3) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	4.644 m Span, 2.141 m to LH Beam and 2.481 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1161 mm², b1= 581 mm and b2= 581 mm
Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³
Composite Section Elastic Properties	ye 89.3 mm, Ix 9964 cm⁴, Zs.t 2451 cm³, Zs.b 503 cm³, Zc.t 11159 cm³

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Headed Stud Connector	15 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2		

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 81.94 kN, RH Support 81.83 kN	< 169.03 kN	OK
Check @ 2.298 m (Max. Moment)	M = 95.07 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 7 < 12.1	Partial	
Axial Resistance (kN)	Rc 1650.94 kN, Rs 1052.15 kN, Rq 610.4 kN	610.4 kN	
Degree of Shear Connection	Na/Np = 7 / 12.1 > 0.4	0.58	OK
Reduced Concrete Area	Area required to resist 610.4 kN	29.2x1161mm²	
Moment Capacity	Plastic neutral axis in top flange @ 135.1 mm	151.19 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.58/(0.58+0.58)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 27.96 kN, RH Support 27.93 kN	< 169.03 kN	OK
Check @ 2.298 m (Max. Moment)	M = 32.44 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 32.28 kN, RH Support 32.24 kN		
Super Imposed Dead Load	4.73 kN each side		
Dead Load (Self Weight)	LH Support 16.9 kN, RH Support 16.88 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	4.12 (6.56) mm @ 2.298 m < L / 360 = 12.9 mm	6.56 mm	OK
Super Imposed Dead Loads	0.60 (0.96) mm @ 2.298 m	0.96 mm	
Dead Loads (Self Weight)	12.28 mm @ 2.298 m	12.28 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 74.5, Super Dead 10.9, SW 88.4 < 275	173.78 N/mm²	OK
TOTAL (Compression)	Live 15.3, Super Dead 2.2, SW 88.4 < 275	105.88 N/mm²	OK
Maximum Concrete Stress	Live 3.36, Super Dead 0.49, SW 0 < 20	3.85 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	3.77 mm	
Natural Frequency	18/√(3.77/1.1) = 9.72 > 4 Hz	9.72 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 88 (N.145-N.228) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	5.118 m Span, 2.141 m to LH Beam and 2.141 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

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Section Properties

Concrete Effective Area	79 x 1791 mm², b1= 896 mm and b2= 896 mm		
Steel Section Elastic Properties	ye 129.8 mm, A 54.8 cm², Ix 6545 cm⁴, Zt 504 cm³, Zb 504 cm³		
Composite Section Elastic Properties	ye 101 mm, Ix 26444 cm⁴, Zs.t 9134 cm³, Zs.b 918 cm³, Zc.t 26250 cm³		
Headed Stud Connector	23 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2		

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 124.62 kN, RH Support 121.03 kN	< 308.40 kN	OK
Check @ 3.545 m (Max. Moment)	M = 219.99 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 11 < 17.3	Partial	
Axial Resistance (kN)	Rc 2546.8 kN, Rs 1506.18 kN, Rq 959.2 kN	959.2 kN	
Degree of Shear Connection	Na/Np = 11 / 17.3 > 0.4	0.637	OK
Reduced Concrete Area	Area required to resist 959.2 kN	29.8x1791mm²	
Moment Capacity	Plastic neutral axis in top flange @ 136.6 mm	302.41 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.9/(0.9+0.9)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 42.98 kN, RH Support 41.78 kN	< 308.40 kN	OK
Check @ 3.545 m (Max. Moment)	M = 75.91 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 129.8 mm	155.73 kN.m	OK

Serviceability Limit State

Support Reactions (kN) Live Loads LH Support 48.83 kN, RH Support 47.4 kN
Super Imposed Dead Load LH Support 7.16 kN, RH Support 6.95 kN

Section Properties

Concrete Effective Area	79 x 1280 mm², b1= 640 mm and b2= 640 mm		
Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³		
Composite Section Elastic Properties	ye 92.7 mm, Ix 13847 cm⁴, Zs.t 3714 cm³, Zs.b 568 cm³, Zc.t 14951 cm³		
Headed Stud Connector	16 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2		

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	83.55 kN each side	< 218.38 kN	OK
Check @ 2.559 m (Max. Moment)	M = 106.9 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 8 < 12.1	Partial	
Axial Resistance (kN)	Rc 1819.45 kN, Rs 1050.78 kN, Rq 697.6 kN	697.6 kN	
Degree of Shear Connection	Na/Np = 8 / 12.1 > 0.4	0.664	OK
Reduced Concrete Area	Area required to resist 697.6 kN	30.3x1279.5mm²	
Moment Capacity	Plastic neutral axis in top flange @ 134.6 mm	186.58 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.64/(0.64+0.64)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	28.56 kN each side	< 218.38 kN	OK
Check @ 2.559 m (Max. Moment)	M = 36.55 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

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Serviceability Limit State

Support Reactions (kN)			
Live Loads	32.88 kN each side		
Super Imposed Dead Load	4.82 kN each side		
Dead Load (Self Weight)	17.27 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	4.04 (5.97) mm @ 2.559 m < L / 360 = 14.2 mm	5.97 mm	OK
Super Imposed Dead Loads	0.59 (0.87) mm @ 2.559 m	0.87 mm	
Dead Loads (Self Weight)	10.15 mm @ 2.559 m	10.15 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 74.1, Super Dead 10.9, SW 78.9 < 275	163.88 N/mm²	OK
TOTAL (Compression)	Live 11.3, Super Dead 1.7, SW 78.9 < 275	91.88 N/mm²	OK
Maximum Concrete Stress	Live 2.81, Super Dead 0.41, SW 0 < 20	3.23 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	3.6 mm	
Natural Frequency	18/√(3.60/1.1) = 9.96 > 4 Hz	9.96 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 155 (N.225-N.232) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	4.644 m Span, 2.142 m to LH Beam and 2.141 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1161 mm², b1= 581 mm and b2= 581 mm
Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm4, Zt 280 cm³, Zb 280 cm³
Composite Section Elastic Properties	ye 96.5 mm, Ix 13515 cm4, Zs.t 4043 cm³, Zs.b 563 cm³, Zc.t 14023 cm³
Headed Stud Connector	15 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	75.82 kN each side	< 218.38 kN	OK
Check @ 2.322 m (Max. Moment)	M = 88.03 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 7 < 12.1	Partial	
Axial Resistance (kN)	Rc 1650.94 kN, Rs 1050.78 kN, Rq 610.4 kN	610.4 kN	
Degree of Shear Connection	Na/Np = 7 / 12.1 > 0.4	0.581	OK
Reduced Concrete Area	Area required to resist 610.4 kN	29.2x1161mm²	
Moment Capacity	Plastic neutral axis in top flange @ 135.8 mm	176.44 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.58/(0.58+0.58)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	25.92 kN each side	< 218.38 kN	OK
Check @ 2.322 m (Max. Moment)	M = 30.1 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

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Serviceability Limit State

Support Reactions (kN)			
Live Loads	29.84 kN each side		
Super Imposed Dead Load	4.38 kN each side		
Dead Load (Self Weight)	15.68 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	2.81 (4.10) mm @ 2.322 m < L / 360 = 12.9 mm	4.10 mm	OK
Super Imposed Dead Loads	0.41 (0.60) mm @ 2.322 m	0.60 mm	
Dead Loads (Self Weight)	6.88 mm @ 2.322 m	6.88 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 61.5, Super Dead 9, SW 65 < 275	135.50 N/mm²	OK
TOTAL (Compression)	Live 8.6, Super Dead 1.3, SW 65 < 275	74.80 N/mm²	OK
Maximum Concrete Stress	Live 2.47, Super Dead 0.36, SW 0 < 20	2.83 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	2.49 mm	
Natural Frequency	18/√(2.49/1.1) = 11.97 > 4 Hz	11.97 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM

Member 89 (M2-N2) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	5.129 m Span, 2.1 m to LH Beam and 2.141 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1282 mm², b1= 641 mm and b2= 641 mm
Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³
Composite Section Elastic Properties	ye 85.9 mm, Ix 10236 cm⁴, Zs.t 2322 cm³, Zs.b 508 cm³, Zc.t 11915 cm³
Headed Stud Connector	16 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	82.94 kN each side	< 169.03 kN	OK
Check @ 2.564 m (Max. Moment)	M = 106.34 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 8 < 12.1	Partial	
Axial Resistance (kN)	Rc 1823.36 kN, Rs 1052.15 kN, Rq 697.6 kN	697.6 kN	
Degree of Shear Connection	Na/Np = 8 / 12.1 > 0.4	0.663	OK
Reduced Concrete Area	Area required to resist 697.6 kN	30.2x1282.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 134.1 mm	161.3 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.64/(0.64+0.64)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	28.37 kN each side	< 169.03 kN	OK
Check @ 2.564 m (Max. Moment)	M = 36.37 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

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Serviceability Limit State

Support Reactions (kN)			
Live Loads	32.64 kN each side		
Super Imposed Dead Load	4.79 kN each side		
Dead Load (Self Weight)	17.15 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	5.46 (8.80) mm @ 2.564 m < L / 360 = 14.2 mm	8.80 mm	OK
Super Imposed Dead Loads	0.80 (1.29) mm @ 2.564 m	1.29 mm	
Dead Loads (Self Weight)	16.81 mm @ 2.564 m	16.81 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 82.5, Super Dead 12.1, SW 99.1 < 275	193.65 N/mm²	OK
TOTAL (Compression)	Live 18, Super Dead 2.6, SW 99.1 < 275	119.77 N/mm²	OK
Maximum Concrete Stress	Live 3.51, Super Dead 0.52, SW 0 < 20	4.03 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	5.04 mm	
Natural Frequency	18/√(5.04/1.1) = 8.41 > 4 Hz	8.41 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 157 (N.228-N.235) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	4.645 m Span, 2.141 m to LH Beam and 2.142 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1161 mm², b1= 581 mm and b2= 581 mm
Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³
Composite Section Elastic Properties	ye 96.5 mm, Ix 13515 cm⁴, Zs.t 4042 cm³, Zs.b 563 cm³, Zc.t 14025 cm³
Headed Stud Connector	15 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	75.83 kN each side	< 218.38 kN	OK
Check @ 2.323 m (Max. Moment)	M = 88.06 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 7 < 12.1	Partial	
Axial Resistance (kN)	Rc 1651.3 kN, Rs 1050.78 kN, Rq 610.4 kN	610.4 kN	
Degree of Shear Connection	Na/Np = 7 / 12.1 > 0.4	0.581	OK
Reduced Concrete Area	Area required to resist 610.4 kN	29.2x1161.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 135.8 mm	176.45 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.58/(0.58+0.58)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	25.93 kN each side	< 218.38 kN	OK

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Check @ 2.323 m (Max. Moment)	M = 30.11 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	29.85 kN each side		
Super Imposed Dead Load	4.38 kN each side		
Dead Load (Self Weight)	15.68 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	2.81 (4.11) mm @ 2.323 m < L / 360 = 12.9 mm	4.11 mm	OK
Super Imposed Dead Loads	0.41 (0.60) mm @ 2.323 m	0.60 mm	
Dead Loads (Self Weight)	6.89 mm @ 2.323 m	6.89 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 61.5, Super Dead 9, SW 65 < 275	135.55 N/mm²	OK
TOTAL (Compression)	Live 8.6, Super Dead 1.3, SW 65 < 275	74.83 N/mm²	OK
Maximum Concrete Stress	Live 2.47, Super Dead 0.36, SW 0 < 20	2.83 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	2.49 mm	
Natural Frequency	18/√(2.49/1.1) = 11.96 > 4 Hz	11.96 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 90 (N.147-N.234) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	5.139 m Span, 2.099 m to LH Beam and 2.1 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1285 mm², b1= 642 mm and b2= 642 mm
Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³
Composite Section Elastic Properties	ye 92.5 mm, Ix 13861 cm⁴, Zs.t 3702 cm³, Zs.b 568 cm³, Zc.t 14991 cm³
Headed Stud Connector	16 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	82.28 kN each side	< 218.38 kN	OK
Check @ 2.569 m (Max. Moment)	M = 105.69 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 8 < 12.1	Partial	
Axial Resistance (kN)	Rc 1826.92 kN, Rs 1050.78 kN, Rq 697.6 kN	697.6 kN	
Degree of Shear Connection	Na/Np = 8 / 12.1 > 0.4	0.664	OK
Reduced Concrete Area	Area required to resist 697.6 kN	30.2x1284.8mm²	
Moment Capacity	Plastic neutral axis in top flange @ 134.6 mm	186.63 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.64/(0.64+0.64)	143.42 kN	OK

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Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	28.14 kN each side	< 218.38 kN	OK
Check @ 2.569 m (Max. Moment)	M = 36.15 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	32.38 kN each side		
Super Imposed Dead Load	4.75 kN each side		
Dead Load (Self Weight)	17.02 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	4.03 (5.94) mm @ 2.569 m < L / 360 = 14.2 mm	5.94 mm	OK
Super Imposed Dead Loads	0.59 (0.87) mm @ 2.569 m	0.87 mm	
Dead Loads (Self Weight)	10.13 mm @ 2.569 m	10.13 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 73.2, Super Dead 10.7, SW 78.1 < 275	162.04 N/mm²	OK
TOTAL (Compression)	Live 11.2, Super Dead 1.6, SW 78.1 < 275	90.94 N/mm²	OK
Maximum Concrete Stress	Live 2.77, Super Dead 0.41, SW 0 < 20	3.18 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	3.58 mm	
Natural Frequency	18/√(3.58/1.1) = 9.98 > 4 Hz	9.98 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM

Member 158 (N2-Q2) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	4.645 m Span, 2.099 m to LH Beam and 2.141 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1161 mm², b1= 581 mm and b2= 581 mm
Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³
Composite Section Elastic Properties	ye 89.3 mm, Ix 9965 cm⁴, Zs.t 2451 cm³, Zs.b 503 cm³, Zc.t 11160 cm³
Headed Stud Connector	15 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	75.09 kN each side	< 169.03 kN	OK
Check @ 2.323 m (Max. Moment)	M = 87.2 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 7 < 12.1	Partial	
Axial Resistance (kN)	Rc 1651.3 kN, Rs 1052.15 kN, Rq 610.4 kN	610.4 kN	
Degree of Shear Connection	Na/Np = 7 / 12.1 > 0.4	0.58	OK
Reduced Concrete Area	Area required to resist 610.4 kN	29.2x1161.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 135.1 mm	151.19 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN

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Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.58/(0.58+0.58)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	25.68 kN each side	< 169.03 kN	OK
Check @ 2.323 m (Max. Moment)	M = 29.82 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	29.55 kN each side		
Super Imposed Dead Load	4.33 kN each side		
Dead Load (Self Weight)	15.53 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	3.78 (6.01) mm @ 2.323 m < L / 360 = 12.9 mm	6.01 mm	OK
Super Imposed Dead Loads	0.55 (0.88) mm @ 2.323 m	0.88 mm	
Dead Loads (Self Weight)	11.31 mm @ 2.323 m	11.31 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 68.3, Super Dead 10, SW 81.3 < 275	159.54 N/mm²	OK
TOTAL (Compression)	Live 14, Super Dead 2.1, SW 81.3 < 275	97.33 N/mm²	OK
Maximum Concrete Stress	Live 3.08, Super Dead 0.45, SW 0 < 20	3.53 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	3.47 mm	
Natural Frequency	18/√(3.47/1.1) = 10.14 > 4 Hz	10.14 Hz	OK

UNPROPPED COMPOSITE SECONDARY EDGE BEAM
Member 91 (M1-N1) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	5.15 m Span and 2.099 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 720 mm², b1= 644 mm and b2= 76 mm
Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³
Composite Section Elastic Properties	ye 107.6 mm, Ix 8602 cm⁴, Zs.t 3860 cm³, Zs.b 481 cm³, Zc.t 8048 cm³
Headed Stud Connector	16 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	65.19 kN each side	< 169.03 kN	OK
Check @ 2.575 m (Max. Moment)	M = 83.93 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 8 < 11.7	Partial	
Axial Resistance (kN)	Rc 1024.12 kN, Rs 1052.15 kN, Rq 697.6 kN	697.6 kN	
Degree of Shear Connection	Na/Np = 8 / 11.7 > 0.4	0.681	OK
Reduced Concrete Area	Area required to resist 697.6 kN	53.8x720.2mm²	

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Moment Capacity	Plastic neutral axis in top flange @ 134.1 mm	153.07 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.64/(0.64+0.08)	256.39 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	14.64 kN each side	< 169.03 kN	OK
Check @ 2.575 m (Max. Moment)	M = 18.85 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	16.22 kN each side		
Super Imposed Dead Load	19.12 kN each side		
Dead Load (Self Weight)	8.91 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	3.27 (4.82) mm @ 2.575 m < L / 360 = 14.3 mm	4.82 mm	OK
Super Imposed Dead Loads	3.86 (5.69) mm @ 2.575 m	5.69 mm	
Dead Loads (Self Weight)	8.84 mm @ 2.575 m	8.84 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 43.4, Super Dead 51.2, SW 51.7 < 275	146.31 N/mm²	OK
TOTAL (Compression)	Live 5.4, Super Dead 6.4, SW 51.7 < 275	63.49 N/mm²	OK
Maximum Concrete Stress	Live 2.59, Super Dead 3.06, SW 0 < 20	5.65 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	7.97 mm	
Natural Frequency	18/√(7.97/1.1) = 6.69 > 4 Hz	6.69 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 160 (N.234-N.240) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	4.646 m Span, 2.099 m to LH Beam and 2.099 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1162 mm², b1= 581 mm and b2= 581 mm
Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³
Composite Section Elastic Properties	ye 96.5 mm, Ix 13516 cm⁴, Zs.t 4042 cm³, Zs.b 563 cm³, Zc.t 14027 cm³
Headed Stud Connector	15 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	74.38 kN each side	< 218.38 kN	OK
Check @ 2.323 m (Max. Moment)	M = 86.39 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 7 < 12.1	Partial	

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Axial Resistance (kN)	Rc 1651.65 kN, Rs 1050.78 kN, Rq 610.4 kN	610.4 kN	
Degree of Shear Connection	Na/Np = 7 / 12.1 > 0.4	0.581	OK
Reduced Concrete Area	Area required to resist 610.4 kN	29.2x1161.5mm²	
Moment Capacity	Plastic neutral axis in top flange @ 135.8 mm	176.45 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.58/(0.58+0.58)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	25.44 kN each side	< 218.38 kN	OK
Check @ 2.323 m (Max. Moment)	M = 29.55 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	29.27 kN each side		
Super Imposed Dead Load	4.29 kN each side		
Dead Load (Self Weight)	15.39 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	2.76 (4.03) mm @ 2.323 m < L / 360 = 12.9 mm	4.03 mm	OK
Super Imposed Dead Loads	0.40 (0.59) mm @ 2.323 m	0.59 mm	
Dead Loads (Self Weight)	6.77 mm @ 2.323 m	6.77 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 60.3, Super Dead 8.9, SW 63.8 < 275	133.00 N/mm²	OK
TOTAL (Compression)	Live 8.4, Super Dead 1.2, SW 63.8 < 275	73.45 N/mm²	OK
Maximum Concrete Stress	Live 2.42, Super Dead 0.36, SW 0 < 20	2.78 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	2.44 mm	
Natural Frequency	18/√(2.44/1.1) = 12.07 > 4 Hz	12.07 Hz	OK

UNPROPPED COMPOSITE SECONDARY EDGE BEAM
Member 162 (N1-Q1) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	4.645 m Span and 2.099 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 657 mm², b1= 581 mm and b2= 76 mm
Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³
Composite Section Elastic Properties	ye 111.3 mm, Ix 8332 cm⁴, Zs.t 4504 cm³, Zs.b 477 cm³, Zc.t 7550 cm³
Headed Stud Connector	15 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	58.8 kN each side	< 169.03 kN	OK

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Check @ 2.323 m (Max. Moment)	M = 68.29 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 7 < 10.7	Partial	
Axial Resistance (kN)	Rc 934.36 kN, Rs 1052.15 kN, Rq 610.4 kN	610.4 kN	
Degree of Shear Connection	Na/Np = 7 / 10.7 > 0.4	0.653	OK
Reduced Concrete Area	Area required to resist 610.4 kN	51.6x657.1mm²	
Moment Capacity	Plastic neutral axis in top flange @ 135.1 mm	144.35 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.58/(0.58+0.08)	253.47 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	13.21 kN each side	< 169.03 kN	OK
Check @ 2.323 m (Max. Moment)	M = 15.34 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	14.63 kN each side		
Super Imposed Dead Load	17.24 kN each side		
Dead Load (Self Weight)	8.04 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	2.24 (3.11) mm @ 2.323 m < L / 360 = 12.9 mm	3.11 mm	OK
Super Imposed Dead Loads	2.63 (3.67) mm @ 2.323 m	3.67 mm	
Dead Loads (Self Weight)	5.85 mm @ 2.323 m	5.85 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 35.6, Super Dead 42, SW 42.1 < 275	119.68 N/mm²	OK
TOTAL (Compression)	Live 3.8, Super Dead 4.4, SW 42.1 < 275	50.29 N/mm²	OK
Maximum Concrete Stress	Live 2.25, Super Dead 2.65, SW 0 < 20	4.90 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	5.21 mm	
Natural Frequency	18/√(5.21/1.1) = 8.27 > 4 Hz	8.27 Hz	OK

UNPROPPED NON-COMPOSITE SECONDARY EDGE BEAM
Member 98 (A2-H2) @ Level 3

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	1.025 m Span and 2.312 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 17.68 kN, RH Support 15.74 kN	< 169.03 kN	OK
Check @ 0.497 m (Max. Moment)	M = 4.28 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

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Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 4.48 kN, RH Support 3.83 kN	< 169.03 kN	OK
Check @ 0.497 m (Max. Moment)	M = 1.07 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 5.1 kN, RH Support 4.33 kN		
Super Imposed Dead Load	LH Support 4.08 kN, RH Support 3.97 kN		
Dead Load (Self Weight)	LH Support 2.71 kN, RH Support 2.33 kN		
Maximum Deflection			
Live Loads	0.04 (0.04) mm @ 0.507 m < L / 360 = 2.8 mm	0.04 mm	OK
Super Imposed Dead Loads	0.03 mm @ 0.507 m	0.03 mm	
Dead Loads (Self Weight)	0.02 mm @ 0.507 m	0.02 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 5.5, Super Dead 4.6, SW 2.9 < 275	13.02 N/mm²	OK
TOTAL (Compression)	Live 5.5, Super Dead 4.6, SW 2.9 < 275	13.02 N/mm²	OK

Vibration Analysis

Beam Deflection		0.06 mm	
Natural Frequency	$18/\sqrt{(0.06)} = 75.83 > 4$ Hz	75.83 Hz	OK

UNPROPPED NON-COMPOSITE PRIMARY INTERNAL BEAM
Member 114 (B9-D9) @ Level 3

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	2.74 m Span, 6.705 m to LH Beam and 4.795 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	0.58 kN each side	< 169.03 kN	OK
Check @ 1.37 m (Max. Moment)	M = 0.4 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Lateral Torsional Buckling (Final Stage)

Check between 0 and 2.74 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 0, 1	0 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.74 m, 3.83 cm, 1, 0.849, 0.84	58.324 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	0.58 kN each side	< 169.03 kN	OK
Check @ 1.37 m (Max. Moment)	M = 0.4 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.74 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 0, 1	0 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.74 m, 3.83 cm, 1, 0.849, 0.84	58.324 kN.m	OK

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Serviceability Limit State

Support Reactions (kN)			
Live Loads	0 kN each side		
Super Imposed Dead Load	0 kN each side		
Dead Load (Self Weight)	0.41 kN each side		
Maximum Deflection			
Live Loads	0.00 (0.00) mm @ 1.37 m < L / 360 = 7.6 mm	0.00 mm	OK
Super Imposed Dead Loads	0.00 mm @ 1.671 m	0.00 mm	
Dead Loads (Self Weight)	0.06 mm @ 1.37 m	0.06 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 0, Super Dead 0, SW 1.3 < 275	1.27 N/mm²	OK
TOTAL (Compression)	Live 0, Super Dead 0, SW 1.3 < 275	1.27 N/mm²	OK

Vibration Analysis

Beam Deflection		0.06 mm	
Natural Frequency	18/√(0.06) = 72.82 > 4 Hz	72.82 Hz	OK

UNPROPPED NON-COMPOSITE SECONDARY INTERNAL BEAM
Member 120 (D4-H5) @ Level 2

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	.748 m Span, 1.002 m to LH Beam and .188 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 5.88 kN, RH Support 6.37 kN	< 169.03 kN	OK
Check @ 0.378 m (Max. Moment)	M = 1.15 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 2.06 kN, RH Support 2.23 kN	< 169.03 kN	OK
Check @ 0.378 m (Max. Moment)	M = 0.4 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 2.28 kN, RH Support 2.48 kN		
Super Imposed Dead Load	LH Support 0.34 kN, RH Support 0.36 kN		
Dead Load (Self Weight)	LH Support 1.26 kN, RH Support 1.35 kN		
Maximum Deflection			
Live Loads	0.01 (0.01) mm @ 0.378 m < L / 360 = 2 mm	0.01 mm	OK
Super Imposed Dead Loads	0.00 mm @ 0.378 m	0.00 mm	
Dead Loads (Self Weight)	0.01 mm @ 0.378 m	0.01 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 2, Super Dead 0.3, SW 1.1 < 275	3.40 N/mm²	OK
TOTAL (Compression)	Live 2, Super Dead 0.3, SW 1.1 < 275	3.40 N/mm²	OK

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Vibration Analysis

Beam Deflection		0.01 mm	
Natural Frequency	$18/\sqrt{(0.01)} = 218.62 > 4$ Hz	218.62 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 136 (N.200-N.224) @ Level 2

Summary of Design Data (Integrated Design)

Steel Section (43 kg/m)	254x146 UB 43 [S 275]
Floor Area Supported	7.025 m Span, 2.135 m to LH Beam and 2.339 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1756 mm², b1= 878 mm and b2= 878 mm
Steel Section Elastic Properties	ye 129.8 mm, A 54.8 cm², Ix 6545 cm⁴, Zt 504 cm³, Zb 504 cm³
Composite Section Elastic Properties	ye 101.9 mm, Ix 26324 cm⁴, Zs.t 9377 cm³, Zs.b 917 cm³, Zc.t 25914 cm³
Headed Stud Connector	23 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 126.52 kN, RH Support 127.31 kN	< 308.40 kN	OK
Check @ 3.512 m (Max. Moment)	M = 222.9 kN.m, Fv = 0.2 kN		
Shear Connection	No of shear connectors from nearest support 11 < 17.3	Partial	
Axial Resistance (kN)	Rc 2497.39 kN, Rs 1506.18 kN, Rq 959.2 kN	959.2 kN	
Degree of Shear Connection	Na/Np = 11 / 17.3 > 0.4	0.637	OK
Reduced Concrete Area	Area required to resist 959.2 kN	30.3x1756.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 136.6 mm	302.13 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.88/(0.88+0.88)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 43.58 kN, RH Support 43.84 kN	< 308.40 kN	OK
Check @ 3.512 m (Max. Moment)	M = 76.77 kN.m, Fv = 0.07 kN		
Moment Capacity	Plastic neutral axis in web @ 129.8 mm	155.73 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 49.61 kN, RH Support 49.92 kN		
Super Imposed Dead Load	LH Support 7.28 kN, RH Support 7.32 kN		
Dead Load (Self Weight)	LH Support 26.4 kN, RH Support 26.56 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	8.32 (11.06) mm @ 3.512 m < L / 360 = 19.5 mm	11.06 mm	OK
Super Imposed Dead Loads	1.22 (1.62) mm @ 3.512 m	1.62 mm	
Dead Loads (Self Weight)	17.82 mm @ 3.512 m	17.82 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 95.3, Super Dead 14, SW 92.2 < 275	201.50 N/mm²	OK
TOTAL (Compression)	Live 9.3, Super Dead 1.4, SW 92.2 < 275	102.94 N/mm²	OK
Maximum Concrete Stress	Live 3.37, Super Dead 0.49, SW 0 < 20	3.87 N/mm²	OK

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Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	7.16 mm	
Natural Frequency	$18/\sqrt{(7.16/1.1)} = 7.06 > 4$ Hz	7.06 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 139 (N.204-N.233) @ Level 2

Summary of Design Data (Integrated Design)

Steel Section (43 kg/m) 254x146 UB 43 [S 275] Floor Area Supported 7.164 m Span, 2.139 m to LH Beam and 2.139 m to RH Beam Non-Continuous Holorib Z35 Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick Concrete Slab 130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m Headed Stud Connector 19x95 mm Placed One per Alternate Trough IMPORTANT: Beam Loads All internal forces and deflection values are obtained directly from MasterFrame

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	5.085 m Span and 2.498 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 712 mm², b1= 636 mm and b2= 76 mm
Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³
Composite Section Elastic Properties	ye 108 mm, Ix 8569 cm⁴, Zs.t 3927 cm³, Zs.b 480 cm³, Zc.t 7985 cm³
Headed Stud Connector	16 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 72.22 kN, RH Support 72.1 kN	< 169.03 kN	OK
Check @ 2.516 m (Max. Moment)	M = 91.73 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 8 < 11.6	Partial	
Axial Resistance (kN)	Rc 1012.57 kN, Rs 1052.15 kN, Rq 697.6 kN	697.6 kN	
Degree of Shear Connection	Na/Np = 8 / 11.6 > 0.4	0.689	OK
Reduced Concrete Area	Area required to resist 697.6 kN	54.4x712.1mm²	
Moment Capacity	Plastic neutral axis in top flange @ 134.1 mm	152.85 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.64/(0.64+0.08)	256.05 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 17.07 kN, RH Support 17.03 kN	< 169.03 kN	OK
Check @ 2.516 m (Max. Moment)	M = 21.68 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)	
Live Loads	LH Support 19.14 kN, RH Support 19.1 kN
Super Imposed Dead Load	19.34 kN each side
Dead Load (Self Weight)	LH Support 10.37 kN, RH Support 10.35 kN

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Maximum Deflection (Partial Connection All Loads)			
Live Loads	3.73 (5.46) mm @ 2.516 m < L / 360 = 14.1 mm	5.46 mm	OK
Super Imposed Dead Loads	3.77 (5.52) mm @ 2.516 m	5.52 mm	
Dead Loads (Self Weight)	9.89 mm @ 2.516 m	9.89 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 50.6, Super Dead 51.2, SW 59.3 < 275	161.09 N/mm²	OK
TOTAL (Compression)	Live 6.2, Super Dead 6.3, SW 59.3 < 275	71.79 N/mm²	OK
Maximum Concrete Stress	Live 3.04, Super Dead 3.08, SW 0 < 20	6.12 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	8.08 mm	
Natural Frequency	18/√(8.08/1.1) = 6.64 > 4 Hz	6.64 Hz	OK

UNPROPPED COMPOSITE SECONDARY EDGE BEAM
Member 153 (N6-Q6) @ Level 2

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	4.643 m Span and 2.481 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 657 mm², b1= 580 mm and b2= 76 mm
Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³
Composite Section Elastic Properties	ye 111.4 mm, Ix 8331 cm⁴, Zs.t 4507 cm³, Zs.b 477 cm³, Zc.t 7548 cm³
Headed Stud Connector	15 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 65.64 kN, RH Support 65.53 kN	< 169.03 kN	OK
Check @ 2.298 m (Max. Moment)	M = 76.13 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 7 < 10.7	Partial	
Axial Resistance (kN)	Rc 934.01 kN, Rs 1052.15 kN, Rq 610.4 kN	610.4 kN	
Degree of Shear Connection	Na/Np = 7 / 10.7 > 0.4	0.654	OK
Reduced Concrete Area	Area required to resist 610.4 kN	51.6x656.8mm²	
Moment Capacity	Plastic neutral axis in top flange @ 135.1 mm	144.35 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.58/(0.58+0.08)	253.46 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 15.49 kN, RH Support 15.45 kN	< 169.03 kN	OK
Check @ 2.298 m (Max. Moment)	M = 17.96 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)	
Live Loads	LH Support 17.36 kN, RH Support 17.32 kN
Super Imposed Dead Load	17.64 kN each side
Dead Load (Self Weight)	LH Support 9.41 kN, RH Support 9.39 kN

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Maximum Deflection (Partial Connection All Loads)			
Live Loads	2.65 (3.68) mm @ 2.298 m < L / 360 = 12.8 mm	3.68 mm	OK
Super Imposed Dead Loads	2.69 (3.74) mm @ 2.298 m	3.74 mm	
Dead Loads (Self Weight)	6.83 mm @ 2.298 m	6.83 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 42.2, Super Dead 42.9, SW 49.2 < 275	134.29 N/mm²	OK
TOTAL (Compression)	Live 4.5, Super Dead 4.5, SW 49.2 < 275	58.17 N/mm²	OK
Maximum Concrete Stress	Live 2.67, Super Dead 2.71, SW 0 < 20	5.38 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	5.55 mm	
Natural Frequency	18/√(5.55/1.1) = 8.02 > 4 Hz	8.02 Hz	OK

UNPROPPED COMPOSITE SECONDARY EDGE BEAM
Member 146 (N.214-N.245) @ Level 2

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	5.11 m Span and 2.1 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 706 mm², b1= 639 mm and b2= 67 mm
Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³
Composite Section Elastic Properties	ye 118.4 mm, Ix 11710 cm⁴, Zs.t 10176 cm³, Zs.b 543 cm³, Zc.t 10016 cm³
Headed Stud Connector	16 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 41.94 kN, RH Support 41.69 kN	< 218.38 kN	OK
Check @ 2.529 m (Max. Moment)	M = 53.42 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 8 < 11.5	Partial	
Axial Resistance (kN)	Rc 1003.51 kN, Rs 1050.78 kN, Rq 697.6 kN	697.6 kN	
Degree of Shear Connection	Na/Np = 8 / 11.5 > 0.4	0.695	OK
Reduced Concrete Area	Area required to resist 697.6 kN	54.9x705.7mm²	
Moment Capacity	Plastic neutral axis in top flange @ 134.6 mm	177.99 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.64/(0.64+0.07)	259.63 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 14.7 kN, RH Support 14.61 kN	< 218.38 kN	OK
Check @ 2.529 m (Max. Moment)	M = 18.72 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)	
Live Loads	LH Support 16.3 kN, RH Support 16.2 kN
Super Imposed Dead Load	LH Support 2.39 kN, RH Support 2.38 kN

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Dead Load (Self Weight)	LH Support 8.94 kN, RH Support 8.89 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	2.35 (3.19) mm @ 2.529 m < L / 360 = 14.1 mm	3.19 mm	OK
Super Imposed Dead Loads	0.34 (0.47) mm @ 2.529 m	0.47 mm	
Dead Loads (Self Weight)	5.22 mm @ 2.529 m	5.22 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 38.2, Super Dead 5.6, SW 40.7 < 275	84.54 N/mm²	OK
TOTAL (Compression)	Live 2, Super Dead 0.3, SW 40.7 < 275	43.02 N/mm²	OK
Maximum Concrete Stress	Live 2.07, Super Dead 0.3, SW 0 < 20	2.38 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	2.08 mm	
Natural Frequency	18/√(2.08/1.1) = 13.09 > 4 Hz	13.09 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 148 (N.216-N3) @ Level 2

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	5.097 m Span, 2.141 m to LH Beam and 2.498 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1274 mm², b1= 637 mm and b2= 637 mm
Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³
Composite Section Elastic Properties	ye 86.1 mm, Ix 10219 cm⁴, Zs.t 2329 cm³, Zs.b 507 cm³, Zc.t 11867 cm³
Headed Stud Connector	16 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 90.26 kN, RH Support 90.14 kN	< 169.03 kN	OK
Check @ 2.548 m (Max. Moment)	M = 114.94 kN.m, Fv = 0.03 kN		
Shear Connection	No of shear connectors from nearest support 8 < 12.1	Partial	
Axial Resistance (kN)	Rc 1811.98 kN, Rs 1052.15 kN, Rq 697.6 kN	697.6 kN	
Degree of Shear Connection	Na/Np = 8 / 12.1 > 0.4	0.663	OK
Reduced Concrete Area	Area required to resist 697.6 kN	30.4x1274.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 134.1 mm	161.23 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.64/(0.64+0.64)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 30.8 kN, RH Support 30.76 kN	< 169.03 kN	OK
Check @ 2.548 m (Max. Moment)	M = 39.22 kN.m, Fv = 0.01 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

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Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 35.56 kN, RH Support 35.51 kN		
Super Imposed Dead Load	5.22 kN each side		
Dead Load (Self Weight)	LH Support 18.61 kN, RH Support 18.59 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	5.85 (9.42) mm @ 2.548 m < L / 360 = 14.1 mm	9.42 mm	OK
Super Imposed Dead Loads	0.86 (1.38) mm @ 2.548 m	1.38 mm	
Dead Loads (Self Weight)	17.88 mm @ 2.548 m	17.88 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 89.3, Super Dead 13.1, SW 106.8 < 275	209.18 N/mm²	OK
TOTAL (Compression)	Live 19.4, Super Dead 2.9, SW 106.8 < 275	129.11 N/mm²	OK
Maximum Concrete Stress	Live 3.82, Super Dead 0.56, SW 0 < 20	4.38 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	5.38 mm	
Natural Frequency	18/√(5.38/1.1) = 8.14 > 4 Hz	8.14 Hz	OK

UNPROPPED COMPOSITE SECONDARY EDGE BEAM
Member 149 (J1-M1) @ Level 2

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	5.11 m Span and
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+193 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 76 mm², b1= 0 mm and b2= 76 mm
Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³
Composite Section Elastic Properties	ye 185.7 mm, Ix 3275 cm⁴, Zs.t 588 cm³, Zs.b 321 cm³, Zc.t 1764 cm³
Headed Stud Connector	16 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	24.33 kN each side	< 169.03 kN	OK
Check @ 2.555 m (Max. Moment)	M = 31.08 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 8 > 1.2	Full	
Axial Resistance (kN)	Rc 108.71 kN, Rs 1052.15 kN, Rq 697.6 kN	108.71 kN	
Moment Capacity	Plastic neutral axis in web @ 178.4 mm	83.94 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	445, 460, 114000, 40, 87.5	367.59 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.08/(0+0.08)	286.84 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	1.07 kN each side	< 169.03 kN	OK
Check @ 2.555 m (Max. Moment)	M = 1.37 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

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Serviceability Limit State

Support Reactions (kN)			
Live Loads	0 kN each side		
Super Imposed Dead Load	16.61 kN each side		
Dead Load (Self Weight)	0.77 kN each side		
Maximum Deflection			
Live Loads (Full Connection)	0.00 (0.00) mm @ 1.84 m < L / 360 = 14.1 mm	0.00 mm	OK
Super Imposed Dead Loads	8.59 mm @ 2.555 m	8.59 mm	
Dead Loads (Self Weight)	0.74 mm @ 2.555 m	0.74 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 0, Super Dead 66, SW 4.4 < 275	70.42 N/mm²	OK
TOTAL (Compression)	Live 0, Super Dead 36.1, SW 4.4 < 275	40.51 N/mm²	OK
Maximum Concrete Stress	Live 0, Super Dead 12.03, SW 0 < 20	12.03 N/mm²	OK

Vibration Analysis

Beam Deflection		8.99 mm	
Natural Frequency	18/√(8.99/1.1) = 6.3 > 4 Hz	6.30 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 154 (N.224-N.236) @ Level 2

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	5.107 m Span, 2.141 m to LH Beam and 2.141 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1277 mm², b1= 638 mm and b2= 638 mm
Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³
Composite Section Elastic Properties	ye 92.8 mm, Ix 13840 cm⁴, Zs.t 3721 cm³, Zs.b 568 cm³, Zc.t 14930 cm³
Headed Stud Connector	16 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	83.37 kN each side	< 218.38 kN	OK
Check @ 2.554 m (Max. Moment)	M = 106.45 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 8 < 12.1	Partial	
Axial Resistance (kN)	Rc 1815.54 kN, Rs 1050.78 kN, Rq 697.6 kN	697.6 kN	
Degree of Shear Connection	Na/Np = 8 / 12.1 > 0.4	0.664	OK
Reduced Concrete Area	Area required to resist 697.6 kN	30.4x1276.8mm²	
Moment Capacity	Plastic neutral axis in top flange @ 134.6 mm	186.56 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.64/(0.64+0.64)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	28.5 kN each side	< 218.38 kN	OK

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Check @ 2.554 m (Max. Moment)	M = 36.39 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	32.81 kN each side		
Super Imposed Dead Load	4.81 kN each side		
Dead Load (Self Weight)	17.23 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	4.01 (5.92) mm @ 2.554 m < L / 360 = 14.1 mm	5.92 mm	OK
Super Imposed Dead Loads	0.59 (0.87) mm @ 2.554 m	0.87 mm	
Dead Loads (Self Weight)	10.07 mm @ 2.554 m	10.07 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 73.8, Super Dead 10.8, SW 78.6 < 275	163.20 N/mm²	OK
TOTAL (Compression)	Live 11.3, Super Dead 1.7, SW 78.6 < 275	91.47 N/mm²	OK
Maximum Concrete Stress	Live 2.81, Super Dead 0.41, SW 0 < 20	3.22 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	3.57 mm	
Natural Frequency	18/√(3.57/1.1) = 10 > 4 Hz	10.00 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 156 (N3-Q3) @ Level 2

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	4.644 m Span, 2.141 m to LH Beam and 2.481 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1161 mm², b1= 581 mm and b2= 581 mm
Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³
Composite Section Elastic Properties	ye 89.3 mm, Ix 9964 cm⁴, Zs.t 2451 cm³, Zs.b 503 cm³, Zc.t 11159 cm³
Headed Stud Connector	15 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear

Support Reactions (kN)	LH Support 81.94 kN, RH Support 81.83 kN	< 169.03 kN	OK
Check @ 2.298 m (Max. Moment)	M = 95.07 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 7 < 12.1	Partial	
Axial Resistance (kN)	Rc 1650.94 kN, Rs 1052.15 kN, Rq 610.4 kN	610.4 kN	
Degree of Shear Connection	Na/Np = 7 / 12.1 > 0.4	0.58	OK
Reduced Concrete Area	Area required to resist 610.4 kN	29.2x1161mm²	
Moment Capacity	Plastic neutral axis in top flange @ 135.1 mm	151.19 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.58/(0.58+0.58)	143.42 kN	OK

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Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 27.96 kN, RH Support 27.93 kN	< 169.03 kN	OK
Check @ 2.298 m (Max. Moment)	M = 32.44 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 32.28 kN, RH Support 32.24 kN		
Super Imposed Dead Load	4.73 kN each side		
Dead Load (Self Weight)	LH Support 16.9 kN, RH Support 16.88 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	4.12 (6.56) mm @ 2.298 m < L / 360 = 12.9 mm	6.56 mm	OK
Super Imposed Dead Loads	0.60 (0.96) mm @ 2.298 m	0.96 mm	
Dead Loads (Self Weight)	12.28 mm @ 2.298 m	12.28 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 74.5, Super Dead 10.9, SW 88.4 < 275	173.78 N/mm²	OK
TOTAL (Compression)	Live 15.3, Super Dead 2.2, SW 88.4 < 275	105.88 N/mm²	OK
Maximum Concrete Stress	Live 3.36, Super Dead 0.49, SW 0 < 20	3.85 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	3.77 mm	
Natural Frequency	$18/\sqrt{(3.77/1.1)} = 9.72 > 4$ Hz	9.72 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 159 (N.233-N.243) @ Level 2

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	5.118 m Span, 2.141 m to LH Beam and 2.141 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	4.644 m Span, 2.142 m to LH Beam and 2.141 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1161 mm², b1= 581 mm and b2= 581 mm
Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³
Composite Section Elastic Properties	ye 96.5 mm, Ix 13515 cm⁴, Zs.t 4043 cm³, Zs.b 563 cm³, Zc.t 14023 cm³
Headed Stud Connector	15 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	75.82 kN each side	< 218.38 kN	OK

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Check @ 2.322 m (Max. Moment)	M = 88.03 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 7 < 12.1	Partial	
Axial Resistance (kN)	Rc 1650.94 kN, Rs 1050.78 kN, Rq 610.4 kN	610.4 kN	
Degree of Shear Connection	Na/Np = 7 / 12.1 > 0.4	0.581	OK
Reduced Concrete Area	Area required to resist 610.4 kN	29.2x1161mm²	
Moment Capacity	Plastic neutral axis in top flange @ 135.8 mm	176.44 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.58/(0.58+0.58)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	25.92 kN each side	< 218.38 kN	OK
Check @ 2.322 m (Max. Moment)	M = 30.1 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	29.84 kN each side		
Super Imposed Dead Load	4.38 kN each side		
Dead Load (Self Weight)	15.68 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	2.81 (4.10) mm @ 2.322 m < L / 360 = 12.9 mm	4.10 mm	OK
Super Imposed Dead Loads	0.41 (0.60) mm @ 2.322 m	0.60 mm	
Dead Loads (Self Weight)	6.88 mm @ 2.322 m	6.88 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 61.5, Super Dead 9, SW 65 < 275	135.50 N/mm²	OK
TOTAL (Compression)	Live 8.6, Super Dead 1.3, SW 65 < 275	74.80 N/mm²	OK
Maximum Concrete Stress	Live 2.47, Super Dead 0.36, SW 0 < 20	2.83 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	2.49 mm	
Natural Frequency	18/√(2.49/1.1) = 11.97 > 4 Hz	11.97 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 164 (M2-N2) @ Level 2

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	5.129 m Span, 2.1 m to LH Beam and 2.141 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1282 mm², b1= 641 mm and b2= 641 mm
Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³
Composite Section Elastic Properties	ye 85.9 mm, Ix 10236 cm⁴, Zs.t 2322 cm³, Zs.b 508 cm³, Zc.t 11915 cm³
Headed Stud Connector	16 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	82.94 kN each side	< 169.03 kN	OK

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Check @ 2.564 m (Max. Moment)	M = 106.34 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 8 < 12.1	Partial	
Axial Resistance (kN)	Rc 1823.36 kN, Rs 1052.15 kN, Rq 697.6 kN	697.6 kN	
Degree of Shear Connection	Na/Np = 8 / 12.1 > 0.4	0.663	OK
Reduced Concrete Area	Area required to resist 697.6 kN	30.2x1282.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 134.1 mm	161.3 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.64/(0.64+0.64)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	28.37 kN each side	< 169.03 kN	OK
Check @ 2.564 m (Max. Moment)	M = 36.37 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	32.64 kN each side		
Super Imposed Dead Load	4.79 kN each side		
Dead Load (Self Weight)	17.15 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	5.46 (8.80) mm @ 2.564 m < L / 360 = 14.2 mm	8.80 mm	OK
Super Imposed Dead Loads	0.80 (1.29) mm @ 2.564 m	1.29 mm	
Dead Loads (Self Weight)	16.81 mm @ 2.564 m	16.81 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 82.5, Super Dead 12.1, SW 99.1 < 275	193.65 N/mm²	OK
TOTAL (Compression)	Live 18, Super Dead 2.6, SW 99.1 < 275	119.77 N/mm²	OK
Maximum Concrete Stress	Live 3.51, Super Dead 0.52, SW 0 < 20	4.03 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	5.04 mm	
Natural Frequency	18/√(5.04/1.1) = 8.41 > 4 Hz	8.41 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 165 (N.243-N.294) @ Level 2

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	4.645 m Span, 2.141 m to LH Beam and 2.142 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1161 mm², b1= 581 mm and b2= 581 mm
Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³
Composite Section Elastic Properties	ye 96.5 mm, Ix 13515 cm⁴, Zs.t 4042 cm³, Zs.b 563 cm³, Zc.t 14025 cm³
Headed Stud Connector	15 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

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Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	75.83 kN each side	< 218.38 kN	OK
Check @ 2.323 m (Max. Moment)	M = 88.06 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 7 < 12.1	Partial	
Axial Resistance (kN)	Rc 1651.3 kN, Rs 1050.78 kN, Rq 610.4 kN	610.4 kN	
Degree of Shear Connection	Na/Np = 7 / 12.1 > 0.4	0.581	OK
Reduced Concrete Area	Area required to resist 610.4 kN	29.2x1161.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 135.8 mm	176.45 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.58/(0.58+0.58)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	25.93 kN each side	< 218.38 kN	OK
Check @ 2.323 m (Max. Moment)	M = 30.11 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	29.85 kN each side		
Super Imposed Dead Load	4.38 kN each side		
Dead Load (Self Weight)	15.68 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	2.81 (4.11) mm @ 2.323 m < L / 360 = 12.9 mm	4.11 mm	OK
Super Imposed Dead Loads	0.41 (0.60) mm @ 2.323 m	0.60 mm	
Dead Loads (Self Weight)	6.89 mm @ 2.323 m	6.89 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 61.5, Super Dead 9, SW 65 < 275	135.55 N/mm²	OK
TOTAL (Compression)	Live 8.6, Super Dead 1.3, SW 65 < 275	74.83 N/mm²	OK
Maximum Concrete Stress	Live 2.47, Super Dead 0.36, SW 0 < 20	2.83 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	2.49 mm	
Natural Frequency	18/√(2.49/1.1) = 11.96 > 4 Hz	11.96 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 167 (N.245-N.249) @ Level 2

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	5.139 m Span, 2.099 m to LH Beam and 2.1 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1285 mm², b1= 642 mm and b2= 642 mm
Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³

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Composite Section Elastic Properties	ye 92.5 mm, Ix 13861 cm^4, Zs.t 3702 cm^3, Zs.b 568 cm^3, Zc.t 14991 cm^3		
Headed Stud Connector	16 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2		

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	82.28 kN each side	< 218.38 kN	OK
Check @ 2.569 m (Max. Moment)	M = 105.69 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 8 < 12.1	Partial	
Axial Resistance (kN)	Rc 1826.92 kN, Rs 1050.78 kN, Rq 697.6 kN	697.6 kN	
Degree of Shear Connection	Na/Np = 8 / 12.1 > 0.4	0.664	OK
Reduced Concrete Area	Area required to resist 697.6 kN	30.2x1284.8mm^2	
Moment Capacity	Plastic neutral axis in top flange @ 134.6 mm	186.63 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.64/(0.64+0.64)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	28.14 kN each side	< 218.38 kN	OK
Check @ 2.569 m (Max. Moment)	M = 36.15 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	32.38 kN each side		
Super Imposed Dead Load	4.75 kN each side		
Dead Load (Self Weight)	17.02 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	4.03 (5.94) mm @ 2.569 m < L / 360 = 14.2 mm	5.94 mm	OK
Super Imposed Dead Loads	0.59 (0.87) mm @ 2.569 m	0.87 mm	
Dead Loads (Self Weight)	10.13 mm @ 2.569 m	10.13 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 73.2, Super Dead 10.7, SW 78.1 < 275	162.04 N/mm^2	OK
TOTAL (Compression)	Live 11.2, Super Dead 1.6, SW 78.1 < 275	90.94 N/mm^2	OK
Maximum Concrete Stress	Live 2.77, Super Dead 0.41, SW 0 < 20	3.18 N/mm^2	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	3.58 mm	
Natural Frequency	18/√(3.58/1.1) = 9.98 > 4 Hz	9.98 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM

Member 168 (N2-Q2) @ Level 2

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	4.645 m Span, 2.099 m to LH Beam and 2.141 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m^3, Mod. Ratio 10, Gr 40 with 252 mm^2/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1161 mm^2, b1= 581 mm and b2= 581 mm
Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm^2, Ix 1749 cm^4, Zt 222 cm^3, Zb 222 cm^3

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Composite Section Elastic Properties	ye 89.3 mm, Ix 9965 cm^4, Zs.t 2451 cm^3, Zs.b 503 cm^3, Zc.t 11160 cm^3		
Headed Stud Connector	15 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2		

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	75.09 kN each side	< 169.03 kN	OK
Check @ 2.323 m (Max. Moment)	M = 87.2 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 7 < 12.1	Partial	
Axial Resistance (kN)	Rc 1651.3 kN, Rs 1052.15 kN, Rq 610.4 kN	610.4 kN	
Degree of Shear Connection	Na/Np = 7 / 12.1 > 0.4	0.58	OK
Reduced Concrete Area	Area required to resist 610.4 kN	29.2x1161.3mm^2	
Moment Capacity	Plastic neutral axis in top flange @ 135.1 mm	151.19 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.58/(0.58+0.58)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	25.68 kN each side	< 169.03 kN	OK
Check @ 2.323 m (Max. Moment)	M = 29.82 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	29.55 kN each side		
Super Imposed Dead Load	4.33 kN each side		
Dead Load (Self Weight)	15.53 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	3.78 (6.01) mm @ 2.323 m < L / 360 = 12.9 mm	6.01 mm	OK
Super Imposed Dead Loads	0.55 (0.88) mm @ 2.323 m	0.88 mm	
Dead Loads (Self Weight)	11.31 mm @ 2.323 m	11.31 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 68.3, Super Dead 10, SW 81.3 < 275	159.54 N/mm^2	OK
TOTAL (Compression)	Live 14, Super Dead 2.1, SW 81.3 < 275	97.33 N/mm^2	OK
Maximum Concrete Stress	Live 3.08, Super Dead 0.45, SW 0 < 20	3.53 N/mm^2	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	3.47 mm	
Natural Frequency	18/√(3.47/1.1) = 10.14 > 4 Hz	10.14 Hz	OK

UNPROPPED COMPOSITE SECONDARY EDGE BEAM
Member 170 (M1-N1) @ Level 2

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	5.15 m Span and 2.099 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m^3, Mod. Ratio 10, Gr 40 with 252 mm^2/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 720 mm^2, b1= 644 mm and b2= 76 mm
Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm^2, Ix 1749 cm^4, Zt 222 cm^3, Zb 222 cm^3

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Composite Section Elastic Properties	ye 107.6 mm, Ix 8602 cm^4, Zs.t 3860 cm^3, Zs.b 481 cm^3, Zc.t 8048 cm^3		
Headed Stud Connector	16 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2		

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	65.19 kN each side	< 169.03 kN	OK
Check @ 2.575 m (Max. Moment)	M = 83.93 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 8 < 11.7	Partial	
Axial Resistance (kN)	Rc 1024.12 kN, Rs 1052.15 kN, Rq 697.6 kN	697.6 kN	
Degree of Shear Connection	Na/Np = 8 / 11.7 > 0.4	0.681	OK
Reduced Concrete Area	Area required to resist 697.6 kN	53.8x720.2mm^2	
Moment Capacity	Plastic neutral axis in top flange @ 134.1 mm	153.07 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.64/(0.64+0.08)	256.39 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	14.64 kN each side	< 169.03 kN	OK
Check @ 2.575 m (Max. Moment)	M = 18.85 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	16.22 kN each side		
Super Imposed Dead Load	19.12 kN each side		
Dead Load (Self Weight)	8.91 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	3.27 (4.82) mm @ 2.575 m < L / 360 = 14.3 mm	4.82 mm	OK
Super Imposed Dead Loads	3.86 (5.69) mm @ 2.575 m	5.69 mm	
Dead Loads (Self Weight)	8.84 mm @ 2.575 m	8.84 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 43.4, Super Dead 51.2, SW 51.7 < 275	146.31 N/mm^2	OK
TOTAL (Compression)	Live 5.4, Super Dead 6.4, SW 51.7 < 275	63.49 N/mm^2	OK
Maximum Concrete Stress	Live 2.59, Super Dead 3.06, SW 0 < 20	5.65 N/mm^2	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	7.97 mm	
Natural Frequency	18/√(7.97/1.1) = 6.69 > 4 Hz	6.69 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 171 (N.249-N.298) @ Level 2

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	4.646 m Span, 2.099 m to LH Beam and 2.099 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m^3, Mod. Ratio 10, Gr 40 with 252 mm^2/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1162 mm^2, b1= 581 mm and b2= 581 mm
Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm^2, Ix 2897 cm^4, Zt 280 cm^3, Zb 280 cm^3

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Composite Section Elastic Properties	ye 96.5 mm, Ix 13516 cm^4, Zs.t 4042 cm^3, Zs.b 563 cm^3, Zc.t 14027 cm^3		
Headed Stud Connector	15 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2		

Ultimate Limit State (Final Stage)

Maximum Shear

Support Reactions (kN)	74.38 kN each side	< 218.38 kN	OK
Check @ 2.323 m (Max. Moment)	M = 86.39 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 7 < 12.1	Partial	
Axial Resistance (kN)	Rc 1651.65 kN, Rs 1050.78 kN, Rq 610.4 kN	610.4 kN	
Degree of Shear Connection	Na/Np = 7 / 12.1 > 0.4	0.581	OK
Reduced Concrete Area	Area required to resist 610.4 kN	29.2x1161.5mm^2	
Moment Capacity	Plastic neutral axis in top flange @ 135.8 mm	176.45 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.58/(0.58+0.58)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear

Support Reactions (kN)	25.44 kN each side	< 218.38 kN	OK
Check @ 2.323 m (Max. Moment)	M = 29.55 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)

Live Loads	29.27 kN each side		
Super Imposed Dead Load	4.29 kN each side		
Dead Load (Self Weight)	15.39 kN each side		

Maximum Deflection (Partial Connection All Loads)

Live Loads	2.76 (4.03) mm @ 2.323 m < L / 360 = 12.9 mm	4.03 mm	OK
Super Imposed Dead Loads	0.40 (0.59) mm @ 2.323 m	0.59 mm	
Dead Loads (Self Weight)	6.77 mm @ 2.323 m	6.77 mm	

Maximum Steel Stress

TOTAL (Tension)	Live 60.3, Super Dead 8.9, SW 63.8 < 275	133.00 N/mm^2	OK
TOTAL (Compression)	Live 8.4, Super Dead 1.2, SW 63.8 < 275	73.45 N/mm^2	OK
Maximum Concrete Stress	Live 2.42, Super Dead 0.36, SW 0 < 20	2.78 N/mm^2	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	2.44 mm	
Natural Frequency	18/√(2.44/1.1) = 12.07 > 4 Hz	12.07 Hz	OK

UNPROPPED COMPOSITE SECONDARY EDGE BEAM

Member 173 (N1-Q1) @ Level 2

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	4.645 m Span and 2.099 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m^3, Mod. Ratio 10, Gr 40 with 252 mm^2/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

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Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	.748 m Span, 1.002 m to LH Beam and .188 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m^3 with 252 mm^2/m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm^2, Ix 1749 cm^4, Zt 222 cm^3, Zb 222 cm^3

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 6.58 kN, RH Support 6.72 kN	< 169.03 kN	OK
Check @ 0.378 m (Max. Moment)	M = 1.24 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 2.3 kN, RH Support 2.34 kN	< 169.03 kN	OK
Check @ 0.378 m (Max. Moment)	M = 0.43 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 2.56 kN, RH Support 2.62 kN		
Super Imposed Dead Load	0.38 kN each side		
Dead Load (Self Weight)	LH Support 1.4 kN, RH Support 1.43 kN		
Maximum Deflection			
Live Loads	0.01 (0.01) mm @ 0.378 m < L / 360 = 2 mm	0.01 mm	OK
Super Imposed Dead Loads	0.00 mm @ 0.378 m	0.00 mm	
Dead Loads (Self Weight)	0.01 mm @ 0.378 m	0.01 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 2.2, Super Dead 0.3, SW 1.2 < 275	3.69 N/mm^2	OK
TOTAL (Compression)	Live 2.2, Super Dead 0.3, SW 1.2 < 275	3.69 N/mm^2	OK

Vibration Analysis

Beam Deflection		0.01 mm	
Natural Frequency	18/√(0.01) = 217.59 > 4 Hz	217.59 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 190 (N.273-N.297) @ Level 3

Summary of Design Data (Integrated Design)

Steel Section (43 kg/m)	254x146 UB 43 [S 275]
Floor Area Supported	7.025 m Span, 2.135 m to LH Beam and 2.339 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m^3, Mod. Ratio 10, Gr 40 with 252 mm^2/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Summary of Design Data (Integrated Design)

Steel Section (43 kg/m)	254x146 UB 43 [S 275]
Floor Area Supported	7.164 m Span, 2.139 m to LH Beam and 2.139 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m^3, Mod. Ratio 10, Gr 40 with 252 mm^2/m

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Headed Stud Connector	19x95 mm Placed One per Alternate Trough		
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame		

Section Properties

Concrete Effective Area	79 x 1791 mm², b1= 896 mm and b2= 896 mm		
Steel Section Elastic Properties	ye 129.8 mm, A 54.8 cm², Ix 6545 cm⁴, Zt 504 cm³, Zb 504 cm³		
Composite Section Elastic Properties	ye 101 mm, Ix 26444 cm⁴, Zs.t 9134 cm³, Zs.b 918 cm³, Zc.t 26250 cm³		
Headed Stud Connector	23 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2		

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 124.62 kN, RH Support 121.03 kN	< 308.40 kN	OK
Check @ 3.545 m (Max. Moment)	M = 219.99 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 11 < 17.3	Partial	
Axial Resistance (kN)	Rc 2546.8 kN, Rs 1506.18 kN, Rq 959.2 kN	959.2 kN	
Degree of Shear Connection	Na/Np = 11 / 17.3 > 0.4	0.637	OK
Reduced Concrete Area	Area required to resist 959.2 kN	29.8x1791mm²	
Moment Capacity	Plastic neutral axis in top flange @ 136.6 mm	302.41 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.9/(0.9+0.9)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 42.98 kN, RH Support 41.78 kN	< 308.40 kN	OK
Check @ 3.545 m (Max. Moment)	M = 75.91 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 129.8 mm	155.73 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 48.83 kN, RH Support 47.4 kN		
Super Imposed Dead Load	LH Support 7.16 kN, RH Support 6.95 kN		
Dead Load (Self Weight)	LH Support 26.05 kN, RH Support 25.33 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	8.50 (11.31) mm @ 3.545 m < L / 360 = 19.9 mm	11.31 mm	OK
Super Imposed Dead Loads	1.25 (1.66) mm @ 3.545 m	1.66 mm	
Dead Loads (Self Weight)	18.33 mm @ 3.545 m	18.33 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 93.8, Super Dead 13.8, SW 91.2 < 275	198.84 N/mm²	OK
TOTAL (Compression)	Live 9.4, Super Dead 1.4, SW 91.2 < 275	102.07 N/mm²	OK
Maximum Concrete Stress	Live 3.28, Super Dead 0.48, SW 0 < 20	3.76 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	7.33 mm	
Natural Frequency	18/√(7.33/1.1) = 6.97 > 4 Hz	6.97 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Members 195 and 199 (H2-M2) @ Level 3

Summary of Design Data (Integrated Design)

Steel Section (107 kg/m)	254x254 UC 107 [S 275]
Floor Area Supported	7.311 m Span, 2.1 m to LH Beam and 2.142 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m

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Headed Stud Connector	19x95 mm Placed @ 250 mm centres		
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame		

Section Properties

Concrete Effective Area	79 x 1828 mm², b1= 914 mm and b2= 914 mm		
Steel Section Elastic Properties	ye 133.4 mm, A 136.4 cm², Ix 17517 cm⁴, Zt 1314 cm³, Zb 1314 cm³		
Composite Section Elastic Properties	ye 148.2 mm, Ix 53413 cm⁴, Zs.t 29298 cm³, Zs.b 2150 cm³, Zc.t 36033 cm³		
Headed Stud Connector (+1)	30 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2		

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 216.87 kN, RH Support 189.84 kN	< 542.79 kN	OK
Check @ 2.924 m (Max. Moment)	M = 420.14 kN.m, Fv = 0.9 kN		
Shear Connection	No of shear connectors from nearest support 12 < 29.8	Partial	
Axial Resistance (kN)	Rc 2599.06 kN, Rs 3614.07 kN, Rq 1046.4 kN	1046.4 kN	
Degree of Shear Connection	Na/Np = 12 / 29.8 > 0.4	0.403	OK
Reduced Concrete Area	Area required to resist 1046.4 kN	31.8x1827.8mm²	
Moment Capacity	Plastic neutral axis in top flange @ 148.5 mm	573.09 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 250 mm	4 per m	
Vp = fn(N.4.D.tp.pyp)	Min(4x4x19,1000)x1.0x350	106.40 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 106.4	324.34 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	4x87.2x0.91/(0.91+0.91)	174.40 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 65.52 kN, RH Support 56.13 kN	< 542.79 kN	OK
Check @ 2.778 m (Max. Moment)	M = 128.42 kN.m, Fv = 0.24 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 70.63 kN, RH Support 60.07 kN		
Super Imposed Dead Load	LH Support 34.12 kN, RH Support 32.57 kN		
Dead Load (Self Weight)	LH Support 40.08 kN, RH Support 34.37 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	6.91 (9.02) mm @ 3.509 m < L / 360 = 20.3 mm	9.02 mm	OK
Super Imposed Dead Loads	3.22 (4.20) mm @ 3.582 m	4.20 mm	
Dead Loads (Self Weight)	11.87 mm @ 3.509 m	11.87 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 65.2, Super Dead 29.4, SW 59.7 < 265	154.26 N/mm²	OK
TOTAL (Compression)	Live 4.8, Super Dead 2.2, SW 59.7 < 265	66.62 N/mm²	OK
Maximum Concrete Stress	Live 3.89, Super Dead 1.76, SW 0 < 20	5.64 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	9 mm	
Natural Frequency	18/√(9.00/1.1) = 6.29 > 4 Hz	6.29 Hz	OK

UNPROPPED COMPOSITE SECONDARY EDGE BEAM
Member 197 (M6-N6) @ Level 3

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	5.085 m Span and 2.498 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick

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Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+193 mm²/m		
Headed Stud Connector	19x95 mm Placed One per Alternate Trough		
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame		

Section Properties

Concrete Effective Area	79 x 712 mm², b1= 636 mm and b2= 76 mm		
Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³		
Composite Section Elastic Properties	ye 108 mm, Ix 8569 cm⁴, Zs.t 3927 cm³, Zs.b 480 cm³, Zc.t 7985 cm³		
Headed Stud Connector	16 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2		

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 72.22 kN, RH Support 72.1 kN	< 169.03 kN	OK
Check @ 2.516 m (Max. Moment)	M = 91.73 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 8 < 11.6	Partial	
Axial Resistance (kN)	Rc 1012.57 kN, Rs 1052.15 kN, Rq 697.6 kN	697.6 kN	
Degree of Shear Connection	Na/Np = 8 / 11.6 > 0.4	0.689	OK
Reduced Concrete Area	Area required to resist 697.6 kN	54.4x712.1mm²	
Moment Capacity	Plastic neutral axis in top flange @ 134.1 mm	152.85 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	445, 460, 114000, 40, 87.5	367.59 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.64/(0.64+0.08)	256.05 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 17.07 kN, RH Support 17.03 kN	< 169.03 kN	OK
Check @ 2.516 m (Max. Moment)	M = 21.68 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 19.14 kN, RH Support 19.1 kN		
Super Imposed Dead Load	19.34 kN each side		
Dead Load (Self Weight)	LH Support 10.37 kN, RH Support 10.35 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	3.73 (5.46) mm @ 2.516 m < L / 360 = 14.1 mm	5.46 mm	OK
Super Imposed Dead Loads	3.77 (5.52) mm @ 2.516 m	5.52 mm	
Dead Loads (Self Weight)	9.89 mm @ 2.516 m	9.89 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 50.6, Super Dead 51.2, SW 59.3 < 275	161.09 N/mm²	OK
TOTAL (Compression)	Live 6.2, Super Dead 6.3, SW 59.3 < 275	71.79 N/mm²	OK
Maximum Concrete Stress	Live 3.04, Super Dead 3.08, SW 0 < 20	6.12 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	8.08 mm	
Natural Frequency	18/√(8.08/1.1) = 6.64 > 4 Hz	6.64 Hz	OK

UNPROPPED COMPOSITE SECONDARY EDGE BEAM
Member 200 (N6-Q6) @ Level 3

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	4.643 m Span and 2.481 m to LH Beam

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Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick		
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+193 mm²/m		
Headed Stud Connector	19x95 mm Placed One per Alternate Trough		
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame		

Section Properties

Concrete Effective Area	79 x 657 mm², b1= 580 mm and b2= 76 mm		
Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³		
Composite Section Elastic Properties	ye 111.4 mm, Ix 8331 cm⁴, Zs.t 4507 cm³, Zs.b 477 cm³, Zc.t 7548 cm³		
Headed Stud Connector	15 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2		

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 65.64 kN, RH Support 65.53 kN	< 169.03 kN	OK
Check @ 2.298 m (Max. Moment)	M = 76.13 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 7 < 10.7	Partial	
Axial Resistance (kN)	Rc 934.01 kN, Rs 1052.15 kN, Rq 610.4 kN	610.4 kN	
Degree of Shear Connection	Na/Np = 7 / 10.7 > 0.4	0.654	OK
Reduced Concrete Area	Area required to resist 610.4 kN	51.6x656.8mm²	
Moment Capacity	Plastic neutral axis in top flange @ 135.1 mm	144.35 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	445, 460, 114000, 40, 87.5	367.59 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.58/(0.58+0.08)	253.46 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 15.49 kN, RH Support 15.45 kN	< 169.03 kN	OK
Check @ 2.298 m (Max. Moment)	M = 17.96 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 17.36 kN, RH Support 17.32 kN		
Super Imposed Dead Load	17.64 kN each side		
Dead Load (Self Weight)	LH Support 9.41 kN, RH Support 9.39 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	2.65 (3.68) mm @ 2.298 m < L / 360 = 12.8 mm	3.68 mm	OK
Super Imposed Dead Loads	2.69 (3.74) mm @ 2.298 m	3.74 mm	
Dead Loads (Self Weight)	6.83 mm @ 2.298 m	6.83 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 42.2, Super Dead 42.9, SW 49.2 < 275	134.29 N/mm²	OK
TOTAL (Compression)	Live 4.5, Super Dead 4.5, SW 49.2 < 275	58.17 N/mm²	OK
Maximum Concrete Stress	Live 2.67, Super Dead 2.71, SW 0 < 20	5.38 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	5.55 mm	
Natural Frequency	18/√(5.55/1.1) = 8.02 > 4 Hz	8.02 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 203 (N.291-N3) @ Level 3

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	5.097 m Span, 2.141 m to LH Beam and 2.498 m to RH Beam

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Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick		
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m		
Headed Stud Connector	19x95 mm Placed One per Alternate Trough		
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame		

Section Properties

Concrete Effective Area	79 x 1274 mm², b1= 637 mm and b2= 637 mm		
Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³		
Composite Section Elastic Properties	ye 86.1 mm, Ix 10219 cm⁴, Zs.t 2329 cm³, Zs.b 507 cm³, Zc.t 11867 cm³		
Headed Stud Connector	16 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2		

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 90.26 kN, RH Support 90.14 kN	< 169.03 kN	OK
Check @ 2.548 m (Max. Moment)	M = 114.94 kN.m, Fv = 0.03 kN		
Shear Connection	No of shear connectors from nearest support 8 < 12.1	Partial	
Axial Resistance (kN)	Rc 1811.98 kN, Rs 1052.15 kN, Rq 697.6 kN	697.6 kN	
Degree of Shear Connection	Na/Np = 8 / 12.1 > 0.4	0.663	OK
Reduced Concrete Area	Area required to resist 697.6 kN	30.4x1274.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 134.1 mm	161.23 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.64/(0.64+0.64)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 30.8 kN, RH Support 30.76 kN	< 169.03 kN	OK
Check @ 2.548 m (Max. Moment)	M = 39.22 kN.m, Fv = 0.01 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 35.56 kN, RH Support 35.51 kN		
Super Imposed Dead Load	5.22 kN each side		
Dead Load (Self Weight)	LH Support 18.61 kN, RH Support 18.59 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	5.85 (9.42) mm @ 2.548 m < L / 360 = 14.1 mm	9.42 mm	OK
Super Imposed Dead Loads	0.86 (1.38) mm @ 2.548 m	1.38 mm	
Dead Loads (Self Weight)	17.88 mm @ 2.548 m	17.88 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 89.3, Super Dead 13.1, SW 106.8 < 275	209.18 N/mm²	OK
TOTAL (Compression)	Live 19.4, Super Dead 2.9, SW 106.8 < 275	129.11 N/mm²	OK
Maximum Concrete Stress	Live 3.82, Super Dead 0.56, SW 0 < 20	4.38 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	5.38 mm	
Natural Frequency	18/√(5.38/1.1) = 8.14 > 4 Hz	8.14 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 206 (N.297-N.303) @ Level 3

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	5.107 m Span, 2.141 m to LH Beam and 2.141 m to RH Beam

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Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick		
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m		
Headed Stud Connector	19x95 mm Placed One per Alternate Trough		
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame		

Section Properties

Concrete Effective Area	79 x 1277 mm², b1= 638 mm and b2= 638 mm		
Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³		
Composite Section Elastic Properties	ye 92.8 mm, Ix 13840 cm⁴, Zs.t 3721 cm³, Zs.b 568 cm³, Zc.t 14930 cm³		
Headed Stud Connector	16 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2		

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	83.37 kN each side	< 218.38 kN	OK
Check @ 2.554 m (Max. Moment)	M = 106.45 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 8 < 12.1	Partial	
Axial Resistance (kN)	Rc 1815.54 kN, Rs 1050.78 kN, Rq 697.6 kN	697.6 kN	
Degree of Shear Connection	Na/Np = 8 / 12.1 > 0.4	0.664	OK
Reduced Concrete Area	Area required to resist 697.6 kN	30.4x1276.8mm²	
Moment Capacity	Plastic neutral axis in top flange @ 134.6 mm	186.56 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.64/(0.64+0.64)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	28.5 kN each side	< 218.38 kN	OK
Check @ 2.554 m (Max. Moment)	M = 36.39 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	32.81 kN each side		
Super Imposed Dead Load	4.81 kN each side		
Dead Load (Self Weight)	17.23 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	4.01 (5.92) mm @ 2.554 m < L / 360 = 14.1 mm	5.92 mm	OK
Super Imposed Dead Loads	0.59 (0.87) mm @ 2.554 m	0.87 mm	
Dead Loads (Self Weight)	10.07 mm @ 2.554 m	10.07 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 73.8, Super Dead 10.8, SW 78.6 < 275	163.20 N/mm²	OK
TOTAL (Compression)	Live 11.3, Super Dead 1.7, SW 78.6 < 275	91.47 N/mm²	OK
Maximum Concrete Stress	Live 2.81, Super Dead 0.41, SW 0 < 20	3.22 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	3.57 mm	
Natural Frequency	18/√(3.57/1.1) = 10 > 4 Hz	10.00 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 207 (N3-Q3) @ Level 3

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	4.644 m Span, 2.141 m to LH Beam and 2.481 m to RH Beam

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Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick		
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m		
Headed Stud Connector	19x95 mm Placed One per Alternate Trough		
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame		

Section Properties

Concrete Effective Area	79 x 1161 mm², b1= 581 mm and b2= 581 mm		
Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³		
Composite Section Elastic Properties	ye 89.3 mm, Ix 9964 cm⁴, Zs.t 2451 cm³, Zs.b 503 cm³, Zc.t 11159 cm³		
Headed Stud Connector	15 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2		

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 81.94 kN, RH Support 81.83 kN	< 169.03 kN	OK
Check @ 2.298 m (Max. Moment)	M = 95.07 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 7 < 12.1	Partial	
Axial Resistance (kN)	Rc 1650.94 kN, Rs 1052.15 kN, Rq 610.4 kN	610.4 kN	
Degree of Shear Connection	Na/Np = 7 / 12.1 > 0.4	0.58	OK
Reduced Concrete Area	Area required to resist 610.4 kN	29.2x1161mm²	
Moment Capacity	Plastic neutral axis in top flange @ 135.1 mm	151.19 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.58/(0.58+0.58)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 27.96 kN, RH Support 27.93 kN	< 169.03 kN	OK
Check @ 2.298 m (Max. Moment)	M = 32.44 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 32.28 kN, RH Support 32.24 kN		
Super Imposed Dead Load	4.73 kN each side		
Dead Load (Self Weight)	LH Support 16.9 kN, RH Support 16.88 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	4.12 (6.56) mm @ 2.298 m < L / 360 = 12.9 mm	6.56 mm	OK
Super Imposed Dead Loads	0.60 (0.96) mm @ 2.298 m	0.96 mm	
Dead Loads (Self Weight)	12.28 mm @ 2.298 m	12.28 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 74.5, Super Dead 10.9, SW 88.4 < 275	173.78 N/mm²	OK
TOTAL (Compression)	Live 15.3, Super Dead 2.2, SW 88.4 < 275	105.88 N/mm²	OK
Maximum Concrete Stress	Live 3.36, Super Dead 0.49, SW 0 < 20	3.85 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	3.77 mm	
Natural Frequency	18/√(3.77/1.1) = 9.72 > 4 Hz	9.72 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 208 (N.302-N.305) @ Level 3

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	5.118 m Span, 2.141 m to LH Beam and 2.141 m to RH Beam

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Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1756 mm², b1= 878 mm and b2= 878 mm
Steel Section Elastic Properties	ye 129.8 mm, A 54.8 cm², Ix 6545 cm⁴, Zt 504 cm³, Zb 504 cm³
Composite Section Elastic Properties	ye 101.9 mm, Ix 26324 cm⁴, Zs.t 9377 cm³, Zs.b 917 cm³, Zc.t 25914 cm³
Headed Stud Connector	23 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 126.52 kN, RH Support 127.31 kN	< 308.40 kN	OK
Check @ 3.512 m (Max. Moment)	M = 222.9 kN.m, Fv = 0.2 kN		
Shear Connection	No of shear connectors from nearest support 11 < 17.3	Partial	
Axial Resistance (kN)	Rc 2497.39 kN, Rs 1506.18 kN, Rq 959.2 kN	959.2 kN	
Degree of Shear Connection	Na/Np = 11 / 17.3 > 0.4	0.637	OK
Reduced Concrete Area	Area required to resist 959.2 kN	30.3x1756.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 136.6 mm	302.13 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.88/(0.88+0.88)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 43.58 kN, RH Support 43.84 kN	< 308.40 kN	OK
Check @ 3.512 m (Max. Moment)	M = 76.77 kN.m, Fv = 0.07 kN		
Moment Capacity	Plastic neutral axis in web @ 129.8 mm	155.73 kN.m	OK

Serviceability Limit State

Support Reactions (kN) Live Loads LH Support 49.61 kN, RH Support 49.92 kN
Super Imposed Dead Load LH Support 7.28 kN, RH Support 7.32 kN

Section Properties

Concrete Effective Area	79 x 1280 mm², b1= 640 mm and b2= 640 mm
Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³
Composite Section Elastic Properties	ye 92.7 mm, Ix 13847 cm⁴, Zs.t 3714 cm³, Zs.b 568 cm³, Zc.t 14951 cm³
Headed Stud Connector	16 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	83.55 kN each side	< 218.38 kN	OK
Check @ 2.559 m (Max. Moment)	M = 106.9 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 8 < 12.1	Partial	
Axial Resistance (kN)	Rc 1819.45 kN, Rs 1050.78 kN, Rq 697.6 kN	697.6 kN	
Degree of Shear Connection	Na/Np = 8 / 12.1 > 0.4	0.664	OK
Reduced Concrete Area	Area required to resist 697.6 kN	30.3x1279.5mm²	
Moment Capacity	Plastic neutral axis in top flange @ 134.6 mm	186.58 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.64/(0.64+0.64)	143.42 kN	OK

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Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	28.56 kN each side	< 218.38 kN	OK
Check @ 2.559 m (Max. Moment)	M = 36.55 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	32.88 kN each side		
Super Imposed Dead Load	4.82 kN each side		
Dead Load (Self Weight)	17.27 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	4.04 (5.97) mm @ 2.559 m < L / 360 = 14.2 mm	5.97 mm	OK
Super Imposed Dead Loads	0.59 (0.87) mm @ 2.559 m	0.87 mm	
Dead Loads (Self Weight)	10.15 mm @ 2.559 m	10.15 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 74.1, Super Dead 10.9, SW 78.9 < 275	163.88 N/mm²	OK
TOTAL (Compression)	Live 11.3, Super Dead 1.7, SW 78.9 < 275	91.88 N/mm²	OK
Maximum Concrete Stress	Live 2.81, Super Dead 0.41, SW 0 < 20	3.23 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	3.6 mm	
Natural Frequency	18/√(3.60/1.1) = 9.96 > 4 Hz	9.96 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 209 (N.303-N.369) @ Level 3

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	4.644 m Span, 2.142 m to LH Beam and 2.141 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1161 mm², b1= 581 mm and b2= 581 mm
Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm4, Zt 280 cm³, Zb 280 cm³
Composite Section Elastic Properties	ye 96.5 mm, Ix 13515 cm4, Zs.t 4043 cm³, Zs.b 563 cm³, Zc.t 14023 cm³
Headed Stud Connector	15 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	75.82 kN each side	< 218.38 kN	OK
Check @ 2.322 m (Max. Moment)	M = 88.03 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 7 < 12.1	Partial	
Axial Resistance (kN)	Rc 1650.94 kN, Rs 1050.78 kN, Rq 610.4 kN	610.4 kN	
Degree of Shear Connection	Na/Np = 7 / 12.1 > 0.4	0.581	OK
Reduced Concrete Area	Area required to resist 610.4 kN	29.2x1161mm²	
Moment Capacity	Plastic neutral axis in top flange @ 135.8 mm	176.44 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.58/(0.58+0.58)	143.42 kN	OK

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Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	25.92 kN each side	< 218.38 kN	OK
Check @ 2.322 m (Max. Moment)	M = 30.1 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	29.84 kN each side		
Super Imposed Dead Load	4.38 kN each side		
Dead Load (Self Weight)	15.68 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	2.81 (4.10) mm @ 2.322 m < L / 360 = 12.9 mm	4.10 mm	OK
Super Imposed Dead Loads	0.41 (0.60) mm @ 2.322 m	0.60 mm	
Dead Loads (Self Weight)	6.88 mm @ 2.322 m	6.88 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 61.5, Super Dead 9, SW 65 < 275	135.50 N/mm²	OK
TOTAL (Compression)	Live 8.6, Super Dead 1.3, SW 65 < 275	74.80 N/mm²	OK
Maximum Concrete Stress	Live 2.47, Super Dead 0.36, SW 0 < 20	2.83 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	2.49 mm	
Natural Frequency	18/√(2.49/1.1) = 11.97 > 4 Hz	11.97 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 210 (M2-N2) @ Level 3

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	5.129 m Span, 2.1 m to LH Beam and 2.141 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+193 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1282 mm², b1= 641 mm and b2= 641 mm
Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³
Composite Section Elastic Properties	ye 85.9 mm, Ix 10236 cm⁴, Zs.t 2322 cm³, Zs.b 508 cm³, Zc.t 11915 cm³
Headed Stud Connector	16 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	106.27 kN each side	< 169.03 kN	OK
Check @ 2.564 m (Max. Moment)	M = 136.26 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 8 < 12.1	Partial	
Axial Resistance (kN)	Rc 1823.36 kN, Rs 1052.15 kN, Rq 697.6 kN	697.6 kN	
Degree of Shear Connection	Na/Np = 8 / 12.1 > 0.4	0.663	OK
Reduced Concrete Area	Area required to resist 697.6 kN	30.2x1282.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 134.1 mm	161.3 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	445, 460, 114000, 40, 87.5	367.59 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.64/(0.64+0.64)	143.42 kN	OK

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Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	28.37 kN each side	< 169.03 kN	OK
Check @ 2.564 m (Max. Moment)	M = 36.37 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	32.64 kN each side		
Super Imposed Dead Load	21.46 kN each side		
Dead Load (Self Weight)	17.15 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	5.46 (8.80) mm @ 2.564 m < L / 360 = 14.2 mm	8.80 mm	OK
Super Imposed Dead Loads	3.59 (5.79) mm @ 2.564 m	5.79 mm	
Dead Loads (Self Weight)	16.81 mm @ 2.564 m	16.81 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 82.5, Super Dead 54.2, SW 99.1 < 275	235.76 N/mm²	OK
TOTAL (Compression)	Live 18, Super Dead 11.8, SW 99.1 < 275	128.97 N/mm²	OK
Maximum Concrete Stress	Live 3.51, Super Dead 2.31, SW 0 < 20	5.82 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	9.54 mm	
Natural Frequency	18/√(9.54/1.1) = 6.11 > 4 Hz	6.11 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 211 (N.305-N.371) @ Level 3

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	4.645 m Span, 2.141 m to LH Beam and 2.142 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1161 mm², b1= 581 mm and b2= 581 mm
Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³
Composite Section Elastic Properties	ye 96.5 mm, Ix 13515 cm⁴, Zs.t 4042 cm³, Zs.b 563 cm³, Zc.t 14025 cm³
Headed Stud Connector	15 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	75.83 kN each side	< 218.38 kN	OK
Check @ 2.323 m (Max. Moment)	M = 88.06 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 7 < 12.1	Partial	
Axial Resistance (kN)	Rc 1651.3 kN, Rs 1050.78 kN, Rq 610.4 kN	610.4 kN	
Degree of Shear Connection	Na/Np = 7 / 12.1 > 0.4	0.581	OK
Reduced Concrete Area	Area required to resist 610.4 kN	29.2x1161.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 135.8 mm	176.45 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN

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Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.58/(0.58+0.58)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	25.93 kN each side	< 218.38 kN	OK
Check @ 2.323 m (Max. Moment)	M = 30.11 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	29.85 kN each side		
Super Imposed Dead Load	4.38 kN each side		
Dead Load (Self Weight)	15.68 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	2.81 (4.11) mm @ 2.323 m < L / 360 = 12.9 mm	4.11 mm	OK
Super Imposed Dead Loads	0.41 (0.60) mm @ 2.323 m	0.60 mm	
Dead Loads (Self Weight)	6.89 mm @ 2.323 m	6.89 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 61.5, Super Dead 9, SW 65 < 275	135.55 N/mm²	OK
TOTAL (Compression)	Live 8.6, Super Dead 1.3, SW 65 < 275	74.83 N/mm²	OK
Maximum Concrete Stress	Live 2.47, Super Dead 0.36, SW 0 < 20	2.83 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	2.49 mm	
Natural Frequency	18/√(2.49/1.1) = 11.96 > 4 Hz	11.96 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 212 (N2-Q2) @ Level 3

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	4.645 m Span, 2.099 m to LH Beam and 2.141 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1161 mm², b1= 581 mm and b2= 581 mm
Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³
Composite Section Elastic Properties	ye 89.3 mm, Ix 9965 cm⁴, Zs.t 2451 cm³, Zs.b 503 cm³, Zc.t 11160 cm³
Headed Stud Connector	15 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	96.23 kN each side	< 169.03 kN	OK
Check @ 2.323 m (Max. Moment)	M = 111.75 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 7 < 12.1	Partial	
Axial Resistance (kN)	Rc 1651.3 kN, Rs 1052.15 kN, Rq 610.4 kN	610.4 kN	
Degree of Shear Connection	Na/Np = 7 / 12.1 > 0.4	0.58	OK
Reduced Concrete Area	Area required to resist 610.4 kN	29.2x1161.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 135.1 mm	151.19 kN.m	OK

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Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.58/(0.58+0.58)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	25.68 kN each side	< 169.03 kN	OK
Check @ 2.323 m (Max. Moment)	M = 29.82 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	29.55 kN each side		
Super Imposed Dead Load	19.43 kN each side		
Dead Load (Self Weight)	15.53 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	3.78 (6.01) mm @ 2.323 m < L / 360 = 12.9 mm	6.01 mm	OK
Super Imposed Dead Loads	2.48 (3.95) mm @ 2.323 m	3.95 mm	
Dead Loads (Self Weight)	11.31 mm @ 2.323 m	11.31 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 68.3, Super Dead 44.9, SW 81.3 < 275	194.41 N/mm²	OK
TOTAL (Compression)	Live 14, Super Dead 9.2, SW 81.3 < 275	104.48 N/mm²	OK
Maximum Concrete Stress	Live 3.08, Super Dead 2.02, SW 0 < 20	5.10 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	6.54 mm	
Natural Frequency	18/√(6.54/1.1) = 7.38 > 4 Hz	7.38 Hz	OK

UNPROPPED NON-COMPOSITE PRIMARY INTERNAL BEAM
Member 217 (B9-D9) @ Level 4

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	2.74 m Span, 6.705 m to LH Beam and 4.795 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	0.58 kN each side	< 169.03 kN	OK
Check @ 1.37 m (Max. Moment)	M = 0.4 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Lateral Torsional Buckling (Final Stage)

Check between 0 and 2.74 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 0, 1	0 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.74 m, 3.83 cm, 1, 0.849, 0.84	58.324 kN.m	OK

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Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	0.58 kN each side	< 169.03 kN	OK
Check @ 1.37 m (Max. Moment)	M = 0.4 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.74 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 0, 1	0 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.74 m, 3.83 cm, 1, 0.849, 0.84	58.324 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	0 kN each side		
Super Imposed Dead Load	0 kN each side		
Dead Load (Self Weight)	0.41 kN each side		
Maximum Deflection			
Live Loads	0.00 (0.00) mm @ 1.425 m < L / 360 = 7.6 mm	0.00 mm	OK
Super Imposed Dead Loads	0.00 mm @ 1.726 m	0.00 mm	
Dead Loads (Self Weight)	0.06 mm @ 1.37 m	0.06 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 0, Super Dead 0, SW 1.3 < 275	1.27 N/mm²	OK
TOTAL (Compression)	Live 0, Super Dead 0, SW 1.3 < 275	1.27 N/mm²	OK

Vibration Analysis

Beam Deflection		0.06 mm	
Natural Frequency	18/√(0.06) = 72.8 > 4 Hz	72.80 Hz	OK

UNPROPPED NON-COMPOSITE SECONDARY EDGE BEAM
Member 223 (A2-H2) @ Level 4

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	1.025 m Span and 2.312 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 17.68 kN, RH Support 15.74 kN	< 169.03 kN	OK
Check @ 0.497 m (Max. Moment)	M = 4.29 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 4.48 kN, RH Support 3.83 kN	< 169.03 kN	OK
Check @ 0.497 m (Max. Moment)	M = 1.07 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)	
Live Loads	LH Support 5.1 kN, RH Support 4.33 kN
Super Imposed Dead Load	LH Support 4.08 kN, RH Support 3.97 kN
Dead Load (Self Weight)	LH Support 2.71 kN, RH Support 2.33 kN

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Maximum Deflection			
Live Loads	0.04 (0.04) mm @ 0.507 m < L / 360 = 2.8 mm	0.04 mm	OK
Super Imposed Dead Loads	0.03 mm @ 0.507 m	0.03 mm	
Dead Loads (Self Weight)	0.02 mm @ 0.507 m	0.02 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 5.5, Super Dead 4.6, SW 2.9 < 275	13.02 N/mm²	OK
TOTAL (Compression)	Live 5.5, Super Dead 4.6, SW 2.9 < 275	13.02 N/mm²	OK

Vibration Analysis

Beam Deflection		0.06 mm	
Natural Frequency	18/√(0.06) = 75.83 > 4 Hz	75.83 Hz	OK

UNPROPPED NON-COMPOSITE SECONDARY INTERNAL BEAM
Member 239 (D4-H5) @ Level 4

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	.748 m Span, 1.002 m to LH Beam and .188 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 6.58 kN, RH Support 6.72 kN	< 169.03 kN	OK
Check @ 0.378 m (Max. Moment)	M = 1.24 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 2.3 kN, RH Support 2.34 kN	< 169.03 kN	OK
Check @ 0.378 m (Max. Moment)	M = 0.43 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 2.56 kN, RH Support 2.62 kN		
Super Imposed Dead Load	0.38 kN each side		
Dead Load (Self Weight)	LH Support 1.4 kN, RH Support 1.43 kN		
Maximum Deflection			
Live Loads	0.01 (0.01) mm @ 0.378 m < L / 360 = 2 mm	0.01 mm	OK
Super Imposed Dead Loads	0.00 mm @ 0.378 m	0.00 mm	
Dead Loads (Self Weight)	0.01 mm @ 0.378 m	0.01 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 2.2, Super Dead 0.3, SW 1.2 < 275	3.69 N/mm²	OK
TOTAL (Compression)	Live 2.2, Super Dead 0.3, SW 1.2 < 275	3.69 N/mm²	OK

Vibration Analysis

Beam Deflection		0.01 mm	
Natural Frequency	18/√(0.01) = 217.59 > 4 Hz	217.59 Hz	OK

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UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 251 (N.351-N.366) @ Level 4

Summary of Design Data (Integrated Design)

Steel Section (43 kg/m)	254x146 UB 43 [S 275]
Floor Area Supported	7.025 m Span, 2.135 m to LH Beam and 2.339 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1756 mm², b1= 878 mm and b2= 878 mm
Steel Section Elastic Properties	ye 129.8 mm, A 54.8 cm², Ix 6545 cm⁴, Zt 504 cm³, Zb 504 cm³
Composite Section Elastic Properties	ye 101.9 mm, Ix 26324 cm⁴, Zs.t 9377 cm³, Zs.b 917 cm³, Zc.t 25914 cm³
Headed Stud Connector	23 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 126.52 kN, RH Support 127.31 kN	< 308.40 kN	OK
Check @ 3.512 m (Max. Moment)	M = 222.9 kN.m, Fv = 0.2 kN		
Shear Connection	No of shear connectors from nearest support 11 < 17.3	Partial	
Axial Resistance (kN)	Rc 2497.39 kN, Rs 1506.18 kN, Rq 959.2 kN	959.2 kN	
Degree of Shear Connection	Na/Np = 11 / 17.3 > 0.4	0.637	OK
Reduced Concrete Area	Area required to resist 959.2 kN	30.3x1756.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 136.6 mm	302.13 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.88/(0.88+0.88)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 43.58 kN, RH Support 43.84 kN	< 308.40 kN	OK
Check @ 3.512 m (Max. Moment)	M = 76.77 kN.m, Fv = 0.07 kN		
Moment Capacity	Plastic neutral axis in web @ 129.8 mm	155.73 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 49.61 kN, RH Support 49.92 kN		
Super Imposed Dead Load	LH Support 7.28 kN, RH Support 7.32 kN		
Dead Load (Self Weight)	LH Support 26.4 kN, RH Support 26.56 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	8.32 (11.06) mm @ 3.512 m < L / 360 = 19.5 mm	11.06 mm	OK
Super Imposed Dead Loads	1.22 (1.62) mm @ 3.512 m	1.62 mm	
Dead Loads (Self Weight)	17.82 mm @ 3.512 m	17.82 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 95.3, Super Dead 14, SW 92.2 < 275	201.50 N/mm²	OK
TOTAL (Compression)	Live 9.3, Super Dead 1.4, SW 92.2 < 275	102.94 N/mm²	OK
Maximum Concrete Stress	Live 3.37, Super Dead 0.49, SW 0 < 20	3.87 N/mm²	OK

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Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	7.16 mm	
Natural Frequency	$18/\sqrt{(7.16/1.1)} = 7.06 > 4$ Hz	7.06 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 253 (N.354-N.370) @ Level 4

Summary of Design Data (Integrated Design)

Steel Section (43 kg/m)	254x146 UB 43 [S 275]
Floor Area Supported	7.164 m Span, 2.139 m to LH Beam and 2.139 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1791 mm², b1= 896 mm and b2= 896 mm
Steel Section Elastic Properties	ye 129.8 mm, A 54.8 cm², Ix 6545 cm⁴, Zt 504 cm³, Zb 504 cm³
Composite Section Elastic Properties	ye 101 mm, Ix 26444 cm⁴, Zs.t 9134 cm³, Zs.b 918 cm³, Zc.t 26250 cm³
Headed Stud Connector	23 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 124.62 kN, RH Support 121.03 kN	< 308.40 kN	OK
Check @ 3.545 m (Max. Moment)	M = 219.99 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 11 < 17.3	Partial	
Axial Resistance (kN)	Rc 2546.8 kN, Rs 1506.18 kN, Rq 959.2 kN	959.2 kN	
Degree of Shear Connection	Na/Np = 11 / 17.3 > 0.4	0.637	OK
Reduced Concrete Area	Area required to resist 959.2 kN	29.8x1791mm²	
Moment Capacity	Plastic neutral axis in top flange @ 136.6 mm	302.41 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.9/(0.9+0.9)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 42.98 kN, RH Support 41.78 kN	< 308.40 kN	OK
Check @ 3.545 m (Max. Moment)	M = 75.91 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 129.8 mm	155.73 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 48.83 kN, RH Support 47.4 kN		
Super Imposed Dead Load	LH Support 7.16 kN, RH Support 6.95 kN		
Dead Load (Self Weight)	LH Support 26.05 kN, RH Support 25.33 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	8.50 (11.31) mm @ 3.545 m < L / 360 = 19.9 mm	11.31 mm	OK
Super Imposed Dead Loads	1.25 (1.66) mm @ 3.545 m	1.66 mm	
Dead Loads (Self Weight)	18.33 mm @ 3.545 m	18.33 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 93.8, Super Dead 13.8, SW 91.2 < 275	198.84 N/mm²	OK
TOTAL (Compression)	Live 9.4, Super Dead 1.4, SW 91.2 < 275	102.07 N/mm²	OK

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Maximum Concrete Stress	Live 3.28, Super Dead 0.48, SW 0 < 20	3.76 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	7.33 mm	
Natural Frequency	18/√(7.33/1.1) = 6.97 > 4 Hz	6.97 Hz	OK

UNPROPPED NON-COMPOSITE SECONDARY EDGE BEAM
Member 255 (H2-M2) @ Level 4

Summary of Design Data (Integrated Design)

Steel Section (107 kg/m)	254x254 UC 107 [S 275]
Floor Area Supported	7.311 m Span and 2.142 m to LH Beam
Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties	ye 133.4 mm, A 136.4 cm², Ix 17517 cm⁴, Zt 1314 cm³, Zb 1314 cm³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 101.22 kN, RH Support 99.43 kN	< 542.79 kN	OK
Check @ 3.618 m (Max. Moment)	M = 183.35 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 26.3 kN, RH Support 25.7 kN	< 542.79 kN	OK
Check @ 3.618 m (Max. Moment)	M = 47.52 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 24.91 kN, RH Support 24.2 kN		
Super Imposed Dead Load	LH Support 27.41 kN, RH Support 27.31 kN		
Dead Load (Self Weight)	LH Support 16.41 kN, RH Support 16.06 kN		
Maximum Deflection			
Live Loads	6.96 (6.96) mm @ 3.618 m < L / 360 = 20.3 mm	6.96 mm	OK
Super Imposed Dead Loads	7.75 mm @ 3.618 m	7.75 mm	
Dead Loads (Self Weight)	4.60 mm @ 3.618 m	4.60 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 34.2, Super Dead 38.1, SW 22.6 < 265	94.82 N/mm²	OK
TOTAL (Compression)	Live 34.2, Super Dead 38.1, SW 22.6 < 265	94.82 N/mm²	OK

Vibration Analysis

Beam Deflection		13.04 mm	
Natural Frequency	18/√(13.04) = 4.98 > 4 Hz	4.98 Hz	OK

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UNPROPPED NON-COMPOSITE PRIMARY INTERNAL BEAM
Member 256 (B9-D9) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	2.74 m Span, 6.705 m to LH Beam and 4.795 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	0.58 kN each side	< 169.03 kN	OK
Check @ 1.37 m (Max. Moment)	M = 0.4 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Lateral Torsional Buckling (Final Stage)

Check between 0 and 2.74 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 0, 1	0 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.74 m, 3.83 cm, 1, 0.849, 0.84	58.324 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	0.58 kN each side	< 169.03 kN	OK
Check @ 1.37 m (Max. Moment)	M = 0.4 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.74 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 0, 1	0 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.74 m, 3.83 cm, 1, 0.849, 0.84	58.324 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	0 kN each side		
Super Imposed Dead Load	0 kN each side		
Dead Load (Self Weight)	0.41 kN each side		
Maximum Deflection			
Live Loads	0.00 (0.00) mm @ 1.836 m < L / 360 = 7.6 mm	0.00 mm	OK
Super Imposed Dead Loads	0.00 mm @ 1.589 m	0.00 mm	
Dead Loads (Self Weight)	0.06 mm @ 1.37 m	0.06 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 0, Super Dead 0, SW 1.3 < 275	1.27 N/mm²	OK
TOTAL (Compression)	Live 0, Super Dead 0, SW 1.3 < 275	1.27 N/mm²	OK

Vibration Analysis

Beam Deflection		0.06 mm	
Natural Frequency	18/√(0.06) = 72.83 > 4 Hz	72.83 Hz	OK

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UNPROPPED COMPOSITE SECONDARY EDGE BEAM
Member 257 (M6-N6) @ Level 4

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	5.085 m Span and 2.498 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+193 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 712 mm², b1= 636 mm and b2= 76 mm
Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³
Composite Section Elastic Properties	ye 108 mm, Ix 8569 cm⁴, Zs.t 3927 cm³, Zs.b 480 cm³, Zc.t 7985 cm³
Headed Stud Connector	16 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 72.22 kN, RH Support 72.1 kN	< 169.03 kN	OK
Check @ 2.516 m (Max. Moment)	M = 91.73 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 8 < 11.6	Partial	
Axial Resistance (kN)	Rc 1012.57 kN, Rs 1052.15 kN, Rq 697.6 kN	697.6 kN	
Degree of Shear Connection	Na/Np = 8 / 11.6 > 0.4	0.689	OK
Reduced Concrete Area	Area required to resist 697.6 kN	54.4x712.1mm²	
Moment Capacity	Plastic neutral axis in top flange @ 134.1 mm	152.85 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	445, 460, 114000, 40, 87.5	367.59 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.64/(0.64+0.08)	256.05 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 17.07 kN, RH Support 17.03 kN	< 169.03 kN	OK
Check @ 2.516 m (Max. Moment)	M = 21.68 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 19.14 kN, RH Support 19.1 kN		
Super Imposed Dead Load	19.34 kN each side		
Dead Load (Self Weight)	LH Support 10.37 kN, RH Support 10.35 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	3.73 (5.46) mm @ 2.516 m < L / 360 = 14.1 mm	5.46 mm	OK
Super Imposed Dead Loads	3.77 (5.52) mm @ 2.516 m	5.52 mm	
Dead Loads (Self Weight)	9.89 mm @ 2.516 m	9.89 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 50.6, Super Dead 51.2, SW 59.3 < 275	161.09 N/mm²	OK
TOTAL (Compression)	Live 6.2, Super Dead 6.3, SW 59.3 < 275	71.79 N/mm²	OK
Maximum Concrete Stress	Live 3.04, Super Dead 3.08, SW 0 < 20	6.12 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	8.08 mm	
Natural Frequency	18/√(8.08/1.1) = 6.64 > 4 Hz	6.64 Hz	OK

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UNPROPPED COMPOSITE SECONDARY EDGE BEAM
Member 259 (N6-Q6) @ Level 4

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	4.643 m Span and 2.481 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m^3, Mod. Ratio 10, Gr 40 with 252+193 mm^2/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 657 mm^2, b1= 580 mm and b2= 76 mm
Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm^2, Ix 1749 cm^4, Zt 222 cm^3, Zb 222 cm^3
Composite Section Elastic Properties	ye 111.4 mm, Ix 8331 cm^4, Zs.t 4507 cm^3, Zs.b 477 cm^3, Zc.t 7548 cm^3
Headed Stud Connector	15 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 65.64 kN, RH Support 65.53 kN	< 169.03 kN	OK
Check @ 2.298 m (Max. Moment)	M = 76.13 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 7 < 10.7	Partial	
Axial Resistance (kN)	Rc 934.01 kN, Rs 1052.15 kN, Rq 610.4 kN	610.4 kN	
Degree of Shear Connection	Na/Np = 7 / 10.7 > 0.4	0.654	OK
Reduced Concrete Area	Area required to resist 610.4 kN	51.6x656.8mm^2	
Moment Capacity	Plastic neutral axis in top flange @ 135.1 mm	144.35 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	445, 460, 114000, 40, 87.5	367.59 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.58/(0.58+0.08)	253.46 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 15.49 kN, RH Support 15.45 kN	< 169.03 kN	OK
Check @ 2.298 m (Max. Moment)	M = 17.96 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 17.36 kN, RH Support 17.32 kN		
Super Imposed Dead Load	17.64 kN each side		
Dead Load (Self Weight)	LH Support 9.41 kN, RH Support 9.39 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	2.65 (3.68) mm @ 2.298 m < L / 360 = 12.8 mm	3.68 mm	OK
Super Imposed Dead Loads	2.69 (3.74) mm @ 2.298 m	3.74 mm	
Dead Loads (Self Weight)	6.83 mm @ 2.298 m	6.83 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 42.2, Super Dead 42.9, SW 49.2 < 275	134.29 N/mm^2	OK
TOTAL (Compression)	Live 4.5, Super Dead 4.5, SW 49.2 < 275	58.17 N/mm^2	OK
Maximum Concrete Stress	Live 2.67, Super Dead 2.71, SW 0 < 20	5.38 N/mm^2	OK

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Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	5.55 mm	
Natural Frequency	$18/\sqrt{(5.55/1.1)} = 8.02 > 4$ Hz	8.02 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 260 (N.364-N3) @ Level 4

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	5.097 m Span, 2.141 m to LH Beam and 2.498 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1274 mm², b1= 637 mm and b2= 637 mm
Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³
Composite Section Elastic Properties	ye 86.1 mm, Ix 10219 cm⁴, Zs.t 2329 cm³, Zs.b 507 cm³, Zc.t 11867 cm³
Headed Stud Connector	16 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 90.26 kN, RH Support 90.14 kN	< 169.03 kN	OK
Check @ 2.548 m (Max. Moment)	M = 114.94 kN.m, Fv = 0.03 kN		
Shear Connection	No of shear connectors from nearest support 8 < 12.1	Partial	
Axial Resistance (kN)	Rc 1811.98 kN, Rs 1052.15 kN, Rq 697.6 kN	697.6 kN	
Degree of Shear Connection	Na/Np = 8 / 12.1 > 0.4	0.663	OK
Reduced Concrete Area	Area required to resist 697.6 kN	30.4x1274.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 134.1 mm	161.23 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.64/(0.64+0.64)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 30.8 kN, RH Support 30.76 kN	< 169.03 kN	OK
Check @ 2.548 m (Max. Moment)	M = 39.22 kN.m, Fv = 0.01 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 35.56 kN, RH Support 35.51 kN		
Super Imposed Dead Load	5.22 kN each side		
Dead Load (Self Weight)	LH Support 18.61 kN, RH Support 18.59 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	5.85 (9.42) mm @ 2.548 m < L / 360 = 14.1 mm	9.42 mm	OK
Super Imposed Dead Loads	0.86 (1.38) mm @ 2.548 m	1.38 mm	
Dead Loads (Self Weight)	17.88 mm @ 2.548 m	17.88 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 89.3, Super Dead 13.1, SW 106.8 < 275	209.18 N/mm²	OK

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TOTAL (Compression)	Live 19.4, Super Dead 2.9, SW 106.8 < 275	129.11 N/mm²	OK
Maximum Concrete Stress	Live 3.82, Super Dead 0.56, SW 0 < 20	4.38 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	5.38 mm	
Natural Frequency	18/√(5.38/1.1) = 8.14 > 4 Hz	8.14 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 261 (N.366-N.372) @ Level 4

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	5.107 m Span, 2.141 m to LH Beam and 2.141 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1277 mm², b1= 638 mm and b2= 638 mm
Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³
Composite Section Elastic Properties	ye 92.8 mm, Ix 13840 cm⁴, Zs.t 3721 cm³, Zs.b 568 cm³, Zc.t 14930 cm³
Headed Stud Connector	16 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	83.37 kN each side	< 218.38 kN	OK
Check @ 2.554 m (Max. Moment)	M = 106.45 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 8 < 12.1	Partial	
Axial Resistance (kN)	Rc 1815.54 kN, Rs 1050.78 kN, Rq 697.6 kN	697.6 kN	
Degree of Shear Connection	Na/Np = 8 / 12.1 > 0.4	0.664	OK
Reduced Concrete Area	Area required to resist 697.6 kN	30.4x1276.8mm²	
Moment Capacity	Plastic neutral axis in top flange @ 134.6 mm	186.56 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.64/(0.64+0.64)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	28.5 kN each side	< 218.38 kN	OK
Check @ 2.554 m (Max. Moment)	M = 36.39 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	32.81 kN each side		
Super Imposed Dead Load	4.81 kN each side		
Dead Load (Self Weight)	17.23 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	4.01 (5.92) mm @ 2.554 m < L / 360 = 14.1 mm	5.92 mm	OK
Super Imposed Dead Loads	0.59 (0.87) mm @ 2.554 m	0.87 mm	
Dead Loads (Self Weight)	10.07 mm @ 2.554 m	10.07 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 73.8, Super Dead 10.8, SW 78.6 < 275	163.20 N/mm²	OK

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TOTAL (Compression)	Live 11.3, Super Dead 1.7, SW 78.6 < 275	91.47 N/mm²	OK
Maximum Concrete Stress	Live 2.81, Super Dead 0.41, SW 0 < 20	3.22 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	3.57 mm	
Natural Frequency	18/√(3.57/1.1) = 10 > 4 Hz	10.00 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 262 (N3-Q3) @ Level 4

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	4.644 m Span, 2.141 m to LH Beam and 2.481 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1161 mm², b1= 581 mm and b2= 581 mm
Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³
Composite Section Elastic Properties	ye 89.3 mm, Ix 9964 cm⁴, Zs.t 2451 cm³, Zs.b 503 cm³, Zc.t 11159 cm³
Headed Stud Connector	15 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear

Support Reactions (kN)	LH Support 81.94 kN, RH Support 81.83 kN	< 169.03 kN	OK
Check @ 2.298 m (Max. Moment)	M = 95.07 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 7 < 12.1	Partial	
Axial Resistance (kN)	Rc 1650.94 kN, Rs 1052.15 kN, Rq 610.4 kN	610.4 kN	
Degree of Shear Connection	Na/Np = 7 / 12.1 > 0.4	0.58	OK
Reduced Concrete Area	Area required to resist 610.4 kN	29.2x1161mm²	
Moment Capacity	Plastic neutral axis in top flange @ 135.1 mm	151.19 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.58/(0.58+0.58)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear

Support Reactions (kN)	LH Support 27.96 kN, RH Support 27.93 kN	< 169.03 kN	OK
Check @ 2.298 m (Max. Moment)	M = 32.44 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)

Live Loads	LH Support 32.28 kN, RH Support 32.24 kN		
Super Imposed Dead Load	4.73 kN each side		
Dead Load (Self Weight)	LH Support 16.9 kN, RH Support 16.88 kN		

Maximum Deflection (Partial Connection All Loads)

Live Loads	4.12 (6.56) mm @ 2.298 m < L / 360 = 12.9 mm	6.56 mm	OK
Super Imposed Dead Loads	0.60 (0.96) mm @ 2.298 m	0.96 mm	
Dead Loads (Self Weight)	12.28 mm @ 2.298 m	12.28 mm	

Maximum Steel Stress

TOTAL (Tension)	Live 74.5, Super Dead 10.9, SW 88.4 < 275	173.78 N/mm²	OK

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TOTAL (Compression)	Live 15.3, Super Dead 2.2, SW 88.4 < 275	105.88 N/mm²	OK
Maximum Concrete Stress	Live 3.36, Super Dead 0.49, SW 0 < 20	3.85 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	3.77 mm	
Natural Frequency	$18/\sqrt{(3.77/1.1)} = 9.72 > 4$ Hz	9.72 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 263 (N.370-N.376) @ Level 4

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	5.118 m Span, 2.141 m to LH Beam and 2.141 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	4.644 m Span, 2.142 m to LH Beam and 2.141 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1161 mm², b1= 581 mm and b2= 581 mm
Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³
Composite Section Elastic Properties	ye 96.5 mm, Ix 13515 cm⁴, Zs.t 4043 cm³, Zs.b 563 cm³, Zc.t 14023 cm³
Headed Stud Connector	15 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	75.82 kN each side	< 218.38 kN	OK
Check @ 2.322 m (Max. Moment)	M = 88.03 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 7 < 12.1	Partial	
Axial Resistance (kN)	Rc 1650.94 kN, Rs 1050.78 kN, Rq 610.4 kN	610.4 kN	
Degree of Shear Connection	Na/Np = 7 / 12.1 > 0.4	0.581	OK
Reduced Concrete Area	Area required to resist 610.4 kN	29.2x1161mm²	
Moment Capacity	Plastic neutral axis in top flange @ 135.8 mm	176.44 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.58/(0.58+0.58)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	25.92 kN each side	< 218.38 kN	OK
Check @ 2.322 m (Max. Moment)	M = 30.1 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)	
Live Loads	29.84 kN each side
Super Imposed Dead Load	4.38 kN each side

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Dead Load (Self Weight)	15.68 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	2.81 (4.10) mm @ 2.322 m < L / 360 = 12.9 mm	4.10 mm	OK
Super Imposed Dead Loads	0.41 (0.60) mm @ 2.322 m	0.60 mm	
Dead Loads (Self Weight)	6.88 mm @ 2.322 m	6.88 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 61.5, Super Dead 9, SW 65 < 275	135.50 N/mm²	OK
TOTAL (Compression)	Live 8.6, Super Dead 1.3, SW 65 < 275	74.80 N/mm²	OK
Maximum Concrete Stress	Live 2.47, Super Dead 0.36, SW 0 < 20	2.83 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	2.49 mm	
Natural Frequency	18/√(2.49/1.1) = 11.97 > 4 Hz	11.97 Hz	OK

UNPROPPED COMPOSITE SECONDARY EDGE BEAM
Member 265 (M2-N2) @ Level 4

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	5.129 m Span and 2.141 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+193 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 718 mm², b1= 641 mm and b2= 76 mm
Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³
Composite Section Elastic Properties	ye 107.7 mm, Ix 8591 cm⁴, Zs.t 3881 cm³, Zs.b 481 cm³, Zc.t 8028 cm³
Headed Stud Connector	16 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	65.74 kN each side	< 169.03 kN	OK
Check @ 2.564 m (Max. Moment)	M = 84.3 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 8 < 11.7	Partial	
Axial Resistance (kN)	Rc 1020.39 kN, Rs 1052.15 kN, Rq 697.6 kN	697.6 kN	
Degree of Shear Connection	Na/Np = 8 / 11.7 > 0.4	0.684	OK
Reduced Concrete Area	Area required to resist 697.6 kN	54x717.6mm²	
Moment Capacity	Plastic neutral axis in top flange @ 134.1 mm	153 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	445, 460, 114000, 40, 87.5	367.59 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.64/(0.64+0.08)	256.28 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	14.86 kN each side	< 169.03 kN	OK
Check @ 2.564 m (Max. Moment)	M = 19.05 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)	
Live Loads	16.48 kN each side
Super Imposed Dead Load	19.09 kN each side
Dead Load (Self Weight)	9.04 kN each side

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Maximum Deflection (Partial Connection All Loads)			
Live Loads	3.29 (4.84) mm @ 2.564 m < L / 360 = 14.2 mm	4.84 mm	OK
Super Imposed Dead Loads	3.81 (5.60) mm @ 2.564 m	5.60 mm	
Dead Loads (Self Weight)	8.86 mm @ 2.564 m	8.86 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 43.9, Super Dead 50.9, SW 52.2 < 275	147.09 N/mm²	OK
TOTAL (Compression)	Live 5.4, Super Dead 6.3, SW 52.2 < 275	63.98 N/mm²	OK
Maximum Concrete Stress	Live 2.63, Super Dead 3.05, SW 0 < 20	5.68 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	7.89 mm	
Natural Frequency	18/√(7.89/1.1) = 6.72 > 4 Hz	6.72 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 266 (N.376-N.446) @ Level 4

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	4.645 m Span, 2.141 m to LH Beam and 2.142 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1161 mm², b1= 581 mm and b2= 581 mm
Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³
Composite Section Elastic Properties	ye 96.5 mm, Ix 13515 cm⁴, Zs.t 4042 cm³, Zs.b 563 cm³, Zc.t 14025 cm³
Headed Stud Connector	15 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	75.83 kN each side	< 218.38 kN	OK
Check @ 2.323 m (Max. Moment)	M = 88.06 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 7 < 12.1	Partial	
Axial Resistance (kN)	Rc 1651.3 kN, Rs 1050.78 kN, Rq 610.4 kN	610.4 kN	
Degree of Shear Connection	Na/Np = 7 / 12.1 > 0.4	0.581	OK
Reduced Concrete Area	Area required to resist 610.4 kN	29.2x1161.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 135.8 mm	176.45 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.58/(0.58+0.58)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	25.93 kN each side	< 218.38 kN	OK
Check @ 2.323 m (Max. Moment)	M = 30.11 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)	
Live Loads	29.85 kN each side
Super Imposed Dead Load	4.38 kN each side

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Dead Load (Self Weight)	15.68 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	2.81 (4.11) mm @ 2.323 m < L / 360 = 12.9 mm	4.11 mm	OK
Super Imposed Dead Loads	0.41 (0.60) mm @ 2.323 m	0.60 mm	
Dead Loads (Self Weight)	6.89 mm @ 2.323 m	6.89 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 61.5, Super Dead 9, SW 65 < 275	135.55 N/mm²	OK
TOTAL (Compression)	Live 8.6, Super Dead 1.3, SW 65 < 275	74.83 N/mm²	OK
Maximum Concrete Stress	Live 2.47, Super Dead 0.36, SW 0 < 20	2.83 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	2.49 mm	
Natural Frequency	18/√(2.49/1.1) = 11.96 > 4 Hz	11.96 Hz	OK

UNPROPPED COMPOSITE SECONDARY EDGE BEAM
Member 267 (N2-Q2) @ Level 4

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	4.645 m Span and 2.141 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 657 mm², b1= 581 mm and b2= 76 mm
Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³
Composite Section Elastic Properties	ye 111.3 mm, Ix 8332 cm⁴, Zs.t 4504 cm³, Zs.b 477 cm³, Zc.t 7550 cm³
Headed Stud Connector	15 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	59.53 kN each side	< 169.03 kN	OK
Check @ 2.323 m (Max. Moment)	M = 69.13 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 7 < 10.7	Partial	
Axial Resistance (kN)	Rc 934.36 kN, Rs 1052.15 kN, Rq 610.4 kN	610.4 kN	
Degree of Shear Connection	Na/Np = 7 / 10.7 > 0.4	0.653	OK
Reduced Concrete Area	Area required to resist 610.4 kN	51.6x657.1mm²	
Moment Capacity	Plastic neutral axis in top flange @ 135.1 mm	144.35 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.58/(0.58+0.08)	253.47 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	13.45 kN each side	< 169.03 kN	OK
Check @ 2.323 m (Max. Moment)	M = 15.62 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

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Serviceability Limit State

Support Reactions (kN)			
Live Loads	14.92 kN each side		
Super Imposed Dead Load	17.29 kN each side		
Dead Load (Self Weight)	8.19 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	2.28 (3.17) mm @ 2.323 m < L / 360 = 12.9 mm	3.17 mm	OK
Super Imposed Dead Loads	2.64 (3.68) mm @ 2.323 m	3.68 mm	
Dead Loads (Self Weight)	5.96 mm @ 2.323 m	5.96 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 36.3, Super Dead 42.1, SW 42.8 < 275	121.26 N/mm²	OK
TOTAL (Compression)	Live 3.8, Super Dead 4.5, SW 42.8 < 275	51.14 N/mm²	OK
Maximum Concrete Stress	Live 2.29, Super Dead 2.66, SW 0 < 20	4.95 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	5.24 mm	
Natural Frequency	18/√(5.24/1.1) = 8.24 > 4 Hz	8.24 Hz	OK

UNPROPPED NON-COMPOSITE SECONDARY EDGE BEAM
Member 272 (A2-H2) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	1.025 m Span and 2.312 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 17.68 kN, RH Support 15.74 kN	< 169.03 kN	OK
Check @ 0.497 m (Max. Moment)	M = 4.28 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 4.48 kN, RH Support 3.83 kN	< 169.03 kN	OK
Check @ 0.497 m (Max. Moment)	M = 1.07 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 5.1 kN, RH Support 4.33 kN		
Super Imposed Dead Load	LH Support 4.08 kN, RH Support 3.97 kN		
Dead Load (Self Weight)	LH Support 2.71 kN, RH Support 2.33 kN		
Maximum Deflection			
Live Loads	0.04 (0.04) mm @ 0.507 m < L / 360 = 2.8 mm	0.04 mm	OK
Super Imposed Dead Loads	0.03 mm @ 0.507 m	0.03 mm	
Dead Loads (Self Weight)	0.02 mm @ 0.507 m	0.02 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 5.5, Super Dead 4.6, SW 2.9 < 275	13.02 N/mm²	OK
TOTAL (Compression)	Live 5.5, Super Dead 4.6, SW 2.9 < 275	13.02 N/mm²	OK

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Vibration Analysis

Beam Deflection		0.06 mm	
Natural Frequency	$18/\sqrt{(0.06)} = 75.83 > 4$ Hz	75.83 Hz	OK

UNPROPPED NON-COMPOSITE SECONDARY INTERNAL BEAM
Member 290 (D4-H5) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	.748 m Span, 1.002 m to LH Beam and .188 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 6.58 kN, RH Support 6.72 kN	< 169.03 kN	OK
Check @ 0.378 m (Max. Moment)	M = 1.24 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 2.3 kN, RH Support 2.34 kN	< 169.03 kN	OK
Check @ 0.378 m (Max. Moment)	M = 0.43 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 2.56 kN, RH Support 2.62 kN		
Super Imposed Dead Load	0.38 kN each side		
Dead Load (Self Weight)	LH Support 1.4 kN, RH Support 1.43 kN		
Maximum Deflection			
Live Loads	0.01 (0.01) mm @ 0.378 m < L / 360 = 2 mm	0.01 mm	OK
Super Imposed Dead Loads	0.00 mm @ 0.378 m	0.00 mm	
Dead Loads (Self Weight)	0.01 mm @ 0.378 m	0.01 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 2.2, Super Dead 0.3, SW 1.2 < 275	3.69 N/mm²	OK
TOTAL (Compression)	Live 2.2, Super Dead 0.3, SW 1.2 < 275	3.69 N/mm²	OK

Vibration Analysis

Beam Deflection		0.01 mm	
Natural Frequency	$18/\sqrt{(0.01)} = 217.59 > 4$ Hz	217.59 Hz	OK

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UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 303 (N.420-N.445) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (43 kg/m)	254x146 UB 43 [S 275]
Floor Area Supported	7.025 m Span, 2.135 m to LH Beam and 2.339 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1756 mm², b1= 878 mm and b2= 878 mm
Steel Section Elastic Properties	ye 129.8 mm, A 54.8 cm², Ix 6545 cm⁴, Zt 504 cm³, Zb 504 cm³
Composite Section Elastic Properties	ye 101.9 mm, Ix 26324 cm⁴, Zs.t 9377 cm³, Zs.b 917 cm³, Zc.t 25914 cm³
Headed Stud Connector	23 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 126.52 kN, RH Support 127.31 kN	< 308.40 kN	OK
Check @ 3.512 m (Max. Moment)	M = 222.9 kN.m, Fv = 0.2 kN		
Shear Connection	No of shear connectors from nearest support 11 < 17.3	Partial	
Axial Resistance (kN)	Rc 2497.39 kN, Rs 1506.18 kN, Rq 959.2 kN	959.2 kN	
Degree of Shear Connection	Na/Np = 11 / 17.3 > 0.4	0.637	OK
Reduced Concrete Area	Area required to resist 959.2 kN	30.3x1756.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 136.6 mm	302.13 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.88/(0.88+0.88)	143.42 kN OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 43.58 kN, RH Support 43.84 kN	< 308.40 kN	OK
Check @ 3.512 m (Max. Moment)	M = 76.77 kN.m, Fv = 0.07 kN		
Moment Capacity	Plastic neutral axis in web @ 129.8 mm	155.73 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 49.61 kN, RH Support 49.92 kN		
Super Imposed Dead Load	LH Support 7.28 kN, RH Support 7.32 kN		
Dead Load (Self Weight)	LH Support 26.4 kN, RH Support 26.56 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	8.32 (11.06) mm @ 3.512 m < L / 360 = 19.5 mm	11.06 mm	OK
Super Imposed Dead Loads	1.22 (1.62) mm @ 3.512 m	1.62 mm	
Dead Loads (Self Weight)	17.82 mm @ 3.512 m	17.82 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 95.3, Super Dead 14, SW 92.2 < 275	201.50 N/mm²	OK
TOTAL (Compression)	Live 9.3, Super Dead 1.4, SW 92.2 < 275	102.94 N/mm²	OK

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Maximum Concrete Stress	Live 3.37, Super Dead 0.49, SW 0 < 20	3.87 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	7.16 mm	
Natural Frequency	18/√(7.16/1.1) = 7.06 > 4 Hz	7.06 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 306 (N.424-N.450) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (43 kg/m)	254x146 UB 43 [S 275]
Floor Area Supported	7.164 m Span, 2.139 m to LH Beam and 2.139 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1791 mm², b1= 896 mm and b2= 896 mm
Steel Section Elastic Properties	ye 129.8 mm, A 54.8 cm², Ix 6545 cm⁴, Zt 504 cm³, Zb 504 cm³
Composite Section Elastic Properties	ye 101 mm, Ix 26444 cm⁴, Zs.t 9134 cm³, Zs.b 918 cm³, Zc.t 26250 cm³
Headed Stud Connector	23 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 124.62 kN, RH Support 121.03 kN	< 308.40 kN	OK
Check @ 3.545 m (Max. Moment)	M = 219.99 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 11 < 17.3	Partial	
Axial Resistance (kN)	Rc 2546.8 kN, Rs 1506.18 kN, Rq 959.2 kN	959.2 kN	
Degree of Shear Connection	Na/Np = 11 / 17.3 > 0.4	0.637	OK
Reduced Concrete Area	Area required to resist 959.2 kN	29.8x1791mm²	
Moment Capacity	Plastic neutral axis in top flange @ 136.6 mm	302.41 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.9/(0.9+0.9)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 42.98 kN, RH Support 41.78 kN	< 308.40 kN	OK
Check @ 3.545 m (Max. Moment)	M = 75.91 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 129.8 mm	155.73 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 48.83 kN, RH Support 47.4 kN		
Super Imposed Dead Load	LH Support 7.16 kN, RH Support 6.95 kN		
Dead Load (Self Weight)	LH Support 26.05 kN, RH Support 25.33 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	8.50 (11.31) mm @ 3.545 m < L / 360 = 19.9 mm	11.31 mm	OK
Super Imposed Dead Loads	1.25 (1.66) mm @ 3.545 m	1.66 mm	
Dead Loads (Self Weight)	18.33 mm @ 3.545 m	18.33 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 93.8, Super Dead 13.8, SW 91.2 < 275	198.84 N/mm²	OK

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TOTAL (Compression)	Live 9.4, Super Dead 1.4, SW 91.2 < 275	102.07 N/mm²	OK
Maximum Concrete Stress	Live 3.28, Super Dead 0.48, SW 0 < 20	3.76 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	7.33 mm	
Natural Frequency	18/√(7.33/1.1) = 6.97 > 4 Hz	6.97 Hz	OK

UNPROPPED COMPOSITE SECONDARY EDGE BEAM
Member 307 (H2-M2) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (86 kg/m)	203x203 UC 86 [S 275]
Floor Area Supported	7.311 m Span and 2.142 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1018 mm², b1= 914 mm and b2= 105 mm
Steel Section Elastic Properties	ye 111.1 mm, A 109.6 cm², Ix 9452 cm⁴, Zt 851 cm³, Zb 851 cm³
Composite Section Elastic Properties	ye 155.8 mm, Ix 28729 cm⁴, Zs.t 11148 cm³, Zs.b 1463 cm³, Zc.t 18443 cm³
Headed Stud Connector (+1)	25 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 100.14 kN, RH Support 98.35 kN	< 448.69 kN	OK
Check @ 3.618 m (Max. Moment)	M = 181.39 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 12 < 16.6	Partial	
Axial Resistance (kN)	Rc 1448.2 kN, Rs 2905.2 kN, Rq 1046.4 kN	1046.4 kN	
Degree of Shear Connection	Na/Np = 12 / 16.6 > 0.4	0.723	OK
Reduced Concrete Area	Area required to resist 1046.4 kN	57.1x1018.4mm²	
Moment Capacity	Plastic neutral axis in top flange @ 146.6 mm	411.13 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.91/(0.91+0.1)	257.40 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 25.23 kN, RH Support 24.63 kN	< 448.69 kN	OK
Check @ 3.618 m (Max. Moment)	M = 45.56 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 24.91 kN, RH Support 24.2 kN		
Super Imposed Dead Load	LH Support 27.41 kN, RH Support 27.31 kN		
Dead Load (Self Weight)	LH Support 15.65 kN, RH Support 15.29 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	4.24 (4.96) mm @ 3.618 m < L / 360 = 20.3 mm	4.96 mm	OK
Super Imposed Dead Loads	4.73 (5.53) mm @ 3.618 m	5.53 mm	
Dead Loads (Self Weight)	8.12 mm @ 3.618 m	8.12 mm	

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Maximum Steel Stress			
TOTAL (Tension)	Live 30.7, Super Dead 34.2, SW 33.2 < 265	98.10 N/mm²	OK
TOTAL (Compression)	Live 4, Super Dead 4.5, SW 33.2 < 265	41.74 N/mm²	OK
Maximum Concrete Stress	Live 2.43, Super Dead 2.71, SW 0 < 20	5.14 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	8.7 mm	
Natural Frequency	18/√(8.70/1.1) = 6.4 > 4 Hz	6.40 Hz	OK

UNPROPPED COMPOSITE SECONDARY EDGE BEAM
Member 311 (M6-N6) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (86 kg/m)	203x203 UC 86 [S 275]
Floor Area Supported	5.085 m Span and 2.498 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+193 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 740 mm², b1= 636 mm and b2= 105 mm
Steel Section Elastic Properties	ye 111.1 mm, A 109.6 cm², Ix 9452 cm⁴, Zt 851 cm³, Zb 851 cm³
Composite Section Elastic Properties	ye 171 mm, Ix 25254 cm⁴, Zs.t 6163 cm³, Zs.b 1394 cm³, Zc.t 14771 cm³
Headed Stud Connector	16 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 74.21 kN, RH Support 74.1 kN	< 448.69 kN	OK
Check @ 2.516 m (Max. Moment)	M = 94.27 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 8 < 12.1	Partial	
Axial Resistance (kN)	Rc 1052.53 kN, Rs 2905.2 kN, Rq 697.6 kN	697.6 kN	
Degree of Shear Connection	Na/Np = 8 / 12.1 > 0.4	0.663	OK
Reduced Concrete Area	Area required to resist 697.6 kN	52.4x740.2mm²	
Moment Capacity	Plastic neutral axis in top flange @ 149.7 mm	371.06 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	445, 460, 114000, 40, 87.5	367.59 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.64/(0.64+0.1)	246.33 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 19.07 kN, RH Support 19.03 kN	< 448.69 kN	OK
Check @ 2.516 m (Max. Moment)	M = 24.21 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 19.14 kN, RH Support 19.1 kN		
Super Imposed Dead Load	19.34 kN each side		
Dead Load (Self Weight)	LH Support 11.8 kN, RH Support 11.77 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	1.26 (1.53) mm @ 2.516 m < L / 360 = 14.1 mm	1.53 mm	OK
Super Imposed Dead Loads	1.28 (1.55) mm @ 2.516 m	1.55 mm	
Dead Loads (Self Weight)	2.08 mm @ 2.516 m	2.08 mm	

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Maximum Steel Stress			
TOTAL (Tension)	Live 17.4, Super Dead 17.6, SW 17.6 < 265	52.69 N/mm²	OK
TOTAL (Compression)	Live 3.9, Super Dead 4, SW 17.6 < 265	25.54 N/mm²	OK
Maximum Concrete Stress	Live 1.65, Super Dead 1.66, SW 0 < 20	3.31 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	2.48 mm	
Natural Frequency	18/√(2.48/1.1) = 11.99 > 4 Hz	11.99 Hz	OK

UNPROPPED COMPOSITE SECONDARY EDGE BEAM
Member 314 (N6-Q6) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (86 kg/m)	203x203 UC 86 [S 275]
Floor Area Supported	4.643 m Span and 2.481 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+193 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 685 mm², b1= 580 mm and b2= 105 mm
Steel Section Elastic Properties	ye 111.1 mm, A 109.6 cm², Ix 9452 cm⁴, Zt 851 cm³, Zb 851 cm³
Composite Section Elastic Properties	ye 174.5 mm, Ix 24457 cm⁴, Zs.t 5499 cm³, Zs.b 1376 cm³, Zc.t 14017 cm³
Headed Stud Connector	15 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 67.46 kN, RH Support 67.35 kN	< 448.69 kN	OK
Check @ 2.298 m (Max. Moment)	M = 78.24 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 7 < 11.2	Partial	
Axial Resistance (kN)	Rc 973.96 kN, Rs 2905.2 kN, Rq 610.4 kN	610.4 kN	
Degree of Shear Connection	Na/Np = 7 / 11.2 > 0.4	0.627	OK
Reduced Concrete Area	Area required to resist 610.4 kN	49.5x684.9mm²	
Moment Capacity	Plastic neutral axis in top flange @ 150.5 mm	361.12 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	445, 460, 114000, 40, 87.5	367.59 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.58/(0.58+0.1)	243.06 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 17.31 kN, RH Support 17.27 kN	< 448.69 kN	OK
Check @ 2.298 m (Max. Moment)	M = 20.07 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 17.36 kN, RH Support 17.32 kN		
Super Imposed Dead Load	17.64 kN each side		
Dead Load (Self Weight)	LH Support 10.71 kN, RH Support 10.69 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	0.90 (1.06) mm @ 2.298 m < L / 360 = 12.8 mm	1.06 mm	OK
Super Imposed Dead Loads	0.92 (1.08) mm @ 2.298 m	1.08 mm	

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Dead Loads (Self Weight)	1.44 mm @ 2.298 m	1.44 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 14.6, Super Dead 14.9, SW 14.6 < 265	44.10 N/mm²	OK
TOTAL (Compression)	Live 3.7, Super Dead 3.7, SW 14.6 < 265	21.98 N/mm²	OK
Maximum Concrete Stress	Live 1.44, Super Dead 1.46, SW 0 < 20	2.90 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	1.74 mm	
Natural Frequency	18/√(1.74/1.1) = 14.3 > 4 Hz	14.30 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 316 (N.441-N3) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	5.097 m Span, 2.141 m to LH Beam and 2.498 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1274 mm², b1= 637 mm and b2= 637 mm
Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³
Composite Section Elastic Properties	ye 86.1 mm, Ix 10219 cm⁴, Zs.t 2329 cm³, Zs.b 507 cm³, Zc.t 11867 cm³
Headed Stud Connector	16 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 90.26 kN, RH Support 90.14 kN	< 169.03 kN	OK
Check @ 2.548 m (Max. Moment)	M = 114.94 kN.m, Fv = 0.03 kN		
Shear Connection	No of shear connectors from nearest support 8 < 12.1	Partial	
Axial Resistance (kN)	Rc 1811.98 kN, Rs 1052.15 kN, Rq 697.6 kN	697.6 kN	
Degree of Shear Connection	Na/Np = 8 / 12.1 > 0.4	0.663	OK
Reduced Concrete Area	Area required to resist 697.6 kN	30.4x1274.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 134.1 mm	161.23 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.64/(0.64+0.64)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 30.8 kN, RH Support 30.76 kN	< 169.03 kN	OK
Check @ 2.548 m (Max. Moment)	M = 39.22 kN.m, Fv = 0.01 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)	
Live Loads	LH Support 35.56 kN, RH Support 35.51 kN
Super Imposed Dead Load	5.22 kN each side
Dead Load (Self Weight)	LH Support 18.61 kN, RH Support 18.59 kN

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Maximum Deflection (Partial Connection All Loads)			
Live Loads	5.85 (9.42) mm @ 2.548 m < L / 360 = 14.1 mm	9.42 mm	OK
Super Imposed Dead Loads	0.86 (1.38) mm @ 2.548 m	1.38 mm	
Dead Loads (Self Weight)	17.88 mm @ 2.548 m	17.88 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 89.3, Super Dead 13.1, SW 106.8 < 275	209.18 N/mm²	OK
TOTAL (Compression)	Live 19.4, Super Dead 2.9, SW 106.8 < 275	129.11 N/mm²	OK
Maximum Concrete Stress	Live 3.82, Super Dead 0.56, SW 0 < 20	4.38 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	5.38 mm	
Natural Frequency	18/√(5.38/1.1) = 8.14 > 4 Hz	8.14 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 318 (N.445-N.451) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	5.107 m Span, 2.141 m to LH Beam and 2.141 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1277 mm², b1= 638 mm and b2= 638 mm
Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³
Composite Section Elastic Properties	ye 92.8 mm, Ix 13840 cm⁴, Zs.t 3721 cm³, Zs.b 568 cm³, Zc.t 14930 cm³
Headed Stud Connector	16 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	83.37 kN each side	< 218.38 kN	OK
Check @ 2.554 m (Max. Moment)	M = 106.45 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 8 < 12.1	Partial	
Axial Resistance (kN)	Rc 1815.54 kN, Rs 1050.78 kN, Rq 697.6 kN	697.6 kN	
Degree of Shear Connection	Na/Np = 8 / 12.1 > 0.4	0.664	OK
Reduced Concrete Area	Area required to resist 697.6 kN	30.4x1276.8mm²	
Moment Capacity	Plastic neutral axis in top flange @ 134.6 mm	186.56 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.64/(0.64+0.64)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	28.5 kN each side	< 218.38 kN	OK
Check @ 2.554 m (Max. Moment)	M = 36.39 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)	
Live Loads	32.81 kN each side
Super Imposed Dead Load	4.81 kN each side

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Dead Load (Self Weight)	17.23 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	4.01 (5.92) mm @ 2.554 m < L / 360 = 14.1 mm	5.92 mm	OK
Super Imposed Dead Loads	0.59 (0.87) mm @ 2.554 m	0.87 mm	
Dead Loads (Self Weight)	10.07 mm @ 2.554 m	10.07 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 73.8, Super Dead 10.8, SW 78.6 < 275	163.20 N/mm²	OK
TOTAL (Compression)	Live 11.3, Super Dead 1.7, SW 78.6 < 275	91.47 N/mm²	OK
Maximum Concrete Stress	Live 2.81, Super Dead 0.41, SW 0 < 20	3.22 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	3.57 mm	
Natural Frequency	18/√(3.57/1.1) = 10 > 4 Hz	10.00 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 319 (N3-Q3) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	4.644 m Span, 2.141 m to LH Beam and 2.481 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1161 mm², b1= 581 mm and b2= 581 mm
Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³
Composite Section Elastic Properties	ye 89.3 mm, Ix 9964 cm⁴, Zs.t 2451 cm³, Zs.b 503 cm³, Zc.t 11159 cm³
Headed Stud Connector	15 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 81.94 kN, RH Support 81.83 kN	< 169.03 kN	OK
Check @ 2.298 m (Max. Moment)	M = 95.07 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 7 < 12.1	Partial	
Axial Resistance (kN)	Rc 1650.94 kN, Rs 1052.15 kN, Rq 610.4 kN	610.4 kN	
Degree of Shear Connection	Na/Np = 7 / 12.1 > 0.4	0.58	OK
Reduced Concrete Area	Area required to resist 610.4 kN	29.2x1161mm²	
Moment Capacity	Plastic neutral axis in top flange @ 135.1 mm	151.19 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.58/(0.58+0.58)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 27.96 kN, RH Support 27.93 kN	< 169.03 kN	OK
Check @ 2.298 m (Max. Moment)	M = 32.44 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)	
Live Loads	LH Support 32.28 kN, RH Support 32.24 kN
Super Imposed Dead Load	4.73 kN each side
Dead Load (Self Weight)	LH Support 16.9 kN, RH Support 16.88 kN

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Maximum Deflection (Partial Connection All Loads)			
Live Loads	4.12 (6.56) mm @ 2.298 m < L / 360 = 12.9 mm	6.56 mm	OK
Super Imposed Dead Loads	0.60 (0.96) mm @ 2.298 m	0.96 mm	
Dead Loads (Self Weight)	12.28 mm @ 2.298 m	12.28 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 74.5, Super Dead 10.9, SW 88.4 < 275	173.78 N/mm²	OK
TOTAL (Compression)	Live 15.3, Super Dead 2.2, SW 88.4 < 275	105.88 N/mm²	OK
Maximum Concrete Stress	Live 3.36, Super Dead 0.49, SW 0 < 20	3.85 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	3.77 mm	
Natural Frequency	18/√(3.77/1.1) = 9.72 > 4 Hz	9.72 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 321 (N.450-N.454) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	5.118 m Span, 2.141 m to LH Beam and 2.141 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1280 mm², b1= 640 mm and b2= 640 mm
Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³
Composite Section Elastic Properties	ye 92.7 mm, Ix 13847 cm⁴, Zs.t 3714 cm³, Zs.b 568 cm³, Zc.t 14951 cm³
Headed Stud Connector	16 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	83.55 kN each side	< 218.38 kN	OK
Check @ 2.559 m (Max. Moment)	M = 106.9 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 8 < 12.1	Partial	
Axial Resistance (kN)	Rc 1819.45 kN, Rs 1050.78 kN, Rq 697.6 kN	697.6 kN	
Degree of Shear Connection	Na/Np = 8 / 12.1 > 0.4	0.664	OK
Reduced Concrete Area	Area required to resist 697.6 kN	30.3x1279.5mm²	
Moment Capacity	Plastic neutral axis in top flange @ 134.6 mm	186.58 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.64/(0.64+0.64)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	28.56 kN each side	< 218.38 kN	OK
Check @ 2.559 m (Max. Moment)	M = 36.55 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)	
Live Loads	32.88 kN each side
Super Imposed Dead Load	4.82 kN each side
Dead Load (Self Weight)	17.27 kN each side

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Maximum Deflection (Partial Connection All Loads)			
Live Loads	4.04 (5.97) mm @ 2.559 m < L / 360 = 14.2 mm	5.97 mm	OK
Super Imposed Dead Loads	0.59 (0.87) mm @ 2.559 m	0.87 mm	
Dead Loads (Self Weight)	10.15 mm @ 2.559 m	10.15 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 74.1, Super Dead 10.9, SW 78.9 < 275	163.88 N/mm²	OK
TOTAL (Compression)	Live 11.3, Super Dead 1.7, SW 78.9 < 275	91.88 N/mm²	OK
Maximum Concrete Stress	Live 2.81, Super Dead 0.41, SW 0 < 20	3.23 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	3.6 mm	
Natural Frequency	$18/\sqrt{(3.60/1.1)} = 9.96 > 4$ Hz	9.96 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 322 (N.451-N.490) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	4.644 m Span, 2.142 m to LH Beam and 2.141 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1161 mm², b1= 581 mm and b2= 581 mm
Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³
Composite Section Elastic Properties	ye 96.5 mm, Ix 13515 cm⁴, Zs.t 4043 cm³, Zs.b 563 cm³, Zc.t 14023 cm³
Headed Stud Connector	15 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	75.82 kN each side	< 218.38 kN	OK
Check @ 2.322 m (Max. Moment)	M = 88.03 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 7 < 12.1	Partial	
Axial Resistance (kN)	Rc 1650.94 kN, Rs 1050.78 kN, Rq 610.4 kN	610.4 kN	
Degree of Shear Connection	Na/Np = 7 / 12.1 > 0.4	0.581	OK
Reduced Concrete Area	Area required to resist 610.4 kN	29.2x1161mm²	
Moment Capacity	Plastic neutral axis in top flange @ 135.8 mm	176.44 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.58/(0.58+0.58)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	25.92 kN each side	< 218.38 kN	OK
Check @ 2.322 m (Max. Moment)	M = 30.1 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)	
Live Loads	29.84 kN each side
Super Imposed Dead Load	4.38 kN each side

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Dead Load (Self Weight)	15.68 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	2.81 (4.10) mm @ 2.322 m < L / 360 = 12.9 mm	4.10 mm	OK
Super Imposed Dead Loads	0.41 (0.60) mm @ 2.322 m	0.60 mm	
Dead Loads (Self Weight)	6.88 mm @ 2.322 m	6.88 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 61.5, Super Dead 9, SW 65 < 275	135.50 N/mm²	OK
TOTAL (Compression)	Live 8.6, Super Dead 1.3, SW 65 < 275	74.80 N/mm²	OK
Maximum Concrete Stress	Live 2.47, Super Dead 0.36, SW 0 < 20	2.83 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	2.49 mm	
Natural Frequency	18/√(2.49/1.1) = 11.97 > 4 Hz	11.97 Hz	OK

UNPROPPED COMPOSITE SECONDARY EDGE BEAM
Member 324 (M2-N2) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	5.129 m Span and 2.141 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+193 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 718 mm², b1= 641 mm and b2= 76 mm
Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³
Composite Section Elastic Properties	ye 107.7 mm, Ix 8591 cm⁴, Zs.t 3881 cm³, Zs.b 481 cm³, Zc.t 8028 cm³
Headed Stud Connector	16 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	65.74 kN each side	< 169.03 kN	OK
Check @ 2.564 m (Max. Moment)	M = 84.3 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 8 < 11.7	Partial	
Axial Resistance (kN)	Rc 1020.39 kN, Rs 1052.15 kN, Rq 697.6 kN	697.6 kN	
Degree of Shear Connection	Na/Np = 8 / 11.7 > 0.4	0.684	OK
Reduced Concrete Area	Area required to resist 697.6 kN	54x717.6mm²	
Moment Capacity	Plastic neutral axis in top flange @ 134.1 mm	153 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	445, 460, 114000, 40, 87.5	367.59 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.64/(0.64+0.08)	256.28 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	14.86 kN each side	< 169.03 kN	OK
Check @ 2.564 m (Max. Moment)	M = 19.05 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

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Serviceability Limit State

Support Reactions (kN)			
Live Loads	16.48 kN each side		
Super Imposed Dead Load	19.09 kN each side		
Dead Load (Self Weight)	9.04 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	3.29 (4.84) mm @ 2.564 m < L / 360 = 14.2 mm	4.84 mm	OK
Super Imposed Dead Loads	3.81 (5.60) mm @ 2.564 m	5.60 mm	
Dead Loads (Self Weight)	8.86 mm @ 2.564 m	8.86 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 43.9, Super Dead 50.9, SW 52.2 < 275	147.09 N/mm²	OK
TOTAL (Compression)	Live 5.4, Super Dead 6.3, SW 52.2 < 275	63.98 N/mm²	OK
Maximum Concrete Stress	Live 2.63, Super Dead 3.05, SW 0 < 20	5.68 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	7.89 mm	
Natural Frequency	18/√(7.89/1.1) = 6.72 > 4 Hz	6.72 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 325 (N.454-N.492) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	4.645 m Span, 2.141 m to LH Beam and 2.142 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1161 mm², b1= 581 mm and b2= 581 mm
Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³
Composite Section Elastic Properties	ye 96.5 mm, Ix 13515 cm⁴, Zs.t 4042 cm³, Zs.b 563 cm³, Zc.t 14025 cm³
Headed Stud Connector	15 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	75.83 kN each side	< 218.38 kN	OK
Check @ 2.323 m (Max. Moment)	M = 88.06 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 7 < 12.1	Partial	
Axial Resistance (kN)	Rc 1651.3 kN, Rs 1050.78 kN, Rq 610.4 kN	610.4 kN	
Degree of Shear Connection	Na/Np = 7 / 12.1 > 0.4	0.581	OK
Reduced Concrete Area	Area required to resist 610.4 kN	29.2x1161.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 135.8 mm	176.45 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.58/(0.58+0.58)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	25.93 kN each side	< 218.38 kN	OK

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Check @ 2.323 m (Max. Moment)	M = 30.11 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	29.85 kN each side		
Super Imposed Dead Load	4.38 kN each side		
Dead Load (Self Weight)	15.68 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	2.81 (4.11) mm @ 2.323 m < L / 360 = 12.9 mm	4.11 mm	OK
Super Imposed Dead Loads	0.41 (0.60) mm @ 2.323 m	0.60 mm	
Dead Loads (Self Weight)	6.89 mm @ 2.323 m	6.89 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 61.5, Super Dead 9, SW 65 < 275	135.55 N/mm²	OK
TOTAL (Compression)	Live 8.6, Super Dead 1.3, SW 65 < 275	74.83 N/mm²	OK
Maximum Concrete Stress	Live 2.47, Super Dead 0.36, SW 0 < 20	2.83 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	2.49 mm	
Natural Frequency	18/√(2.49/1.1) = 11.96 > 4 Hz	11.96 Hz	OK

UNPROPPED COMPOSITE SECONDARY EDGE BEAM
Member 327 (N2-Q2) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (86 kg/m)	203x203 UC 86 [S 275]
Floor Area Supported	4.645 m Span and 2.141 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 685 mm², b1= 581 mm and b2= 105 mm
Steel Section Elastic Properties	ye 111.1 mm, A 109.6 cm², Ix 9452 cm⁴, Zt 851 cm³, Zb 851 cm³
Composite Section Elastic Properties	ye 174.5 mm, Ix 24461 cm⁴, Zs.t 5501 cm³, Zs.b 1376 cm³, Zc.t 14021 cm³
Headed Stud Connector	15 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	61.35 kN each side	< 448.69 kN	OK
Check @ 2.323 m (Max. Moment)	M = 71.25 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 7 < 11.2	Partial	
Axial Resistance (kN)	Rc 974.32 kN, Rs 2905.2 kN, Rq 610.4 kN	610.4 kN	
Degree of Shear Connection	Na/Np = 7 / 11.2 > 0.4	0.626	OK
Reduced Concrete Area	Area required to resist 610.4 kN	49.5x685.2mm²	
Moment Capacity	Plastic neutral axis in top flange @ 150.5 mm	361.13 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.58/(0.58+0.1)	243.07 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	15.27 kN each side	< 448.69 kN	OK

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Check @ 2.323 m (Max. Moment)	M = 17.73 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	14.92 kN each side		
Super Imposed Dead Load	17.29 kN each side		
Dead Load (Self Weight)	9.49 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	0.78 (0.91) mm @ 2.323 m < L / 360 = 12.9 mm	0.91 mm	OK
Super Imposed Dead Loads	0.90 (1.06) mm @ 2.323 m	1.06 mm	
Dead Loads (Self Weight)	1.28 mm @ 2.323 m	1.28 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 12.6, Super Dead 14.6, SW 13 < 265	40.12 N/mm²	OK
TOTAL (Compression)	Live 3.1, Super Dead 3.6, SW 13 < 265	19.75 N/mm²	OK
Maximum Concrete Stress	Live 1.24, Super Dead 1.43, SW 0 < 20	2.67 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	1.65 mm	
Natural Frequency	18/√(1.65/1.1) = 14.72 > 4 Hz	14.72 Hz	OK

UNPROPPED NON-COMPOSITE SECONDARY EDGE BEAM
Member 364 (B15-B14) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	1.91 m Span and 2.367 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 26.46 kN, RH Support 26.28 kN	< 169.03 kN	OK
Check @ 0.945 m (Max. Moment)	M = 12.59 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 6.19 kN, RH Support 6.13 kN	< 169.03 kN	OK
Check @ 0.945 m (Max. Moment)	M = 2.94 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 6.93 kN, RH Support 6.85 kN		
Super Imposed Dead Load	LH Support 7.22 kN, RH Support 7.21 kN		
Dead Load (Self Weight)	LH Support 3.76 kN, RH Support 3.73 kN		
Maximum Deflection			
Live Loads	0.35 (0.35) mm @ 0.945 m < L / 360 = 5.3 mm	0.35 mm	OK
Super Imposed Dead Loads	0.37 mm @ 0.945 m	0.37 mm	
Dead Loads (Self Weight)	0.19 mm @ 0.945 m	0.19 mm	

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Maximum Steel Stress			
TOTAL (Tension)	Live 14.8, Super Dead 15.5, SW 8.1 < 275	38.41 N/mm²	OK
TOTAL (Compression)	Live 14.8, Super Dead 15.5, SW 8.1 < 275	38.41 N/mm²	OK

Vibration Analysis

Beam Deflection		0.59 mm	
Natural Frequency	18/√(0.59) = 23.38 > 4 Hz	23.38 Hz	OK

UNPROPPED NON-COMPOSITE SECONDARY EDGE BEAM
Member 365 (B14-B13) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	4.17 m Span and 2.367 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 57.38 kN, RH Support 57.78 kN	< 169.03 kN	OK
Check @ 2.106 m (Max. Moment)	M = 60.02 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 13.39 kN, RH Support 13.52 kN	< 169.03 kN	OK
Check @ 2.106 m (Max. Moment)	M = 14.02 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 14.96 kN, RH Support 15.12 kN		
Super Imposed Dead Load	LH Support 15.75 kN, RH Support 15.77 kN		
Dead Load (Self Weight)	LH Support 8.14 kN, RH Support 8.22 kN		
Maximum Deflection			
Live Loads	7.92 (7.92) mm @ 2.106 m < L / 360 = 11.5 mm	7.92 mm	OK
Super Imposed Dead Loads	8.30 mm @ 2.106 m	8.30 mm	
Dead Loads (Self Weight)	4.31 mm @ 2.106 m	4.31 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 70.7, Super Dead 74, SW 38.4 < 275	183.11 N/mm²	OK
TOTAL (Compression)	Live 70.7, Super Dead 74, SW 38.4 < 275	183.11 N/mm²	OK

Vibration Analysis

Beam Deflection		13.4 mm	
Natural Frequency	18/√(13.40) = 4.92 > 4 Hz	4.92 Hz	OK

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UNPROPPED COMPOSITE SECONDARY EDGE BEAM
Member 366 (A8-A4) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	3.592 m Span and 1.04 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 525 mm², b1= 449 mm and b2= 76 mm
Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³
Composite Section Elastic Properties	ye 120.7 mm, Ix 7671 cm⁴, Zs.t 8386 cm³, Zs.b 467 cm³, Zc.t 6461 cm³
Headed Stud Connector (+1)	12 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	31.15 kN each side	< 169.03 kN	OK
Check @ 1.796 m (Max. Moment)	M = 27.98 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 6 < 8.6	Partial	
Axial Resistance (kN)	Rc 747.19 kN, Rs 1052.15 kN, Rq 523.2 kN	523.2 kN	
Degree of Shear Connection	Na/Np = 6 / 8.6 > 0.4	0.7	OK
Reduced Concrete Area	Area required to resist 523.2 kN	55.3x525.5mm²	
Moment Capacity	Plastic neutral axis in top flange @ 136.1 mm	133.81 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.45/(0.45+0.08)	245.11 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	5.44 kN each side	< 169.03 kN	OK
Check @ 1.796 m (Max. Moment)	M = 4.88 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	5.6 kN each side		
Super Imposed Dead Load	12.5 kN each side		
Dead Load (Self Weight)	3.35 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	0.43 (0.56) mm @ 1.796 m < L / 360 = 9.9 mm	0.56 mm	OK
Super Imposed Dead Loads	0.96 (1.25) mm @ 1.796 m	1.25 mm	
Dead Loads (Self Weight)	1.13 mm @ 1.796 m	1.13 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 10.8, Super Dead 24, SW 13.6 < 275	48.35 N/mm²	OK
TOTAL (Compression)	Live 0.6, Super Dead 1.3, SW 13.6 < 275	15.50 N/mm²	OK
Maximum Concrete Stress	Live 0.78, Super Dead 1.74, SW 0 < 20	2.52 N/mm²	OK

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Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	1.57 mm	
Natural Frequency	$18/\sqrt{(1.57/1.1)} = 15.09 > 4$ Hz	15.09 Hz	OK

UNPROPPED COMPOSITE SECONDARY EDGE BEAM
Member 367 (B13-B12) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	4.735 m Span and 2.285 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 668 mm², b1= 592 mm and b2= 76 mm
Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³
Composite Section Elastic Properties	ye 110.6 mm, Ix 8382 cm⁴, Zs.t 4365 cm³, Zs.b 478 cm³, Zc.t 7640 cm³
Headed Stud Connector (+1)	16 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 65.12 kN, RH Support 64.18 kN	< 169.03 kN	OK
Check @ 2.343 m (Max. Moment)	M = 76.52 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 8 < 10.9	Partial	
Axial Resistance (kN)	Rc 950.36 kN, Rs 1052.15 kN, Rq 697.6 kN	697.6 kN	
Degree of Shear Connection	Na/Np = 8 / 10.9 > 0.4	0.734	OK
Reduced Concrete Area	Area required to resist 697.6 kN	58x668.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 134.1 mm	151.61 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.59/(0.59+0.08)	254.03 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 15.19 kN, RH Support 14.87 kN	< 169.03 kN	OK
Check @ 2.343 m (Max. Moment)	M = 17.79 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 16.98 kN, RH Support 16.6 kN		
Super Imposed Dead Load	LH Support 17.88 kN, RH Support 17.82 kN		
Dead Load (Self Weight)	LH Support 9.23 kN, RH Support 9.04 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	2.70 (3.52) mm @ 2.343 m < L / 360 = 13.1 mm	3.52 mm	OK
Super Imposed Dead Loads	2.87 (3.74) mm @ 2.343 m	3.74 mm	
Dead Loads (Self Weight)	7.05 mm @ 2.343 m	7.05 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 41.6, Super Dead 44.2, SW 48.7 < 275	134.59 N/mm²	OK
TOTAL (Compression)	Live 4.6, Super Dead 4.8, SW 48.7 < 275	58.14 N/mm²	OK
Maximum Concrete Stress	Live 2.6, Super Dead 2.77, SW 0 < 20	5.37 N/mm²	OK

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Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	5.56 mm	
Natural Frequency	$18/\sqrt{(5.56/1.1)} = 8 > 4$ Hz	8.00 Hz	OK

UNPROPPED NON-COMPOSITE SECONDARY INTERNAL BEAM
Member 368 (N.49-N.52) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	1.912 m Span, 2.365 m to LH Beam and 2.364 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 35.15 kN, RH Support 34.76 kN	< 218.38 kN	OK
Check @ 0.956 m (Max. Moment)	M = 16.71 kN.m, Fv = 0.09 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 11.98 kN, RH Support 11.85 kN	< 218.38 kN	OK
Check @ 0.956 m (Max. Moment)	M = 5.7 kN.m, Fv = 0.03 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 13.85 kN, RH Support 13.7 kN		
Super Imposed Dead Load	LH Support 2.03 kN, RH Support 2.01 kN		
Dead Load (Self Weight)	LH Support 7.24 kN, RH Support 7.16 kN		
Maximum Deflection			
Live Loads	0.42 (0.42) mm @ 0.956 m < L / 360 = 5.3 mm	0.42 mm	OK
Super Imposed Dead Loads	0.06 mm @ 0.956 m	0.06 mm	
Dead Loads (Self Weight)	0.22 mm @ 0.956 m	0.22 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 23.5, Super Dead 3.4, SW 12.3 < 275	39.25 N/mm²	OK
TOTAL (Compression)	Live 23.5, Super Dead 3.4, SW 12.3 < 275	39.25 N/mm²	OK

Vibration Analysis

Beam Deflection		0.32 mm	
Natural Frequency	$18/\sqrt{(0.32)} = 31.64 > 4$ Hz	31.64 Hz	OK

UNPROPPED NON-COMPOSITE SECONDARY INTERNAL BEAM
Member 369 (N.50-N.53) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	1.916 m Span, 2.358 m to LH Beam and 2.359 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick

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Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m		
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame		
Section Properties			
Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³		
Ultimate Limit State (Final Stage)			
Maximum Shear			
Support Reactions (kN)	LH Support 35.15 kN, RH Support 34.77 kN	< 218.38 kN	OK
Check @ 0.948 m (Max. Moment)	M = 16.75 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK
Ultimate Limit State (Construction Stage)			
Maximum Shear			
Support Reactions (kN)	LH Support 11.98 kN, RH Support 11.86 kN	< 218.38 kN	OK
Check @ 0.948 m (Max. Moment)	M = 5.71 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK
Serviceability Limit State			
Support Reactions (kN)			
Live Loads	LH Support 13.85 kN, RH Support 13.7 kN		
Super Imposed Dead Load	LH Support 2.03 kN, RH Support 2.01 kN		
Dead Load (Self Weight)	LH Support 7.24 kN, RH Support 7.17 kN		
Maximum Deflection			
Live Loads	0.43 (0.43) mm @ 0.948 m < L / 360 = 5.3 mm	0.43 mm	OK
Super Imposed Dead Loads	0.06 mm @ 0.948 m	0.06 mm	
Dead Loads (Self Weight)	0.22 mm @ 0.948 m	0.22 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 23.6, Super Dead 3.5, SW 12.3 < 275	39.34 N/mm²	OK
TOTAL (Compression)	Live 23.6, Super Dead 3.5, SW 12.3 < 275	39.34 N/mm²	OK
Vibration Analysis			
Beam Deflection		0.33 mm	
Natural Frequency	18/√(0.33) = 31.45 > 4 Hz	31.45 Hz	OK

UNPROPPED NON-COMPOSITE SECONDARY EDGE BEAM
Member 371 (F15-N.55) @ Level 1

Summary of Design Data (Integrated Design)			
Steel Section (86 kg/m)	203x203 UC 86 [S 275]		
Floor Area Supported	1.922 m Span and .218 m to LH Beam		
Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick		
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m		
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame		
Section Properties			
Steel Section Elastic Properties	ye 111.1 mm, A 109.6 cm², Ix 9452 cm⁴, Zt 851 cm³, Zb 851 cm³		
Ultimate Limit State (Final Stage)			
Maximum Shear			
Support Reactions (kN)	LH Support 10.96 kN, RH Support 12.01 kN	< 448.69 kN	OK
Check @ 0.98 m (Max. Moment)	M = 5.52 kN.m, Fv = 0.03 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Ultimate Limit State (Construction Stage)			
Maximum Shear			
Support Reactions (kN)	LH Support 1.51 kN, RH Support 1.86 kN	< 448.69 kN	OK

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Check @ 1.018 m (Max. Moment)	M = 0.81 kN.m, Fv = 0.02 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 0.42 kN, RH Support 0.84 kN		
Super Imposed Dead Load	LH Support 6.31 kN, RH Support 6.37 kN		
Dead Load (Self Weight)	LH Support 1.04 kN, RH Support 1.25 kN		
Maximum Deflection			
Live Loads	0.01 (0.01) mm @ 0.999 m < L / 360 = 5.3 mm	0.01 mm	OK
Super Imposed Dead Loads	0.06 mm @ 0.961 m	0.06 mm	
Dead Loads (Self Weight)	0.01 mm @ 0.98 m	0.01 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 0.4, Super Dead 3.6, SW 0.6 < 265	4.59 N/mm²	OK
TOTAL (Compression)	Live 0.4, Super Dead 3.6, SW 0.6 < 265	4.59 N/mm²	OK

Vibration Analysis

Beam Deflection		0.07 mm	
Natural Frequency	18/√(0.07) = 67.12 > 4 Hz	67.12 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 372 (N.52-N.56) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	4.171 m Span, 2.367 m to LH Beam and 1.904 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1043 mm², b1= 521 mm and b2= 521 mm
Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³
Composite Section Elastic Properties	ye 100.9 mm, Ix 13139 cm⁴, Zs.t 4534 cm³, Zs.b 559 cm³, Zc.t 13053 cm³
Headed Stud Connector	13 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 73.11 kN, RH Support 71.09 kN	< 218.38 kN	OK
Check @ 2.064 m (Max. Moment)	M = 75.18 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 6 < 12.1	Partial	
Axial Resistance (kN)	Rc 1482.79 kN, Rs 1050.78 kN, Rq 523.2 kN	523.2 kN	
Degree of Shear Connection	Na/Np = 6 / 12.1 > 0.4	0.498	OK
Reduced Concrete Area	Area required to resist 523.2 kN	27.9x1042.8mm²	
Moment Capacity	Plastic neutral axis in top flange @ 137 mm	166.17 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.52/(0.52+0.52)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 24.95 kN, RH Support 24.28 kN	< 218.38 kN	OK

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Check @ 2.064 m (Max. Moment)	M = 25.67 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 28.8 kN, RH Support 28 kN		
Super Imposed Dead Load	LH Support 4.22 kN, RH Support 4.11 kN		
Dead Load (Self Weight)	LH Support 15.08 kN, RH Support 14.68 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	1.99 (3.05) mm @ 2.064 m < L / 360 = 11.5 mm	3.05 mm	OK
Super Imposed Dead Loads	0.29 (0.45) mm @ 2.064 m	0.45 mm	
Dead Loads (Self Weight)	4.73 mm @ 2.064 m	4.73 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 53, Super Dead 7.8, SW 55.4 < 275	116.17 N/mm²	OK
TOTAL (Compression)	Live 6.5, Super Dead 1, SW 55.4 < 275	62.87 N/mm²	OK
Maximum Concrete Stress	Live 2.27, Super Dead 0.33, SW 0 < 20	2.60 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	1.8 mm	
Natural Frequency	18/√(1.80/1.1) = 14.08 > 4 Hz	14.08 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 373 (N.53-N.57) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	4.188 m Span, 1.896 m to LH Beam and 2.164 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1047 mm², b1= 524 mm and b2= 524 mm
Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³
Composite Section Elastic Properties	ye 100.8 mm, Ix 13153 cm⁴, Zs.t 4512 cm³, Zs.b 559 cm³, Zc.t 13088 cm³
Headed Stud Connector	13 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 71.7 kN, RH Support 68.27 kN	< 218.38 kN	OK
Check @ 2.072 m (Max. Moment)	M = 73.28 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 6 < 12.1	Partial	
Axial Resistance (kN)	Rc 1488.83 kN, Rs 1050.78 kN, Rq 523.2 kN	523.2 kN	
Degree of Shear Connection	Na/Np = 6 / 12.1 > 0.4	0.498	OK
Reduced Concrete Area	Area required to resist 523.2 kN	27.8x1047mm²	
Moment Capacity	Plastic neutral axis in top flange @ 137 mm	166.2 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.52/(0.52+0.52)	143.42 kN	OK

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Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 24.48 kN, RH Support 23.34 kN	< 218.38 kN	OK
Check @ 2.072 m (Max. Moment)	M = 25.04 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 28.24 kN, RH Support 26.87 kN		
Super Imposed Dead Load	LH Support 4.14 kN, RH Support 3.94 kN		
Dead Load (Self Weight)	LH Support 14.8 kN, RH Support 14.11 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	1.95 (3.00) mm @ 2.072 m < L / 360 = 11.6 mm	3.00 mm	OK
Super Imposed Dead Loads	0.29 (0.44) mm @ 2.072 m	0.44 mm	
Dead Loads (Self Weight)	4.65 mm @ 2.072 m	4.65 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 51.6, Super Dead 7.6, SW 54 < 275	113.25 N/mm²	OK
TOTAL (Compression)	Live 6.4, Super Dead 0.9, SW 54 < 275	61.37 N/mm²	OK
Maximum Concrete Stress	Live 2.2, Super Dead 0.32, SW 0 < 20	2.53 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	1.76 mm	
Natural Frequency	18/√(1.76/1.1) = 14.21 > 4 Hz	14.21 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 374 (F14-F13) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	4.21 m Span, 2.152 m to LH Beam and .436 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 744 mm², b1= 526 mm and b2= 218 mm
Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³
Composite Section Elastic Properties	ye 115.9 mm, Ix 11910 cm⁴, Zs.t 8520 cm³, Zs.b 545 cm³, Zc.t 10385 cm³
Headed Stud Connector	13 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 46.46 kN, RH Support 47.99 kN	< 218.38 kN	OK
Check @ 2.127 m (Max. Moment)	M = 49.71 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 6 < 12.1	Partial	
Axial Resistance (kN)	Rc 1058.32 kN, Rs 1050.78 kN, Rq 523.2 kN	523.2 kN	
Degree of Shear Connection	Na/Np = 6 / 12.1 > 0.4	0.498	OK
Reduced Concrete Area	Area required to resist 523.2 kN	39.1x744.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 137 mm	163.25 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN

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Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.53/(0.53+0.22)	202.82 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 16.07 kN, RH Support 16.59 kN	< 218.38 kN	OK
Check @ 2.127 m (Max. Moment)	M = 17.19 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 18.17 kN, RH Support 18.78 kN		
Super Imposed Dead Load	LH Support 2.67 kN, RH Support 2.76 kN		
Dead Load (Self Weight)	LH Support 9.75 kN, RH Support 10.06 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	1.47 (2.16) mm @ 2.127 m < L / 360 = 11.6 mm	2.16 mm	OK
Super Imposed Dead Loads	0.22 (0.32) mm @ 2.127 m	0.32 mm	
Dead Loads (Self Weight)	3.24 mm @ 2.127 m	3.24 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 35.7, Super Dead 5.2, SW 37.2 < 275	78.16 N/mm²	OK
TOTAL (Compression)	Live 2.3, Super Dead 0.3, SW 37.2 < 275	39.84 N/mm²	OK
Maximum Concrete Stress	Live 1.87, Super Dead 0.27, SW 0 < 20	2.15 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	1.32 mm	
Natural Frequency	18/√(1.32/1.1) = 16.43 > 4 Hz	16.43 Hz	OK

UNPROPPED NON-COMPOSITE SECONDARY EDGE BEAM
Member 375 (N.55-G13) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (86 kg/m)	203x203 UC 86 [S 275]
Floor Area Supported	4.171 m Span and .44 m to LH Beam
Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties	ye 111.1 mm, A 109.6 cm², Ix 9452 cm⁴, Zt 851 cm³, Zb 851 cm³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 30.95 kN, RH Support 33.5 kN	< 448.69 kN	OK
Check @ 2.107 m (Max. Moment)	M = 33.61 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 5.66 kN, RH Support 6.51 kN	< 448.69 kN	OK
Check @ 2.15 m (Max. Moment)	M = 6.36 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

Serviceability Limit State

Support Reactions (kN)	
Live Loads	LH Support 3.77 kN, RH Support 4.79 kN
Super Imposed Dead Load	LH Support 14.11 kN, RH Support 14.26 kN

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Dead Load (Self Weight)	LH Support 3.69 kN, RH Support 4.2 kN		
Maximum Deflection			
Live Loads	0.42 (0.42) mm @ 2.107 m < L / 360 = 11.5 mm	0.42 mm	OK
Super Imposed Dead Loads	1.38 mm @ 2.107 m	1.38 mm	
Dead Loads (Self Weight)	0.38 mm @ 2.107 m	0.38 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 5.3, Super Dead 17.4, SW 4.8 < 265	27.48 N/mm²	OK
TOTAL (Compression)	Live 5.3, Super Dead 17.4, SW 4.8 < 265	27.48 N/mm²	OK

Vibration Analysis

Beam Deflection		1.81 mm	
Natural Frequency	18/√(1.81) = 13.38 > 4 Hz	13.38 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 376 (N.56-N.94) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	4.738 m Span, 2.284 m to LH Beam and 1.864 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1185 mm², b1= 592 mm and b2= 592 mm
Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³
Composite Section Elastic Properties	ye 95.7 mm, Ix 13584 cm⁴, Zs.t 3968 cm³, Zs.b 564 cm³, Zc.t 14211 cm³
Headed Stud Connector	15 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 77.25 kN, RH Support 76.08 kN	< 218.38 kN	OK
Check @ 2.344 m (Max. Moment)	M = 90.81 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 7 < 12.1	Partial	
Axial Resistance (kN)	Rc 1684.36 kN, Rs 1050.78 kN, Rq 610.4 kN	610.4 kN	
Degree of Shear Connection	Na/Np = 7 / 12.1 > 0.4	0.581	OK
Reduced Concrete Area	Area required to resist 610.4 kN	28.6x1184.5mm²	
Moment Capacity	Plastic neutral axis in top flange @ 135.8 mm	176.62 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.59/(0.59+0.59)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 26.41 kN, RH Support 26.02 kN	< 218.38 kN	OK
Check @ 2.344 m (Max. Moment)	M = 31.05 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

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Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 30.41 kN, RH Support 29.94 kN		
Super Imposed Dead Load	LH Support 4.46 kN, RH Support 4.39 kN		
Dead Load (Self Weight)	LH Support 15.97 kN, RH Support 15.74 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	3.00 (4.39) mm @ 2.344 m < L / 360 = 13.1 mm	4.39 mm	OK
Super Imposed Dead Loads	0.44 (0.64) mm @ 2.344 m	0.64 mm	
Dead Loads (Self Weight)	7.39 mm @ 2.344 m	7.39 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 63.3, Super Dead 9.3, SW 67 < 275	139.66 N/mm²	OK
TOTAL (Compression)	Live 9, Super Dead 1.3, SW 67 < 275	77.36 N/mm²	OK
Maximum Concrete Stress	Live 2.51, Super Dead 0.37, SW 0 < 20	2.88 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	2.66 mm	
Natural Frequency	18/√(2.66/1.1) = 11.58 > 4 Hz	11.58 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 377 (N.57-E12) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	4.739 m Span, 1.863 m to LH Beam and 2.171 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1185 mm², b1= 592 mm and b2= 592 mm
Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³
Composite Section Elastic Properties	ye 95.7 mm, Ix 13585 cm⁴, Zs.t 3967 cm³, Zs.b 564 cm³, Zc.t 14213 cm³
Headed Stud Connector	15 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 73.38 kN, RH Support 73.15 kN	< 218.38 kN	OK
Check @ 2.345 m (Max. Moment)	M = 86.8 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 7 < 12.1	Partial	
Axial Resistance (kN)	Rc 1684.71 kN, Rs 1050.78 kN, Rq 610.4 kN	610.4 kN	
Degree of Shear Connection	Na/Np = 7 / 12.1 > 0.4	0.581	OK
Reduced Concrete Area	Area required to resist 610.4 kN	28.6x1184.8mm²	
Moment Capacity	Plastic neutral axis in top flange @ 135.8 mm	176.62 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.59/(0.59+0.59)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 25.13 kN, RH Support 25.05 kN	< 218.38 kN	OK

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Check @ 2.345 m (Max. Moment)	M = 29.72 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 28.86 kN, RH Support 28.77 kN		
Super Imposed Dead Load	LH Support 4.23 kN, RH Support 4.22 kN		
Dead Load (Self Weight)	LH Support 15.2 kN, RH Support 15.15 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	2.87 (4.20) mm @ 2.345 m < L / 360 = 13.1 mm	4.20 mm	OK
Super Imposed Dead Loads	0.42 (0.62) mm @ 2.345 m	0.62 mm	
Dead Loads (Self Weight)	7.08 mm @ 2.345 m	7.08 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 60.5, Super Dead 8.9, SW 64.2 < 275	133.56 N/mm²	OK
TOTAL (Compression)	Live 8.6, Super Dead 1.3, SW 64.2 < 275	74.05 N/mm²	OK
Maximum Concrete Stress	Live 2.4, Super Dead 0.35, SW 0 < 20	2.75 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	2.55 mm	
Natural Frequency	18/√(2.55/1.1) = 11.83 > 4 Hz	11.83 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 378 (F13-N.98) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	4.739 m Span, 2.171 m to LH Beam and 1.971 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1185 mm², b1= 592 mm and b2= 592 mm
Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³
Composite Section Elastic Properties	ye 95.7 mm, Ix 13585 cm⁴, Zs.t 3967 cm³, Zs.b 564 cm³, Zc.t 14213 cm³
Headed Stud Connector	15 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 79.34 kN, RH Support 77.09 kN	< 218.38 kN	OK
Check @ 2.345 m (Max. Moment)	M = 92.67 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 7 < 12.1	Partial	
Axial Resistance (kN)	Rc 1684.71 kN, Rs 1050.78 kN, Rq 610.4 kN	610.4 kN	
Degree of Shear Connection	Na/Np = 7 / 12.1 > 0.4	0.581	OK
Reduced Concrete Area	Area required to resist 610.4 kN	28.6x1184.8mm²	
Moment Capacity	Plastic neutral axis in top flange @ 135.8 mm	176.62 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.59/(0.59+0.59)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 27.11 kN, RH Support 26.36 kN	< 218.38 kN	OK

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Check @ 2.345 m (Max. Moment)	M = 31.68 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 31.24 kN, RH Support 30.34 kN		
Super Imposed Dead Load	LH Support 4.58 kN, RH Support 4.45 kN		
Dead Load (Self Weight)	LH Support 16.39 kN, RH Support 15.94 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	3.06 (4.48) mm @ 2.345 m < L / 360 = 13.1 mm	4.48 mm	OK
Super Imposed Dead Loads	0.45 (0.66) mm @ 2.345 m	0.66 mm	
Dead Loads (Self Weight)	7.54 mm @ 2.345 m	7.54 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 64.7, Super Dead 9.5, SW 68.4 < 275	142.51 N/mm²	OK
TOTAL (Compression)	Live 9.2, Super Dead 1.3, SW 68.4 < 275	78.91 N/mm²	OK
Maximum Concrete Stress	Live 2.57, Super Dead 0.38, SW 0 < 20	2.94 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	2.71 mm	
Natural Frequency	18/√(2.71/1.1) = 11.46 > 4 Hz	11.46 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 379 (N.60-N.101) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	4.77 m Span, 1.959 m to LH Beam and 2.334 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1193 mm², b1= 596 mm and b2= 596 mm
Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³
Composite Section Elastic Properties	ye 95.5 mm, Ix 13607 cm⁴, Zs.t 3944 cm³, Zs.b 565 cm³, Zc.t 14274 cm³
Headed Stud Connector	15 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 82.52 kN, RH Support 80.27 kN	< 218.38 kN	OK
Check @ 2.36 m (Max. Moment)	M = 97.06 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 7 < 12.1	Partial	
Axial Resistance (kN)	Rc 1695.74 kN, Rs 1050.78 kN, Rq 610.4 kN	610.4 kN	
Degree of Shear Connection	Na/Np = 7 / 12.1 > 0.4	0.581	OK
Reduced Concrete Area	Area required to resist 610.4 kN	28.4x1192.5mm²	
Moment Capacity	Plastic neutral axis in top flange @ 135.8 mm	176.68 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.6/(0.6+0.6)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 28.17 kN, RH Support 27.42 kN	< 218.38 kN	OK

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Check @ 2.36 m (Max. Moment)	M = 33.15 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 32.5 kN, RH Support 31.61 kN		
Super Imposed Dead Load	LH Support 4.77 kN, RH Support 4.64 kN		
Dead Load (Self Weight)	LH Support 17.03 kN, RH Support 16.58 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	3.25 (4.76) mm @ 2.36 m < L / 360 = 13.2 mm	4.76 mm	OK
Super Imposed Dead Loads	0.48 (0.70) mm @ 2.36 m	0.70 mm	
Dead Loads (Self Weight)	8.00 mm @ 2.36 m	8.00 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 67.7, Super Dead 9.9, SW 71.5 < 275	149.18 N/mm²	OK
TOTAL (Compression)	Live 9.7, Super Dead 1.4, SW 71.5 < 275	82.65 N/mm²	OK
Maximum Concrete Stress	Live 2.68, Super Dead 0.39, SW 0 < 20	3.07 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	2.88 mm	
Natural Frequency	18/√(2.88/1.1) = 11.13 > 4 Hz	11.13 Hz	OK

UNPROPPED COMPOSITE SECONDARY EDGE BEAM
Member 380 (K13-K12) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	4.77 m Span and 2.334 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	3.293 m Span, 1.343 m to LH Beam and 1.266 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 52.6 kN, RH Support 56.05 kN	< 218.38 kN	OK
Check @ 1.663 m (Max. Moment)	M = 44.73 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 17.99 kN, RH Support 19.14 kN	< 218.38 kN	OK
Check @ 1.663 m (Max. Moment)	M = 15.29 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 20.7 kN, RH Support 22.07 kN		

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Super Imposed Dead Load	LH Support 3.04 kN, RH Support 3.24 kN		
Dead Load (Self Weight)	LH Support 10.88 kN, RH Support 11.57 kN		
Maximum Deflection			
Live Loads	3.35 (3.35) mm @ 1.663 m < L / 360 = 9.1 mm	3.35 mm	OK
Super Imposed Dead Loads	0.49 mm @ 1.663 m	0.49 mm	
Dead Loads (Self Weight)	1.76 mm @ 1.663 m	1.76 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 62.9, Super Dead 9.2, SW 33 < 275	105.08 N/mm²	OK
TOTAL (Compression)	Live 62.9, Super Dead 9.2, SW 33 < 275	105.08 N/mm²	OK

Vibration Analysis

Beam Deflection		2.58 mm	
Natural Frequency	18/√(2.58) = 11.2 > 4 Hz	11.20 Hz	OK

UNPROPPED NON-COMPOSITE SECONDARY EDGE BEAM
Member 384 (B15-B14) @ Level 2

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	1.91 m Span and 2.367 m to LH Beam
Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 26.46 kN, RH Support 26.28 kN	< 169.03 kN	OK
Check @ 0.945 m (Max. Moment)	M = 12.59 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 6.19 kN, RH Support 6.13 kN	< 169.03 kN	OK
Check @ 0.945 m (Max. Moment)	M = 2.94 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 6.93 kN, RH Support 6.85 kN		
Super Imposed Dead Load	LH Support 7.22 kN, RH Support 7.21 kN		
Dead Load (Self Weight)	LH Support 3.76 kN, RH Support 3.73 kN		
Maximum Deflection			
Live Loads	0.35 (0.35) mm @ 0.945 m < L / 360 = 5.3 mm	0.35 mm	OK
Super Imposed Dead Loads	0.37 mm @ 0.945 m	0.37 mm	
Dead Loads (Self Weight)	0.19 mm @ 0.945 m	0.19 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 14.8, Super Dead 15.5, SW 8.1 < 275	38.41 N/mm²	OK
TOTAL (Compression)	Live 14.8, Super Dead 15.5, SW 8.1 < 275	38.41 N/mm²	OK

Vibration Analysis

Beam Deflection		0.59 mm	
Natural Frequency	18/√(0.59) = 23.38 > 4 Hz	23.38 Hz	OK

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UNPROPPED NON-COMPOSITE SECONDARY EDGE BEAM
Member 385 (B14-B13) @ Level 2

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]		
Floor Area Supported	4.17 m Span and 2.367 m to LH Beam		
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick		
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m		
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame		

Section Properties

Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³		

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 57.38 kN, RH Support 57.78 kN	< 169.03 kN	OK
Check @ 2.106 m (Max. Moment)	M = 60.02 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.59/(0.59+0.08)	254.03 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 15.19 kN, RH Support 14.87 kN	< 169.03 kN	OK
Check @ 2.343 m (Max. Moment)	M = 17.79 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 16.98 kN, RH Support 16.6 kN		
Super Imposed Dead Load	LH Support 17.88 kN, RH Support 17.82 kN		
Dead Load (Self Weight)	LH Support 9.23 kN, RH Support 9.04 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	2.70 (3.80) mm @ 2.343 m < L / 360 = 13.1 mm	3.80 mm	OK
Super Imposed Dead Loads	2.87 (4.04) mm @ 2.343 m	4.04 mm	
Dead Loads (Self Weight)	7.05 mm @ 2.343 m	7.05 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 41.6, Super Dead 44.2, SW 48.7 < 275	134.59 N/mm²	OK
TOTAL (Compression)	Live 4.6, Super Dead 4.8, SW 48.7 < 275	58.14 N/mm²	OK
Maximum Concrete Stress	Live 2.6, Super Dead 2.77, SW 0 < 20	5.37 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	5.89 mm	
Natural Frequency	18/√(5.89/1.1) = 7.78 > 4 Hz	7.78 Hz	OK

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UNPROPPED COMPOSITE SECONDARY EDGE BEAM
Member 389 (B9-N.73) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (60 kg/m)	203x203 UC 60 [S 275]
Floor Area Supported	6.705 m Span and 2.74 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 941 mm², b1= 838 mm and b2= 103 mm
Steel Section Elastic Properties	ye 104.8 mm, A 76.4 cm², Ix 6127 cm⁴, Zt 585 cm³, Zb 585 cm³
Composite Section Elastic Properties	ye 138.5 mm, Ix 20883 cm⁴, Zs.t 24670 cm³, Zs.b 1038 cm³, Zc.t 15081 cm³
Headed Stud Connector	22 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	102.43 kN each side	< 325.09 kN	OK
Check @ 3.353 m (Max. Moment)	M = 171.71 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 11 < 15.3	Partial	
Axial Resistance (kN)	Rc 1338.14 kN, Rs 2100.18 kN, Rq 959.2 kN	959.2 kN	
Degree of Shear Connection	Na/Np = 11 / 15.3 > 0.4	0.717	OK
Reduced Concrete Area	Area required to resist 959.2 kN	56.6x941mm²	
Moment Capacity	Plastic neutral axis in top flange @ 139.9 mm	309.56 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.84/(0.84+0.1)	255.48 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	25.85 kN each side	< 325.09 kN	OK
Check @ 3.353 m (Max. Moment)	M = 43.33 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 104.8 mm	180.43 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	27.56 kN each side		
Super Imposed Dead Load	25.83 kN each side		
Dead Load (Self Weight)	15.84 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	5.05 (6.32) mm @ 3.353 m < L / 360 = 18.6 mm	6.32 mm	OK
Super Imposed Dead Loads	4.74 (5.93) mm @ 3.353 m	5.93 mm	
Dead Loads (Self Weight)	9.90 mm @ 3.353 m	9.90 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 44.5, Super Dead 41.7, SW 45.4 < 275	131.62 N/mm²	OK
TOTAL (Compression)	Live 1.9, Super Dead 1.8, SW 45.4 < 275	49.04 N/mm²	OK

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Maximum Concrete Stress	Live 3.06, Super Dead 2.87, SW 0 < 20	5.93 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	9.46 mm	
Natural Frequency	18/√(9.46/1.1) = 6.14 > 4 Hz	6.14 Hz	OK

UNPROPPED NON-COMPOSITE SECONDARY EDGE BEAM
Member 390 (A8-A4) @ Level 2

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	3.592 m Span and 1.04 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	31.15 kN each side	< 169.03 kN	OK
Check @ 1.796 m (Max. Moment)	M = 27.98 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	5.44 kN each side	< 169.03 kN	OK
Check @ 1.796 m (Max. Moment)	M = 4.88 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	5.6 kN each side		
Super Imposed Dead Load	12.5 kN each side		
Dead Load (Self Weight)	3.35 kN each side		
Maximum Deflection			
Live Loads	1.89 (1.89) mm @ 1.796 m < L / 360 = 9.9 mm	1.89 mm	OK
Super Imposed Dead Loads	4.21 mm @ 1.796 m	4.21 mm	
Dead Loads (Self Weight)	1.13 mm @ 1.796 m	1.13 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 22.7, Super Dead 50.6, SW 13.6 < 275	86.82 N/mm²	OK
TOTAL (Compression)	Live 22.7, Super Dead 50.6, SW 13.6 < 275	86.82 N/mm²	OK

Vibration Analysis

Beam Deflection		5.53 mm	
Natural Frequency	18/√(5.53) = 7.66 > 4 Hz	7.66 Hz	OK

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UNPROPPED NON-COMPOSITE SECONDARY INTERNAL BEAM
Member 391 (N.73-N.75) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	3.592 m Span, 1.04 m to LH Beam and 2.74 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 52.26 kN, RH Support 52.69 kN	< 218.38 kN	OK
Check @ 1.815 m (Max. Moment)	M = 47.12 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 17.92 kN, RH Support 18.06 kN	< 218.38 kN	OK
Check @ 1.815 m (Max. Moment)	M = 16.16 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 20.54 kN, RH Support 20.71 kN		
Super Imposed Dead Load	LH Support 3.01 kN, RH Support 3.04 kN		
Dead Load (Self Weight)	LH Support 10.85 kN, RH Support 10.93 kN		
Maximum Deflection			
Live Loads	4.19 (4.19) mm @ 1.815 m < L / 360 = 9.9 mm	4.19 mm	OK
Super Imposed Dead Loads	0.61 mm @ 1.815 m	0.61 mm	
Dead Loads (Self Weight)	2.21 mm @ 1.815 m	2.21 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 66.1, Super Dead 9.7, SW 34.9 < 275	110.72 N/mm²	OK
TOTAL (Compression)	Live 66.1, Super Dead 9.7, SW 34.9 < 275	110.72 N/mm²	OK

Vibration Analysis

Beam Deflection		3.24 mm	
Natural Frequency	18/√(3.24) = 9.99 > 4 Hz	9.99 Hz	OK

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REVISED STRUCTURAL CALCULATIONS FOR SUPERSTRUCTURE (PAGES 400-599)

PROPOSED OFFICE DEVELOPMENT AT 18 ORCHARD STREET NEATH

PART I

THOMAS PARRY DESIGN PARTNERSHIP
THE OLD SKETTY COACH HOUSE
GOWER ROAD
SWANSEA

STRUCTURAL ENGINEERS

SLOWIKOWSKI, BLACKSHAW AND PARTNERS

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Vibration Analysis

Beam Deflection		9.26 mm	
Natural Frequency	$18/\sqrt{(9.26)} = 5.91 > 4$ Hz	5.91 Hz	OK

UNPROPPED COMPOSITE PRIMARY EDGE BEAM
Members 196, 201 and 204 (F13-K13) @ Level 4

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	4.702 m Span and 4.735 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+393 mm²/m
Headed Stud Connector	19x95 mm Placed @ 300 mm centre
Transverse Beams	@ 0.928 and 2.351 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	122 x 649 mm², b1= 588 mm and b2= 61 mm
Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³
Composite Section Elastic Properties	ye 109.2 mm, Ix 8365 cm⁴, Zs.t 4010 cm³, Zs.b 469 cm³, Zc.t 7660 cm³
Headed Stud Connector	15 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support -281.27 kN, RH Support 19.06 kN	< 542.79 kN	OK
Check @ 0.893 m (Max. Moment)	M = -251.45 kN.m, Fv = 281.65 kN		
Negative Moments	Program designs only simply supported composite beams. Design as standard steel member in MasterKey Steel Design.		Warning

UNPROPPED NON-COMPOSITE PRIMARY INTERNAL BEAM
Members 214, 227 and 229 (N.308-E10) @ Level 4

Summary of Design Data (Integrated Design)

Steel Section (86 kg/m)	203x203 UC 86 [S 275]
Floor Area Supported	4.15 m Span, 4.795 m to LH Beam and 2.81 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252+193 mm²/m
Transverse Beams	@ 2.285 and 2.745 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties	ye 111.1 mm, A 109.6 cm², Ix 9452 cm⁴, Zt 851 cm³, Zb 851 cm³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 51.81 kN, RH Support 84.42 kN	< 448.69 kN	OK
Check @ 2.739 m (Max. Moment)	M = 117.2 kN.m, Fv = 4.05 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

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Check @ 2.285 m	M = 115.25 kN.m, Fv = 49.06 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 2.745 m	M = 117.33 kN.m, Fv = 82.72 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

Lateral Torsional Buckling (Final Stage)

Check between 0 and 2.285 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 115.245, 0.6	69.147 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.285 m, 5.34 cm, 1, 0.85, 0.854	258.826 kN.m	OK
Check between 2.285 and 2.745 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	115.245, 117.325, 0.993	116.493 kN.m	
Mb=fn(L,ry,β_w,u,v)	0.46 m, 5.34 cm, 1, 0.85, 0.991	258.826 kN.m	OK
Check between 2.745 and 4.15 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	117.325, 0, 0.6	70.395 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.405 m, 5.34 cm, 1, 0.85, 0.931	258.826 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 19.74 kN, RH Support 31.32 kN	< 448.69 kN	OK
Check @ 2.739 m (Max. Moment)	M = 42.65 kN.m, Fv = 1.23 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 2.285 m	M = 41.97 kN.m, Fv = 16.99 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 2.745 m	M = 42.78 kN.m, Fv = 29.62 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.285 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 41.973, 0.6	25.184 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.285 m, 5.34 cm, 1, 0.85, 0.854	258.826 kN.m	OK
Check between 2.285 and 2.745 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	41.973, 42.775, 0.993	42.454 kN.m	
Mb=fn(L,ry,β_w,u,v)	0.46 m, 5.34 cm, 1, 0.85, 0.991	258.826 kN.m	OK
Check between 2.745 and 4.15 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	42.775, 0, 0.6	25.665 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.405 m, 5.34 cm, 1, 0.85, 0.931	258.826 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 19.15 kN, RH Support 31.79 kN		
Super Imposed Dead Load	LH Support 2.79 kN, RH Support 4.68 kN		
Dead Load (Self Weight)	LH Support 12.28 kN, RH Support 19.34 kN		
Maximum Deflection			
Live Loads	3.55 (3.55) mm @ 2.2 m < L / 360 = 11.5 mm	3.55 mm	OK
Super Imposed Dead Loads	0.52 mm @ 2.2 m	0.52 mm	
Dead Loads (Self Weight)	2.12 mm @ 2.2 m	2.12 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 52.3, Super Dead 7.6, SW 30.8 < 265	90.78 N/mm²	OK
TOTAL (Compression)	Live 52.3, Super Dead 7.6, SW 30.8 < 265	90.78 N/mm²	OK

Vibration Analysis

Beam Deflection		2.99 mm	
Natural Frequency	18/√(2.99) = 10.4 > 4 Hz	10.40 Hz	OK

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UNPROPPED NON-COMPOSITE PRIMARY INTERNAL BEAM
Members 220 and 222 (A4-D4) @ Level 4

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	3.875 m Span, 1.042 m to LH Beam and 3.592 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m
Transverse Beam	@ 1.04 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 39.36 kN, RH Support 14.95 kN	< 169.03 kN	OK
Check @ 1.046 m (Max. Moment)	M = 40.62 kN.m, Fv = 13.76 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK
Check @ 1.04 m	M = 40.71 kN.m, Fv = 38.93 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Lateral Torsional Buckling (Final Stage)

Check between 0 and 1.04 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 40.71, 0.6	24.426 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.04 m, 3.83 cm, 1, 0.849, 0.967	68.117 kN.m	OK
Check between 1.04 and 3.875 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	40.71, 0, 0.6	24.426 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.835 m, 3.83 cm, 1, 0.849, 0.833	57.526 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 14.03 kN, RH Support 5.66 kN	< 169.03 kN	OK
Check @ 1.046 m (Max. Moment)	M = 14.33 kN.m, Fv = 4.47 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK
Check @ 1.04 m	M = 14.37 kN.m, Fv = 13.6 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 1.04 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 14.365, 0.6	8.619 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.04 m, 3.83 cm, 1, 0.849, 0.967	68.117 kN.m	OK
Check between 1.04 and 3.875 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	14.365, 0, 0.6	8.619 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.835 m, 3.83 cm, 1, 0.849, 0.833	57.526 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 15.15 kN, RH Support 5.56 kN		
Super Imposed Dead Load	LH Support 2.22 kN, RH Support 0.82 kN		
Dead Load (Self Weight)	LH Support 8.58 kN, RH Support 3.52 kN		
Maximum Deflection			
Live Loads	5.17 (5.17) mm @ 1.705 m < L / 360 = 10.7 mm	5.17 mm	OK
Super Imposed Dead Loads	0.76 mm @ 1.705 m	0.76 mm	
Dead Loads (Self Weight)	2.97 mm @ 1.744 m	2.97 mm	

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Maximum Steel Stress			
TOTAL (Tension)	Live 70.8, Super Dead 10.4, SW 39.4 < 275	120.60 N/mm²	OK
TOTAL (Compression)	Live 70.8, Super Dead 10.4, SW 39.4 < 275	120.60 N/mm²	OK

Vibration Analysis

Beam Deflection		4.25 mm	
Natural Frequency	18/√(4.25) = 8.73 > 4 Hz	8.73 Hz	OK

UNPROPPED NON-COMPOSITE PRIMARY EDGE BEAM
Members 224 and 274 (B12-E12) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (86 kg/m)	203x203 UC 86 [S 275]
Floor Area Supported	4.15 m Span and 2.81 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m
Transverse Beam	@ 2.285 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties	ye 111.1 mm, A 109.6 cm², Ix 9452 cm⁴, Zt 851 cm³, Zb 851 cm³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support -0.86 kN, RH Support -26.93 kN	< 169.03 kN	OK
Check @ 2.324 m (Max. Moment)	M = -66.36 kN.m, Fv = 45.75 kN		
Negative Moments	Program designs only simply supported composite beams. Design as standard steel member in MasterKey Steel Design.		Warning

UNPROPPED COMPOSITE PRIMARY INTERNAL BEAM
Members 226, 228 and 231 (E12-K12) @ Level 4

Summary of Design Data (Integrated Design)

Steel Section (86 kg/m)	203x203 UC 86 [S 275]
Floor Area Supported	6.497 m Span, 2.81 m to LH Beam and 4.735 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+503 mm²/m
Headed Stud Connector	19x95 mm Placed @ 150 mm centre
Transverse Beams	@ 2.173 and 4.146 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	122 x 1624 mm², b1= 812 mm and b2= 812 mm
Steel Section Elastic Properties	ye 111.1 mm, A 109.6 cm², Ix 9452 cm⁴, Zt 851 cm³, Zb 851 cm³
Composite Section Elastic Properties	ye 125.2 mm, Ix 34803 cm⁴, Zs.t 71760 cm³, Zs.b 1533 cm³, Zc.t 27809 cm³
Headed Stud Connector	43 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 130.17 kN, RH Support 124.55 kN	< 448.69 kN	OK
Check @ 4.093 m (Max. Moment)	M = 289.29 kN.m, Fv = 3.69 kN		
Shear Connection	No of shear connectors from nearest support 16 < 33.3		Partial

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Axial Resistance (kN)	Rc 3565.31 kN, Rs 2905.2 kN, Rq 1395.2 kN	1395.2 kN	
Degree of Shear Connection	Na/Np = 16 / 33.3 > 0.4	0.48	OK
Reduced Concrete Area	Area required to resist 1395.2 kN	47.7x1624.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 143.4 mm	458.27 kN.m	OK
Check @ 2.173 m	M = 280.02 kN.m, Fv = 127.55 kN		
Shear Connection	No of shear connectors from nearest support 14 < 33.3	Partial	
Axial Resistance (kN)	Rc 3565.31 kN, Rs 2905.2 kN, Rq 1220.8 kN	1220.8 kN	
Reduced Concrete Area	Area required to resist 1220.8 kN	41.8x1624.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 145 mm	440.93 kN.m	OK
Check @ 4.146 m	M = 289.49 kN.m, Fv = 121.72 kN		
Shear Connection	No of shear connectors from nearest support 16 < 33.3	Partial	
Axial Resistance (kN)	Rc 3565.31 kN, Rs 2905.2 kN, Rq 1395.2 kN	1395.2 kN	
Reduced Concrete Area	Area required to resist 1395.2 kN	47.7x1624.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 143.4 mm	458.27 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 150 mm	6.67 per m	
Vr = fn(Asv,fy,Acv,fcu)	755, 460, 79000, 40	337.91 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	6.67x87.2x0.81/(0.81+0.81)	290.67 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 47.09 kN, RH Support 45.16 kN	< 448.69 kN	OK
Check @ 4.093 m (Max. Moment)	M = 102.79 kN.m, Fv = 0.58 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 2.173 m	M = 99.47 kN.m, Fv = 44.47 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 4.146 m	M = 102.82 kN.m, Fv = 42.32 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.173 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 99.474, 0.6	59.684 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.173 m, 5.34 cm, 1, 0.85, 0.864	258.826 kN.m	OK
Check between 2.173 and 4.146 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	99.474, 102.823, 0.987	101.483 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.973 m, 5.34 cm, 1, 0.85, 0.882	258.826 kN.m	OK
Check between 4.146 and 6.497 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	102.823, 0, 0.6	61.694 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.351 m, 5.34 cm, 1, 0.85, 0.849	258.826 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 49.69 kN, RH Support 47.49 kN		
Super Imposed Dead Load	LH Support 7.29 kN, RH Support 6.96 kN		
Dead Load (Self Weight)	LH Support 28.9 kN, RH Support 27.73 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	6.81 (8.83) mm @ 3.249 m < L / 360 = 18 mm	8.83 mm	OK
Super Imposed Dead Loads	1.00 (1.30) mm @ 3.249 m	1.30 mm	
Dead Loads (Self Weight)	14.20 mm @ 3.249 m	14.20 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 72.8, Super Dead 10.7, SW 73.8 < 265	157.25 N/mm²	OK
TOTAL (Compression)	Live 1.6, Super Dead 0.2, SW 73.8 < 265	75.60 N/mm²	OK
Maximum Concrete Stress	Live 4.01, Super Dead 0.59, SW 0 < 20	4.60 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	6.04 mm	
Natural Frequency	18/√(6.04/1.1) = 7.68 > 4 Hz	7.68 Hz	OK

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UNPROPPED COMPOSITE PRIMARY EDGE BEAM
Members 230 and 268 (A8-D8) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	3.78 m Span and 3.592 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+785 mm²/m
Headed Stud Connector	19x95 mm Placed @ 200 mm centre
Transverse Beam	@ 1.04 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	122 x 534 mm², b1= 473 mm and b2= 61 mm
Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³
Composite Section Elastic Properties	ye 115.7 mm, Ix 7821 cm⁴, Zs.t 5471 cm³, Zs.b 455 cm³, Zc.t 6759 cm³
Headed Stud Connector	18 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 122.01 kN, RH Support 44.97 kN	< 169.03 kN	OK
Check @ 1.058 m (Max. Moment)	M = 120.83 kN.m, Fv = 43.82 kN		
Shear Connection	No of shear connectors from nearest support 5 < 12.1	Partial	
Axial Resistance (kN)	Rc 1171.41 kN, Rs 1052.15 kN, Rq 436 kN	436 kN	
Degree of Shear Connection	Na/Np = 5 / 12.1 > 0.4	0.414	OK
Reduced Concrete Area	Area required to resist 436 kN	45.4x533.7mm²	
Moment Capacity	Plastic neutral axis in top flange @ 137.2 mm	126.47 kN.m	OK
Check @ 1.04 m	M = 121.74 kN.m, Fv = 112.12 kN		
Shear Connection	No of shear connectors from nearest support 5 < 12.1	Partial	
Axial Resistance (kN)	Rc 1171.41 kN, Rs 1052.15 kN, Rq 436 kN	436 kN	
Reduced Concrete Area	Area required to resist 436 kN	45.4x533.7mm²	
Moment Capacity	Plastic neutral axis in top flange @ 137.2 mm	124.26 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 200 mm	5 per m	
Vr = fn(Asv,fy,Acv,fcu)	1037, 460, 79000, 40	399.71 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	5x87.2x0.47/(0.47+0.06)	386.03 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 33.44 kN, RH Support 13.15 kN	< 169.03 kN	OK
Check @ 1.058 m (Max. Moment)	M = 34.22 kN.m, Fv = 12 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK
Check @ 1.04 m	M = 34.55 kN.m, Fv = 33 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 1.04 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 34.549, 0.6	20.729 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.04 m, 3.83 cm, 1, 0.849, 0.967	68.117 kN.m	OK
Check between 1.04 and 3.78 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	34.549, 0, 0.6	20.729 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.74 m, 3.83 cm, 1, 0.849, 0.84	58.324 kN.m	OK

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Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 34.89 kN, RH Support 13.2 kN		
Super Imposed Dead Load	LH Support 26.76 kN, RH Support 8.85 kN		
Dead Load (Self Weight)	LH Support 20.56 kN, RH Support 8.13 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	2.54 (3.43) mm @ 1.663 m < L / 360 = 10.5 mm	3.43 mm	OK
Super Imposed Dead Loads	1.71 (2.31) mm @ 1.663 m	2.31 mm	
Dead Loads (Self Weight)	6.72 mm @ 1.701 m	6.72 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 79, Super Dead 52.9, SW 94.7 < 275	226.62 N/mm²	OK
TOTAL (Compression)	Live 6.6, Super Dead 4.4, SW 94.7 < 275	105.69 N/mm²	OK
Maximum Concrete Stress	Live 5.32, Super Dead 3.56, SW 0 < 20	8.88 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	4.16 mm	
Natural Frequency	$18/\sqrt{(4.16/1.1)} = 9.26 > 4$ Hz	9.26 Hz	OK

UNPROPPED COMPOSITE PRIMARY INTERNAL BEAM
Members 232, 234, 236 and 240 (E10-K10) @ Level 4

Summary of Design Data (Integrated Design)

Steel Section (86 kg/m)	203x203 UC 86 [S 275]
Floor Area Supported	6.147 m Span, 4.795 m to LH Beam and 2.81 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+785 mm²/m
Headed Stud Connector	19x95 mm Placed @ 135 mm centre
Transverse Beams	@ 0.522, 2.173 and 4.16 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	122 x 1537 mm², b1= 768 mm and b2= 768 mm
Steel Section Elastic Properties	ye 111.1 mm, A 109.6 cm², Ix 9452 cm⁴, Zt 851 cm³, Zb 851 cm³
Composite Section Elastic Properties	ye 127.5 mm, Ix 34216 cm⁴, Zs.t 134470 cm³, Zs.b 1522 cm³, Zc.t 26846 cm³
Headed Stud Connector	45 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 171.98 kN, RH Support 125.52 kN	< 448.69 kN	OK
Check @ 2.213 m (Max. Moment)	M = 262.97 kN.m, Fv = 7.01 kN		
Shear Connection	No of shear connectors from nearest support 16 < 33.3	Partial	
Axial Resistance (kN)	Rc 3373.25 kN, Rs 2905.2 kN, Rq 1395.2 kN	1395.2 kN	
Degree of Shear Connection	Na/Np = 16 / 33.3 > 0.4	0.48	OK
Reduced Concrete Area	Area required to resist 1395.2 kN	50.4x1536.8mm²	
Moment Capacity	Plastic neutral axis in top flange @ 143.4 mm	456.38 kN.m	OK
Check @ 0.522 m	M = 89.71 kN.m, Fv = 171.35 kN		
Shear Connection	No of shear connectors from nearest support 3 < 33.3	Partial	
Axial Resistance (kN)	Rc 3373.25 kN, Rs 2905.2 kN, Rq 261.6 kN	261.6 kN	
Reduced Concrete Area	Area required to resist 261.6 kN	9.5x1536.8mm²	
Moment Capacity	Plastic neutral axis in web @ 202.2 mm	313.49 kN.m	OK
Check @ 2.173 m	M = 263.25 kN.m, Fv = 104.18 kN		
Shear Connection	No of shear connectors from nearest support 16 < 33.3	Partial	
Axial Resistance (kN)	Rc 3373.25 kN, Rs 2905.2 kN, Rq 1395.2 kN	1395.2 kN	
Reduced Concrete Area	Area required to resist 1395.2 kN	50.4x1536.8mm²	
Moment Capacity	Plastic neutral axis in top flange @ 143.4 mm	456.38 kN.m	OK

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Check @ 4.16 m	M = 247.05 kN.m, Fv = 123.12 kN		
Shear Connection	No of shear connectors from nearest support 15 < 33.3	Partial	
Axial Resistance (kN)	Rc 3373.25 kN, Rs 2905.2 kN, Rq 1308 kN	1308 kN	
Reduced Concrete Area	Area required to resist 1308 kN	47.3x1536.8mm²	
Moment Capacity	Plastic neutral axis in top flange @ 144.2 mm	448.1 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 135 mm	7.41 per m	
Vr = fn(Asv,fy,Acv,fcu)	1037, 460, 79000, 40	399.71 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	7.41x87.2x0.77/(0.77+0.77)	322.96 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 61.45 kN, RH Support 45.46 kN	< 448.69 kN	OK
Check @ 2.213 m (Max. Moment)	M = 93.62 kN.m, Fv = 1.73 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 0.522 m	M = 31.94 kN.m, Fv = 60.82 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 2.173 m	M = 93.7 kN.m, Fv = 36.43 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 4.16 m	M = 87.97 kN.m, Fv = 43.07 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 0.522 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 31.944, 0.6	19.166 kN.m	
Mb=fn(L,ry,β_w,u,v)	0.522 m, 5.34 cm, 1, 0.85, 0.989	258.826 kN.m	OK
Check between 0.522 and 2.173 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	31.944, 93.695, 0.736	68.995 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.651 m, 5.34 cm, 1, 0.85, 0.91	258.826 kN.m	OK
Check between 2.173 and 4.16 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	93.695, 87.965, 0.976	91.403 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.987 m, 5.34 cm, 1, 0.85, 0.881	258.826 kN.m	OK
Check between 4.16 and 6.147 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	87.965, 0, 0.6	52.779 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.987 m, 5.34 cm, 1, 0.85, 0.881	258.826 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 66.11 kN, RH Support 47.88 kN		
Super Imposed Dead Load	LH Support 9.7 kN, RH Support 7.02 kN		
Dead Load (Self Weight)	LH Support 37.59 kN, RH Support 27.91 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	5.68 (7.20) mm @ 3.074 m < L / 360 = 17 mm	7.20 mm	OK
Super Imposed Dead Loads	0.83 (1.06) mm @ 3.074 m	1.06 mm	
Dead Loads (Self Weight)	11.69 mm @ 3.074 m	11.69 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 66.5, Super Dead 9.8, SW 67.3 < 265	143.55 N/mm²	OK
TOTAL (Compression)	Live 0.8, Super Dead 0.1, SW 67.3 < 265	68.13 N/mm²	OK
Maximum Concrete Stress	Live 3.77, Super Dead 0.55, SW 0 < 20	4.33 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	5 mm	
Natural Frequency	18/√(5.00/1.1) = 8.44 > 4 Hz	8.44 Hz	OK

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UNPROPPED COMPOSITE PRIMARY INTERNAL BEAM
Members 233, 237, 241 and 244 (D9-K9) @ Level 4

Summary of Design Data (Integrated Design)

Steel Section (107 kg/m)	254x254 UC 107 [S 275]
Floor Area Supported	7.032 m Span, 6.705 m to LH Beam and 4.795 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+393 mm²/m
Headed Stud Connector	19x95 mm Placed @ 175 mm centre
Transverse Beams	@ 1.865, 3.516 and 5.503 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	122 x 1758 mm², b1= 879 mm and b2= 879 mm
Steel Section Elastic Properties	ye 133.4 mm, A 136.4 cm², Ix 17517 cm⁴, Zt 1314 cm³, Zb 1314 cm³
Composite Section Elastic Properties	ye 139.7 mm, Ix 54313 cm⁴, Zs.t 56228 cm³, Zs.b 2113 cm³, Zc.t 38889 cm³
Headed Stud Connector (+1)	41 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 230.22 kN, RH Support 245.78 kN	< 542.79 kN	OK
Check @ 3.516 m (Max. Moment)	M = 548.75 kN.m, Fv = 72.65 kN		
Shear Connection	No of shear connectors from nearest support 21 < 41.4	Partial	
Axial Resistance (kN)	Rc 3858.9 kN, Rs 3614.07 kN, Rq 1831.2 kN	1831.2 kN	
Degree of Shear Connection	Na/Np = 21 / 41.4 > 0.4	0.507	OK
Reduced Concrete Area	Area required to resist 1831.2 kN	57.9x1758mm²	
Moment Capacity	Plastic neutral axis in top flange @ 142.7 mm	651.01 kN.m	OK
Check @ 1.865 m	M = 426.83 kN.m, Fv = 227.43 kN		
Shear Connection	No of shear connectors from nearest support 11 < 41.4	Partial	
Axial Resistance (kN)	Rc 3858.9 kN, Rs 3614.07 kN, Rq 959.2 kN	959.2 kN	
Reduced Concrete Area	Area required to resist 959.2 kN	30.3x1758mm²	
Moment Capacity	Plastic neutral axis in top flange @ 149.1 mm	562.22 kN.m	OK
Check @ 5.503 m	M = 374.13 kN.m, Fv = 243.49 kN		
Shear Connection	No of shear connectors from nearest support 10 < 41.4	Partial	
Axial Resistance (kN)	Rc 3858.9 kN, Rs 3614.07 kN, Rq 872 kN	872 kN	
Reduced Concrete Area	Area required to resist 872 kN	27.6x1758mm²	
Moment Capacity	Plastic neutral axis in top flange @ 149.7 mm	551.72 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 175 mm	5.71 per m	
Vr = fn(Asv,fy,Acv,fcu)	645, 460, 79000, 40	302.49 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	5.71x87.2x0.88/(0.88+0.88)	249.14 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 82.89 kN, RH Support 88.04 kN	< 542.79 kN	OK
Check @ 3.516 m (Max. Moment)	M = 195.03 kN.m, Fv = 24.84 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK
Check @ 1.865 m	M = 152.01 kN.m, Fv = 80.1 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK
Check @ 5.503 m	M = 132.89 kN.m, Fv = 85.75 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK

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Lateral Torsional Buckling (Construction Stage)

Check between 0 and 1.865 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 152.006, 0.6	91.204 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.865 m, 6.6 cm, 1, 0.848, 0.944	393.366 kN.m	OK
Check between 1.865 and 3.516 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	152.006, 195.033, 0.912	177.822 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.651 m, 6.6 cm, 1, 0.848, 0.955	393.366 kN.m	OK
Check between 3.516 and 5.503 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	195.033, 132.892, 0.873	170.177 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.987 m, 6.6 cm, 1, 0.848, 0.937	393.366 kN.m	OK
Check between 5.503 and 7.032 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	132.892, 0, 0.6	79.735 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.529 m, 6.6 cm, 1, 0.848, 0.961	393.366 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 88.12 kN, RH Support 94.34 kN		
Super Imposed Dead Load	LH Support 12.92 kN, RH Support 13.84 kN		
Dead Load (Self Weight)	LH Support 50.82 kN, RH Support 53.9 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	9.26 (12.14) mm @ 3.516 m < L / 360 = 19.5 mm	12.14 mm	OK
Super Imposed Dead Loads	1.36 (1.78) mm @ 3.516 m	1.78 mm	
Dead Loads (Self Weight)	16.23 mm @ 3.516 m	16.23 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 100.1, Super Dead 14.7, SW 90.7 < 265	205.51 N/mm²	OK
TOTAL (Compression)	Live 3.8, Super Dead 0.6, SW 90.7 < 265	95.02 N/mm²	OK
Maximum Concrete Stress	Live 5.44, Super Dead 0.8, SW 0 < 20	6.24 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	8.23 mm	
Natural Frequency	18/√(8.23/1.1) = 6.58 > 4 Hz	6.58 Hz	OK

UNPROPPED COMPOSITE PRIMARY INTERNAL BEAM
Members 235, 242, 245 and 248 (D8-K8) @ Level 4

Summary of Design Data (Integrated Design)

Steel Section (107 kg/m)	254x254 UC 107 [S 275]
Floor Area Supported	6.27 m Span, 1.74 m to LH Beam and 6.705 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+393 mm²/m
Headed Stud Connector	19x95 mm Placed @ 175 mm centre
Transverse Beams	@ 1.568, 3.135 and 5.122 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	122 x 1480 mm², b1= 696 mm and b2= 784 mm
Steel Section Elastic Properties	ye 133.4 mm, A 136.4 cm², Ix 17517 cm⁴, Zt 1314 cm³, Zb 1314 cm³
Composite Section Elastic Properties	ye 148.1 mm, Ix 51566 cm⁴, Zs.t 28511 cm³, Zs.b 2074 cm³, Zc.t 34822 cm³
Headed Stud Connector	35 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 193.44 kN, RH Support 209.15 kN	< 542.79 kN	OK
Check @ 3.135 m (Max. Moment)	M = 399.44 kN.m, Fv = 61.34 kN		
Shear Connection	No of shear connectors from nearest support 17 < 37.2	Partial	
Axial Resistance (kN)	Rc 3248.13 kN, Rs 3614.07 kN, Rq 1482.4 kN	1482.4 kN	
Degree of Shear Connection	Na/Np = 17 / 37.2 > 0.4	0.456	OK

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Reduced Concrete Area	Area required to resist 1482.4 kN	55.7x1479.8mm²	
Moment Capacity	Plastic neutral axis in top flange @ 145.3 mm	612.51 kN.m	OK
Check @ 1.568 m	M = 301.54 kN.m, Fv = 191.09 kN		
Shear Connection	No of shear connectors from nearest support 8 < 37.2	Partial	
Axial Resistance (kN)	Rc 3248.13 kN, Rs 3614.07 kN, Rq 697.6 kN	697.6 kN	
Reduced Concrete Area	Area required to resist 697.6 kN	26.2x1479.8mm²	
Moment Capacity	Plastic neutral axis in web @ 160.5 mm	528.05 kN.m	OK
Check @ 5.122 m	M = 239.22 kN.m, Fv = 207.43 kN		
Shear Connection	No of shear connectors from nearest support 6 < 37.2	Partial	
Axial Resistance (kN)	Rc 3248.13 kN, Rs 3614.07 kN, Rq 523.2 kN	523.2 kN	
Reduced Concrete Area	Area required to resist 523.2 kN	19.6x1479.8mm²	
Moment Capacity	Plastic neutral axis in web @ 186.2 mm	501.81 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 175 mm	5.71 per m	
Vr = fn(Asv,fy,Acv,fcu)	645, 460, 79000, 40	302.49 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	5.71x87.2x0.78/(0.7+0.78)	263.92 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 69.98 kN, RH Support 75.22 kN	< 542.79 kN	OK
Check @ 3.135 m (Max. Moment)	M = 142.61 kN.m, Fv = 20.97 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK
Check @ 1.568 m	M = 107.93 kN.m, Fv = 67.64 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK
Check @ 5.122 m	M = 85.41 kN.m, Fv = 73.5 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 1.568 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 107.93, 0.6	64.758 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.568 m, 6.6 cm, 1, 0.848, 0.959	393.366 kN.m	OK
Check between 1.568 and 3.135 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	107.93, 142.61, 0.903	128.738 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.567 m, 6.6 cm, 1, 0.848, 0.959	393.366 kN.m	OK
Check between 3.135 and 5.122 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	142.61, 85.406, 0.84	119.728 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.987 m, 6.6 cm, 1, 0.848, 0.937	393.366 kN.m	OK
Check between 5.122 and 6.27 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	85.406, 0, 0.6	51.244 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.148 m, 6.6 cm, 1, 0.848, 0.977	393.366 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 73.84 kN, RH Support 80.11 kN		
Super Imposed Dead Load	LH Support 10.83 kN, RH Support 11.75 kN		
Dead Load (Self Weight)	LH Support 42.95 kN, RH Support 46.09 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	5.59 (7.36) mm @ 3.135 m < L / 360 = 17.4 mm	7.36 mm	OK
Super Imposed Dead Loads	0.82 (1.08) mm @ 3.135 m	1.08 mm	
Dead Loads (Self Weight)	9.39 mm @ 3.135 m	9.39 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 74.1, Super Dead 10.9, SW 66.4 < 265	151.33 N/mm²	OK
TOTAL (Compression)	Live 5.4, Super Dead 0.8, SW 66.4 < 265	72.58 N/mm²	OK
Maximum Concrete Stress	Live 4.41, Super Dead 0.65, SW 0 < 20	5.06 N/mm²	OK

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Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	5.01 mm	
Natural Frequency	$18/\sqrt{(5.01/1.1)} = 8.44 > 4$ Hz	8.44 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Members 238, 243, 246, 249 and 252 (D4-P4) @ Level 4

Summary of Design Data (Integrated Design)

Steel Section (86 kg/m)	203x203 UC 86 [S 275]
Floor Area Supported	6.739 m Span, .18 m to LH Beam and 1.79 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 932 mm², b1= 90 mm and b2= 842 mm
Steel Section Elastic Properties	ye 111.1 mm, A 109.6 cm², Ix 9452 cm⁴, Zt 851 cm³, Zb 851 cm³
Composite Section Elastic Properties	ye 160.1 mm, Ix 27741 cm⁴, Zs.t 9221 cm³, Zs.b 1444 cm³, Zc.t 17329 cm³

Headed Stud Connector	22 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2		

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 165.75 kN, RH Support 189.23 kN	< 448.69 kN	OK
Check @ 3.167 m (Max. Moment)	M = 356.89 kN.m, Fv = 9.74 kN		
Shear Connection	No of shear connectors from nearest support 10 < 15.2	Partial	
Axial Resistance (kN)	Rc 1325.84 kN, Rs 2905.2 kN, Rq 872 kN	872 kN	
Degree of Shear Connection	Na/Np = 10 / 15.2 > 0.4	0.658	OK
Reduced Concrete Area	Area required to resist 872 kN	52x932.4mm²	
Moment Capacity	Plastic neutral axis in top flange @ 148.1 mm	392.64 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.84/(0.09+0.84)	259.15 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 58.73 kN, RH Support 66.52 kN	< 448.69 kN	OK
Check @ 3.167 m (Max. Moment)	M = 125.13 kN.m, Fv = 3.31 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 64.01 kN, RH Support 73.39 kN		
Super Imposed Dead Load	LH Support 9.39 kN, RH Support 10.76 kN		
Dead Load (Self Weight)	LH Support 35.85 kN, RH Support 40.52 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	11.25 (13.48) mm @ 3.37 m < L / 360 = 18.7 mm	13.48 mm	OK
Super Imposed Dead Loads	1.65 (1.98) mm @ 3.37 m	1.98 mm	
Dead Loads (Self Weight)	18.17 mm @ 3.37 m	18.17 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 96, Super Dead 14.1, SW 89.5 < 265	199.60 N/mm²	OK
TOTAL (Compression)	Live 15, Super Dead 2.2, SW 89.5 < 265	106.78 N/mm²	OK

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Maximum Concrete Stress	Live 8, Super Dead 1.17, SW 0 < 20	9.17 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	9.52 mm	
Natural Frequency	18/√(9.52/1.1) = 6.12 > 4 Hz	6.12 Hz	OK

UNPROPPED NON-COMPOSITE SECONDARY INTERNAL BEAM
Members 247 and 258 (H5-M5) @ Level 4

Summary of Design Data (Integrated Design)

Steel Section (107 kg/m) 254x254 UC 107 [S 275] Floor Area Supported 6.853 m Span, 2.338 m to LH Beam and .376 m to RH Beam Continuous Holorib Z35 Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick Concrete Slab 130 mm Thick @ 2350 kg/m³ with 252 mm²/m IMPORTANT: Beam Loads All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties ye 133.4 mm, A 136.4 cm², Ix 17517 cm⁴, Zt 1314 cm³, Zb 1314 cm³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 109.57 kN, RH Support 133.34 kN	< 542.79 kN	OK
Check @ 3.632 m (Max. Moment)	M = 217.01 kN.m, Fv = 0.08 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 39.95 kN, RH Support 47.87 kN	< 542.79 kN	OK
Check @ 3.632 m (Max. Moment)	M = 78.19 kN.m, Fv = 0.23 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 41.64 kN, RH Support 51.12 kN		
Super Imposed Dead Load	LH Support 6.11 kN, RH Support 7.5 kN		
Dead Load (Self Weight)	LH Support 24.57 kN, RH Support 29.32 kN		
Maximum Deflection			
Live Loads	11.23 (11.23) mm @ 3.495 m < L / 360 = 19 mm	11.23 mm	OK
Super Imposed Dead Loads	1.65 mm @ 3.495 m	1.65 mm	
Dead Loads (Self Weight)	6.49 mm @ 3.495 m	6.49 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 63.2, Super Dead 9.3, SW 36.5 < 265	108.98 N/mm²	OK
TOTAL (Compression)	Live 63.2, Super Dead 9.3, SW 36.5 < 265	108.98 N/mm²	OK

Vibration Analysis

Beam Deflection		9.26 mm	
Natural Frequency	18/√(9.26) = 5.91 > 4 Hz	5.91 Hz	OK

UNPROPPED NON-COMPOSITE PRIMARY INTERNAL BEAM
Members 269 and 271 (A4-D4) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	3.875 m Span, 1.042 m to LH Beam and 3.592 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m

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Transverse Beam	@ 1.04 m		
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame		
Section Properties			
Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³		
Ultimate Limit State (Final Stage)			
Maximum Shear			
Support Reactions (kN)	LH Support 39.36 kN, RH Support 14.96 kN	< 218.38 kN	OK
Check @ 1.046 m (Max. Moment)	M = 40.62 kN.m, Fv = 13.77 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK
Check @ 1.04 m	M = 40.71 kN.m, Fv = 38.92 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK
Lateral Torsional Buckling (Final Stage)			
Check between 0 and 1.04 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 40.707, 0.6	24.424 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.04 m, 3.18 cm, 1, 0.882, 0.973	86.46 kN.m	OK
Check between 1.04 and 3.875 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	40.707, 0, 0.6	24.424 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.835 m, 3.18 cm, 1, 0.882, 0.856	61.27 kN.m	OK
Ultimate Limit State (Construction Stage)			
Maximum Shear			
Support Reactions (kN)	LH Support 14.03 kN, RH Support 5.66 kN	< 218.38 kN	OK
Check @ 1.046 m (Max. Moment)	M = 14.34 kN.m, Fv = 4.48 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK
Check @ 1.04 m	M = 14.36 kN.m, Fv = 13.59 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK
Lateral Torsional Buckling (Construction Stage)			
Check between 0 and 1.04 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 14.363, 0.6	8.618 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.04 m, 3.18 cm, 1, 0.882, 0.973	86.46 kN.m	OK
Check between 1.04 and 3.875 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	14.363, 0, 0.6	8.618 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.835 m, 3.18 cm, 1, 0.882, 0.856	61.27 kN.m	OK
Serviceability Limit State			
Support Reactions (kN)			
Live Loads	LH Support 15.15 kN, RH Support 5.56 kN		
Super Imposed Dead Load	LH Support 2.22 kN, RH Support 0.82 kN		
Dead Load (Self Weight)	LH Support 8.58 kN, RH Support 3.52 kN		
Maximum Deflection			
Live Loads	3.12 (3.12) mm @ 1.705 m < L / 360 = 10.7 mm	3.12 mm	OK
Super Imposed Dead Loads	0.46 mm @ 1.705 m	0.46 mm	
Dead Loads (Self Weight)	1.80 mm @ 1.744 m	1.80 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 56.1, Super Dead 8.3, SW 31.2 < 275	95.62 N/mm²	OK
TOTAL (Compression)	Live 56.1, Super Dead 8.3, SW 31.2 < 275	95.62 N/mm²	OK
Vibration Analysis			
Beam Deflection		2.57 mm	
Natural Frequency	18/√(2.57) = 11.23 > 4 Hz	11.23 Hz	OK

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UNPROPPED COMPOSITE PRIMARY EDGE BEAM
Members 275, 278 and 281 (E12-K12) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (86 kg/m)	203x203 UC 86 [S 275]
Floor Area Supported	6.497 m Span and 2.81 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+393 mm²/m
Headed Stud Connector	19x95 mm Placed @ 300 mm centre
Transverse Beams	@ 2.173 and 4.146 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	122 x 896 mm², b1= 812 mm and b2= 84 mm
Steel Section Elastic Properties	ye 111.1 mm, A 109.6 cm², Ix 9452 cm⁴, Zt 851 cm³, Zb 851 cm³
Composite Section Elastic Properties	ye 151.2 mm, Ix 28558 cm⁴, Zs.t 13472 cm³, Zs.b 1421 cm³, Zc.t 18888 cm³
Headed Stud Connector	21 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 79.38 kN, RH Support 77.11 kN	< 448.69 kN	OK
Check @ 3.378 m (Max. Moment)	M = 155.76 kN.m, Fv = 0.09 kN		
Shear Connection	No of shear connectors from nearest support 10 < 22.5	Partial	
Axial Resistance (kN)	Rc 1966.25 kN, Rs 2905.2 kN, Rq 872 kN	872 kN	
Degree of Shear Connection	Na/Np = 10 / 22.5 > 0.4	0.443	OK
Reduced Concrete Area	Area required to resist 872 kN	54.1x895.8mm²	
Moment Capacity	Plastic neutral axis in top flange @ 148.1 mm	391.72 kN.m	OK
Check @ 2.173 m	M = 148.17 kN.m, Fv = 57 kN		
Shear Connection	No of shear connectors from nearest support 7 < 22.5	Partial	
Axial Resistance (kN)	Rc 1966.25 kN, Rs 2905.2 kN, Rq 610.4 kN	610.4 kN	
Reduced Concrete Area	Area required to resist 610.4 kN	37.9x895.8mm²	
Moment Capacity	Plastic neutral axis in top flange @ 150.5 mm	364.68 kN.m	OK
Check @ 4.146 m	M = 152.81 kN.m, Fv = 52.89 kN		
Shear Connection	No of shear connectors from nearest support 8 < 22.5	Partial	
Axial Resistance (kN)	Rc 1966.25 kN, Rs 2905.2 kN, Rq 697.6 kN	697.6 kN	
Reduced Concrete Area	Area required to resist 697.6 kN	43.3x895.8mm²	
Moment Capacity	Plastic neutral axis in top flange @ 149.7 mm	374.23 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 300 mm	3.33 per m	
Vr = fn(Asv,fy,Acv,fcu)	645, 460, 79000, 40	302.49 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.33x87.2x0.81/(0.81+0.08)	263.53 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 19.62 kN, RH Support 18.84 kN	< 448.69 kN	OK
Check @ 3.638 m (Max. Moment)	M = 41.12 kN.m, Fv = 0.02 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 2.173 m	M = 39.79 kN.m, Fv = 17 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 4.146 m	M = 40.97 kN.m, Fv = 16.01 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

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Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.173 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 39.791, 0.6	23.875 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.173 m, 5.34 cm, 1, 0.85, 0.864	258.826 kN.m	OK
Check between 2.173 and 4.146 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	39.791, 40.971, 0.988	40.499 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.973 m, 5.34 cm, 1, 0.85, 0.882	258.826 kN.m	OK
Check between 4.146 and 6.497 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	40.971, 0, 0.6	24.583 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.351 m, 5.34 cm, 1, 0.85, 0.849	258.826 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 18.06 kN, RH Support 17.17 kN		
Super Imposed Dead Load	LH Support 23.76 kN, RH Support 23.63 kN		
Dead Load (Self Weight)	LH Support 12.29 kN, RH Support 11.82 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	3.01 (4.02) mm @ 3.249 m < L / 360 = 18 mm	4.02 mm	OK
Super Imposed Dead Loads	3.02 (4.03) mm @ 3.249 m	4.03 mm	
Dead Loads (Self Weight)	5.81 mm @ 3.249 m	5.81 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 28.4, Super Dead 28.2, SW 30 < 265	86.67 N/mm²	OK
TOTAL (Compression)	Live 3, Super Dead 3, SW 30 < 265	36.01 N/mm²	OK
Maximum Concrete Stress	Live 2.14, Super Dead 2.12, SW 0 < 20	4.26 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	6.36 mm	
Natural Frequency	18/√(6.36/1.1) = 7.49 > 4 Hz	7.49 Hz	OK

UNPROPPED COMPOSITE PRIMARY INTERNAL BEAM
Members 282, 285, 287 and 291 (E10-K10) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (86 kg/m)	203x203 UC 86 [S 275]
Floor Area Supported	6.147 m Span, 4.795 m to LH Beam and 2.81 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+785 mm²/m
Headed Stud Connector	19x95 mm Placed @ 135 mm centre
Transverse Beams	@ 0.522, 2.173 and 4.16 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	122 x 1537 mm², b1= 768 mm and b2= 768 mm
Steel Section Elastic Properties	ye 111.1 mm, A 109.6 cm², Ix 9452 cm⁴, Zt 851 cm³, Zb 851 cm³
Composite Section Elastic Properties	ye 127.5 mm, Ix 34216 cm⁴, Zs.t 134470 cm³, Zs.b 1522 cm³, Zc.t 26846 cm³
Headed Stud Connector	45 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 171.98 kN, RH Support 125.52 kN	< 448.69 kN	OK
Check @ 2.213 m (Max. Moment)	M = 262.97 kN.m, Fv = 7.01 kN		
Shear Connection	No of shear connectors from nearest support 16 < 33.3	Partial	
Axial Resistance (kN)	Rc 3373.25 kN, Rs 2905.2 kN, Rq 1395.2 kN	1395.2 kN	
Degree of Shear Connection	Na/Np = 16 / 33.3 > 0.4	0.48	OK
Reduced Concrete Area	Area required to resist 1395.2 kN	50.4x1536.8mm²	
Moment Capacity	Plastic neutral axis in top flange @ 143.4 mm	456.38 kN.m	OK

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Check @ 0.522 m	M = 89.71 kN.m, Fv = 171.35 kN		
Shear Connection	No of shear connectors from nearest support 3 < 33.3	Partial	
Axial Resistance (kN)	Rc 3373.25 kN, Rs 2905.2 kN, Rq 261.6 kN	261.6 kN	
Reduced Concrete Area	Area required to resist 261.6 kN	9.5x1536.8mm²	
Moment Capacity	Plastic neutral axis in web @ 202.2 mm	313.49 kN.m	OK
Check @ 2.173 m	M = 263.25 kN.m, Fv = 104.18 kN		
Shear Connection	No of shear connectors from nearest support 16 < 33.3	Partial	
Axial Resistance (kN)	Rc 3373.25 kN, Rs 2905.2 kN, Rq 1395.2 kN	1395.2 kN	
Reduced Concrete Area	Area required to resist 1395.2 kN	50.4x1536.8mm²	
Moment Capacity	Plastic neutral axis in top flange @ 143.4 mm	456.38 kN.m	OK
Check @ 4.16 m	M = 247.04 kN.m, Fv = 123.12 kN		
Shear Connection	No of shear connectors from nearest support 15 < 33.3	Partial	
Axial Resistance (kN)	Rc 3373.25 kN, Rs 2905.2 kN, Rq 1308 kN	1308 kN	
Reduced Concrete Area	Area required to resist 1308 kN	47.3x1536.8mm²	
Moment Capacity	Plastic neutral axis in top flange @ 144.2 mm	448.1 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 135 mm	7.41 per m	
Vr = fn(Asv,fy,Acv,fcu)	1037, 460, 79000, 40	399.71 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	7.41x87.2x0.77/(0.77+0.77)	322.96 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 61.45 kN, RH Support 45.46 kN	< 448.69 kN	OK
Check @ 2.213 m (Max. Moment)	M = 93.62 kN.m, Fv = 1.73 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 0.522 m	M = 31.95 kN.m, Fv = 60.82 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 2.173 m	M = 93.7 kN.m, Fv = 36.43 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 4.16 m	M = 87.96 kN.m, Fv = 43.07 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 0.522 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 31.945, 0.6	19.167 kN.m	
Mb=fn(L,ry,β_w,u,v)	0.522 m, 5.34 cm, 1, 0.85, 0.989	258.826 kN.m	OK
Check between 0.522 and 2.173 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	31.945, 93.697, 0.736	68.996 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.651 m, 5.34 cm, 1, 0.85, 0.91	258.826 kN.m	OK
Check between 2.173 and 4.16 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	93.697, 87.96, 0.976	91.402 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.987 m, 5.34 cm, 1, 0.85, 0.881	258.826 kN.m	OK
Check between 4.16 and 6.147 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	87.96, 0, 0.6	52.776 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.987 m, 5.34 cm, 1, 0.85, 0.881	258.826 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 66.11 kN, RH Support 47.88 kN		
Super Imposed Dead Load	LH Support 9.7 kN, RH Support 7.02 kN		
Dead Load (Self Weight)	LH Support 37.59 kN, RH Support 27.91 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	5.68 (7.20) mm @ 3.074 m < L / 360 = 17 mm	7.20 mm	OK
Super Imposed Dead Loads	0.83 (1.06) mm @ 3.074 m	1.06 mm	
Dead Loads (Self Weight)	11.69 mm @ 3.074 m	11.69 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 66.5, Super Dead 9.8, SW 67.3 < 265	143.54 N/mm²	OK

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TOTAL (Compression)	Live 0.8, Super Dead 0.1, SW 67.3 < 265	68.12 N/mm²	OK
Maximum Concrete Stress	Live 3.77, Super Dead 0.55, SW 0 < 20	4.33 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	5 mm	
Natural Frequency	18/√(5.00/1.1) = 8.44 > 4 Hz	8.44 Hz	OK

UNPROPPED COMPOSITE PRIMARY INTERNAL BEAM
Members 283, 288, 292 and 295 (D9-K9) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (107 kg/m)	254x254 UC 107 [S 275]
Floor Area Supported	7.032 m Span, 6.705 m to LH Beam and 4.795 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+393 mm²/m
Headed Stud Connector	19x95 mm Placed @ 175 mm centre
Transverse Beams	@ 1.865, 3.516 and 5.503 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	122 x 1758 mm², b1= 879 mm and b2= 879 mm
Steel Section Elastic Properties	ye 133.4 mm, A 136.4 cm², Ix 17517 cm⁴, Zt 1314 cm³, Zb 1314 cm³
Composite Section Elastic Properties	ye 139.7 mm, Ix 54313 cm⁴, Zs.t 56228 cm³, Zs.b 2113 cm³, Zc.t 38889 cm³
Headed Stud Connector	40 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 229.77 kN, RH Support 245.62 kN	< 542.79 kN	OK
Check @ 3.516 m (Max. Moment)	M = 548.18 kN.m, Fv = 72.82 kN		
Shear Connection	No of shear connectors from nearest support 20 < 41.4	Partial	
Axial Resistance (kN)	Rc 3858.9 kN, Rs 3614.07 kN, Rq 1744 kN	1744 kN	
Degree of Shear Connection	Na/Np = 20 / 41.4 > 0.4	0.483	OK
Reduced Concrete Area	Area required to resist 1744 kN	55.1x1758mm²	
Moment Capacity	Plastic neutral axis in top flange @ 143.4 mm	643.46 kN.m	OK
Check @ 1.865 m	M = 425.99 kN.m, Fv = 226.98 kN		
Shear Connection	No of shear connectors from nearest support 10 < 41.4	Partial	
Axial Resistance (kN)	Rc 3858.9 kN, Rs 3614.07 kN, Rq 872 kN	872 kN	
Reduced Concrete Area	Area required to resist 872 kN	27.6x1758mm²	
Moment Capacity	Plastic neutral axis in top flange @ 149.7 mm	551.72 kN.m	OK
Check @ 5.503 m	M = 373.88 kN.m, Fv = 243.33 kN		
Shear Connection	No of shear connectors from nearest support 9 < 41.4	Partial	
Axial Resistance (kN)	Rc 3858.9 kN, Rs 3614.07 kN, Rq 784.8 kN	784.8 kN	
Reduced Concrete Area	Area required to resist 784.8 kN	24.8x1758mm²	
Moment Capacity	Plastic neutral axis in top flange @ 150.4 mm	540.91 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 175 mm	5.71 per m	
Vr = fn(Asv,fy,Acv,fcu)	645, 460, 79000, 40	302.49 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	5.71x87.2x0.88/(0.88+0.88)	249.14 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 82.44 kN, RH Support 87.88 kN	< 542.79 kN	OK
Check @ 3.516 m (Max. Moment)	M = 194.47 kN.m, Fv = 25 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK

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Check @ 1.865 m	M = 151.17 kN.m, Fv = 79.65 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK
Check @ 5.503 m	M = 132.65 kN.m, Fv = 85.59 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 1.865 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 151.172, 0.6	90.703 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.865 m, 6.6 cm, 1, 0.848, 0.944	393.366 kN.m	OK
Check between 1.865 and 3.516 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	151.172, 194.468, 0.911	177.15 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.651 m, 6.6 cm, 1, 0.848, 0.955	393.366 kN.m	OK
Check between 3.516 and 5.503 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	194.468, 132.647, 0.873	169.74 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.987 m, 6.6 cm, 1, 0.848, 0.937	393.366 kN.m	OK
Check between 5.503 and 7.032 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	132.647, 0, 0.6	79.588 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.529 m, 6.6 cm, 1, 0.848, 0.961	393.366 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 88.12 kN, RH Support 94.34 kN		
Super Imposed Dead Load	LH Support 12.92 kN, RH Support 13.84 kN		
Dead Load (Self Weight)	LH Support 50.49 kN, RH Support 53.79 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	9.26 (12.28) mm @ 3.516 m < L / 360 = 19.5 mm	12.28 mm	OK
Super Imposed Dead Loads	1.36 (1.80) mm @ 3.516 m	1.80 mm	
Dead Loads (Self Weight)	16.17 mm @ 3.516 m	16.17 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 100.1, Super Dead 14.7, SW 90.4 < 265	205.20 N/mm²	OK
TOTAL (Compression)	Live 3.8, Super Dead 0.6, SW 90.4 < 265	94.72 N/mm²	OK
Maximum Concrete Stress	Live 5.44, Super Dead 0.8, SW 0 < 20	6.24 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	8.24 mm	
Natural Frequency	18/√(8.24/1.1) = 6.58 > 4 Hz	6.58 Hz	OK

UNPROPPED COMPOSITE PRIMARY INTERNAL BEAM
Members 286, 293, 296 and 299 (D8-K8) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (107 kg/m)	254x254 UC 107 [S 275]
Floor Area Supported	6.27 m Span, 1.74 m to LH Beam and 6.705 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+252 mm²/m
Headed Stud Connector	19x95 mm Placed @ 200 mm centre
Transverse Beams	@ 1.568, 3.135 and 5.122 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	122 x 1480 mm², b1= 696 mm and b2= 784 mm
Steel Section Elastic Properties	ye 133.4 mm, A 136.4 cm², Ix 17517 cm⁴, Zt 1314 cm³, Zb 1314 cm³
Composite Section Elastic Properties	ye 148.1 mm, Ix 51566 cm⁴, Zs.t 28511 cm³, Zs.b 2074 cm³, Zc.t 34822 cm³
Headed Stud Connector	31 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)

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Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 190.9 kN, RH Support 199.76 kN	< 542.79 kN	OK
Check @ 3.135 m (Max. Moment)	M = 392.44 kN.m, Fv = 59.42 kN		
Shear Connection	No of shear connectors from nearest support 15 < 37.2	Partial	
Axial Resistance (kN)	Rc 3248.13 kN, Rs 3614.07 kN, Rq 1308 kN	1308 kN	
Degree of Shear Connection	Na/Np = 15 / 37.2 > 0.4	0.403	OK
Reduced Concrete Area	Area required to resist 1308 kN	49.1x1479.8mm²	
Moment Capacity	Plastic neutral axis in top flange @ 146.5 mm	596.2 kN.m	OK
Check @ 1.568 m	M = 297.56 kN.m, Fv = 188.55 kN		
Shear Connection	No of shear connectors from nearest support 7 < 37.2	Partial	
Axial Resistance (kN)	Rc 3248.13 kN, Rs 3614.07 kN, Rq 610.4 kN	610.4 kN	
Reduced Concrete Area	Area required to resist 610.4 kN	22.9x1479.8mm²	
Moment Capacity	Plastic neutral axis in web @ 173.4 mm	515.63 kN.m	OK
Check @ 5.122 m	M = 228.4 kN.m, Fv = 198.03 kN		
Shear Connection	No of shear connectors from nearest support 6 < 37.2	Partial	
Axial Resistance (kN)	Rc 3248.13 kN, Rs 3614.07 kN, Rq 523.2 kN	523.2 kN	
Reduced Concrete Area	Area required to resist 523.2 kN	19.6x1479.8mm²	
Moment Capacity	Plastic neutral axis in web @ 186.2 mm	501.81 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 200 mm	5 per m	
Vr = fn(Asv,fy,Acv,fcu)	504, 460, 79000, 40	257.09 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	5x87.2x0.78/(0.7+0.78)	230.93 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 67.18 kN, RH Support 64.61 kN	< 542.79 kN	OK
Check @ 3.135 m (Max. Moment)	M = 134.76 kN.m, Fv = 18.78 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK
Check @ 1.568 m	M = 103.52 kN.m, Fv = 64.83 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK
Check @ 5.122 m	M = 73.2 kN.m, Fv = 62.88 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 1.568 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 103.515, 0.6	62.109 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.568 m, 6.6 cm, 1, 0.848, 0.959	393.366 kN.m	OK
Check between 1.568 and 3.135 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	103.515, 134.759, 0.907	122.261 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.567 m, 6.6 cm, 1, 0.848, 0.959	393.366 kN.m	OK
Check between 3.135 and 5.122 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	134.759, 73.196, 0.817	110.134 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.987 m, 6.6 cm, 1, 0.848, 0.937	393.366 kN.m	OK
Check between 5.122 and 6.27 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	73.196, 0, 0.6	43.918 kN.m	
Mb=fn(L,ry,β_w,u,v)	1.148 m, 6.6 cm, 1, 0.848, 0.977	393.366 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 71.31 kN, RH Support 68.84 kN		
Super Imposed Dead Load	LH Support 11.13 kN, RH Support 13.08 kN		
Dead Load (Self Weight)	LH Support 41.23 kN, RH Support 39.77 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	5.24 (7.06) mm @ 3.072 m < L / 360 = 17.4 mm	7.06 mm	OK
Super Imposed Dead Loads	0.86 (1.16) mm @ 3.135 m	1.16 mm	
Dead Loads (Self Weight)	8.78 mm @ 3.072 m	8.78 mm	

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Maximum Steel Stress			
TOTAL (Tension)	Live 70.2, Super Dead 11.3, SW 62.8 < 265	144.36 N/mm²	OK
TOTAL (Compression)	Live 5.1, Super Dead 0.8, SW 62.8 < 265	68.74 N/mm²	OK
Maximum Concrete Stress	Live 4.18, Super Dead 0.67, SW 0 < 20	4.86 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	4.85 mm	
Natural Frequency	18/√(4.85/1.1) = 8.57 > 4 Hz	8.57 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Members 289, 294, 297, 300 and 305 (D4-P4) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (107 kg/m)	254x254 UC 107 [S 275]
Floor Area Supported	6.739 m Span, .18 m to LH Beam and 1.79 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+393 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 932 mm², b1= 90 mm and b2= 842 mm
Steel Section Elastic Properties	ye 133.4 mm, A 136.4 cm², Ix 17517 cm⁴, Zt 1314 cm³, Zb 1314 cm³
Composite Section Elastic Properties	ye 184.8 mm, Ix 41866 cm⁴, Zs.t 7633 cm³, Zs.b 1976 cm³, Zc.t 22649 cm³
Headed Stud Connector	22 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 164.04 kN, RH Support 181.66 kN	< 542.79 kN	OK
Check @ 3.167 m (Max. Moment)	M = 349.99 kN.m, Fv = 12.39 kN		
Shear Connection	No of shear connectors from nearest support 10 < 15.2	Partial	
Axial Resistance (kN)	Rc 1325.84 kN, Rs 3614.07 kN, Rq 872 kN	872 kN	
Degree of Shear Connection	Na/Np = 10 / 15.2 > 0.4	0.658	OK
Reduced Concrete Area	Area required to resist 872 kN	52x932.4mm²	
Moment Capacity	Plastic neutral axis in top flange @ 149.7 mm	541.08 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	645, 460, 114000, 40, 87.5	431.99 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.84/(0.09+0.84)	259.15 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 56.64 kN, RH Support 57.73 kN	< 542.79 kN	OK
Check @ 3.167 m (Max. Moment)	M = 117.02 kN.m, Fv = 6.34 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 60.68 kN, RH Support 62.86 kN		
Super Imposed Dead Load	LH Support 9.79 kN, RH Support 12.05 kN		
Dead Load (Self Weight)	LH Support 34.73 kN, RH Support 35.42 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	6.77 (7.74) mm @ 3.302 m < L / 360 = 18.7 mm	7.74 mm	OK
Super Imposed Dead Loads	1.18 (1.34) mm @ 3.37 m	1.34 mm	
Dead Loads (Self Weight)	9.06 mm @ 3.302 m	9.06 mm	

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Maximum Steel Stress			
TOTAL (Tension)	Live 64.8, Super Dead 10.9, SW 54.5 < 265	130.22 N/mm²	OK
TOTAL (Compression)	Live 16.8, Super Dead 2.8, SW 54.5 < 265	74.09 N/mm²	OK
Maximum Concrete Stress	Live 5.65, Super Dead 0.95, SW 0 < 20	6.61 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	5.91 mm	
Natural Frequency	18/√(5.91/1.1) = 7.77 > 4 Hz	7.77 Hz	OK

UNPROPPED NON-COMPOSITE SECONDARY INTERNAL BEAM
Members 298 and 312 (H5-M5) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (107 kg/m)	254x254 UC 107 [S 275]
Floor Area Supported	6.853 m Span, 2.338 m to LH Beam and .376 m to RH Beam
Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties	ye 133.4 mm, A 136.4 cm², Ix 17517 cm⁴, Zt 1314 cm³, Zb 1314 cm³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 109.57 kN, RH Support 133.34 kN	< 542.79 kN	OK
Check @ 3.632 m (Max. Moment)	M = 217.01 kN.m, Fv = 0.08 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 39.95 kN, RH Support 47.87 kN	< 542.79 kN	OK
Check @ 3.632 m (Max. Moment)	M = 78.19 kN.m, Fv = 0.23 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 41.64 kN, RH Support 51.12 kN		
Super Imposed Dead Load	LH Support 6.11 kN, RH Support 7.5 kN		
Dead Load (Self Weight)	LH Support 24.57 kN, RH Support 29.32 kN		
Maximum Deflection			
Live Loads	11.23 (11.23) mm @ 3.495 m < L / 360 = 19 mm	11.23 mm	OK
Super Imposed Dead Loads	1.65 mm @ 3.495 m	1.65 mm	
Dead Loads (Self Weight)	6.49 mm @ 3.495 m	6.49 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 63.2, Super Dead 9.3, SW 36.5 < 265	108.98 N/mm²	OK
TOTAL (Compression)	Live 63.2, Super Dead 9.3, SW 36.5 < 265	108.98 N/mm²	OK

Vibration Analysis

Beam Deflection		9.26 mm	
Natural Frequency	18/√(9.26) = 5.91 > 4 Hz	5.91 Hz	OK

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UNPROPPED COMPOSITE SECONDARY EDGE BEAM
Members 381-382 (A4-A2) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	6.008 m Span and 1.072 m to LH Beam
Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 13.79, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 612 mm², b1= 536 mm and b2= 76 mm
Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³
Composite Section Elastic Properties	ye 127.8 mm, Ix 7177 cm⁴, Zs.t 33608 cm³, Zs.b 460 cm³, Zc.t 7929 cm³
Headed Stud Connector	19 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 64.7 kN, RH Support 45.1 kN	< 169.03 kN	OK
Check @ 1.923 m (Max. Moment)	M = 104.8 kN.m, Fv = 6.21 kN		
Shear Connection	No of shear connectors from nearest support 6 < 10	Partial	
Axial Resistance (kN)	Rc 870.9 kN, Rs 1052.15 kN, Rq 523.2 kN	523.2 kN	
Degree of Shear Connection	Na/Np = 6 / 10 > 0.4	0.601	OK
Reduced Concrete Area	Area required to resist 523.2 kN	47.5x612.5mm²	
Moment Capacity	Plastic neutral axis in top flange @ 136.1 mm	135.86 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(tp.pyp)	1.0, 350(Continuous)	350.00 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 350	567.94 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.54/(0.54+0.08)	251.04 kN	OK

† The Engineer must ensure that the deck contribution Vp for a continuous profile can be achieved for this edge beam

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 152 mm	6.58 per m	
Vp = fn(N.4.D.tp.pyp)	Min(6.58x4x19,1000)x1.0x350	175.00 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	755, 460, 114000, 40, 175	554.91 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	6.58x87.2x0.95/(0.95+0.1)	516.84 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 40.56 kN, RH Support 37.41 kN	< 448.69 kN	OK
Check @ 2.966 m (Max. Moment)	M = 86.61 kN.m, Fv = 0.08 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

Serviceability Limit State

Support Reactions (kN)	
Live Loads	LH Support 40.23 kN, RH Support 37.63 kN
Super Imposed Dead Load	LH Support 30.61 kN, RH Support 30.22 kN
Dead Load (Self Weight)	LH Support 25.14 kN, RH Support 23.14 kN

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Maximum Deflection			
Live Loads (Full Connection)	8.37 (8.37) mm @ 3.726 m < L / 360 = 21.1 mm	8.37 mm	OK
Super Imposed Dead Loads	5.96 mm @ 3.803 m	5.96 mm	
Dead Loads (Self Weight)	16.02 mm @ 3.726 m	16.02 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 58.6, Super Dead 40.3, SW 63.1 < 265	161.95 N/mm²	OK
TOTAL (Compression)	Live 7.1, Super Dead 4.9, SW 63.1 < 265	75.07 N/mm²	OK
Maximum Concrete Stress	Live 4.55, Super Dead 3.13, SW 0 < 20	7.68 N/mm²	OK

Vibration Analysis

Beam Deflection		12 mm	
Natural Frequency	18/√(12.00/1.1) = 5.45 > 4 Hz	5.45 Hz	OK

UNPROPPED COMPOSITE SECONDARY EDGE BEAM
Members 392 and 405 (A4-A2) @ Level 2

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	6.008 m Span and 1.072 m to LH Beam
Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 13.79, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 612 mm², b1= 536 mm and b2= 76 mm
Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³
Composite Section Elastic Properties	ye 127.8 mm, Ix 7177 cm⁴, Zs.t 33608 cm³, Zs.b 460 cm³, Zc.t 7929 cm³
Headed Stud Connector	19 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 64.71 kN, RH Support 45.09 kN	< 169.03 kN	OK
Check @ 1.923 m (Max. Moment)	M = 104.74 kN.m, Fv = 6.19 kN		
Shear Connection	No of shear connectors from nearest support 6 < 10	Partial	
Axial Resistance (kN)	Rc 870.9 kN, Rs 1052.15 kN, Rq 523.2 kN	523.2 kN	
Degree of Shear Connection	Na/Np = 6 / 10 > 0.4	0.601	OK
Reduced Concrete Area	Area required to resist 523.2 kN	47.5x612.5mm²	
Moment Capacity	Plastic neutral axis in top flange @ 136.1 mm	135.86 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(tp.pyp)	1.0, 350(Continuous)	350.00 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 350	567.94 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.54/(0.54+0.08)	251.04 kN	OK

† The Engineer must ensure that the deck contribution Vp for a continuous profile can be achieved for this edge beam

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 13.62 kN, RH Support 6.9 kN	< 169.03 kN	OK
Check @ 1.923 m (Max. Moment)	M = 24.69 kN.m, Fv = 5.18 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

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Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 14.21 kN, RH Support 6.49 kN		
Super Imposed Dead Load	LH Support 21.61 kN, RH Support 20.48 kN		
Dead Load (Self Weight)	LH Support 8.37 kN, RH Support 4.31 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	5.25 (6.22) mm @ 2.704 m < L / 360 = 16.6 mm	6.22 mm	OK
Super Imposed Dead Loads	8.25 (9.78) mm @ 3.004 m	9.78 mm	
Dead Loads (Self Weight)	12.73 mm @ 2.764 m	12.73 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 57.6, Super Dead 70.1, SW 68.1 < 275	195.82 N/mm²	OK
TOTAL (Compression)	Live 0.8, Super Dead 1, SW 68.1 < 275	69.84 N/mm²	OK
Maximum Concrete Stress	Live 3.34, Super Dead 4.07, SW 0 < 20	7.41 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	13.51 mm	
Natural Frequency	18/√(13.51/1.1) = 5.14 > 4 Hz	5.14 Hz	OK

UNPROPPED COMPOSITE SECONDARY EDGE BEAM
Members 409 and 412 (B12-B9) @ Level 2

Summary of Design Data (Integrated Design)

Steel Section (86 kg/m)	203x203 UC 86 [S 275]
Floor Area Supported	7.605 m Span and 2.285 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+503 mm²/m
Headed Stud Connector	19x95 mm Placed One per Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1055 mm², b1= 951 mm and b2= 105 mm
Steel Section Elastic Properties	ye 111.1 mm, A 109.6 cm², Ix 9452 cm⁴, Zt 851 cm³, Zb 851 cm³
Composite Section Elastic Properties	ye 154 mm, Ix 29131 cm⁴, Zs.t 12127 cm³, Zs.b 1470 cm³, Zc.t 18913 cm³
Headed Stud Connector	50 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 142.44 kN, RH Support 134.98 kN	< 448.69 kN	OK
Check @ 3.27 m (Max. Moment)	M = 294.47 kN.m, Fv = 0.87 kN		
Shear Connection	No of shear connectors from nearest support 21 > 17.2	Full	
Axial Resistance (kN)	Rc 1500.46 kN, Rs 2905.2 kN, Rq 1831.2 kN	1500.46 kN	
Moment Capacity	Plastic neutral axis in top flange @ 142.5 mm	447.34 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 152 mm	6.58 per m	
Vp = fn(N.4.D.tp.pyp)	Min(6.58x4x19,1000)x1.0x350	175.00 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	755, 460, 114000, 40, 175	554.91 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	6.58x87.2x0.95/(0.95+0.1)	516.84 kN	OK

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Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 40.57 kN, RH Support 37.41 kN	< 448.69 kN	OK
Check @ 2.966 m (Max. Moment)	M = 86.61 kN.m, Fv = 0.08 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 40.23 kN, RH Support 37.63 kN		
Super Imposed Dead Load	LH Support 30.61 kN, RH Support 30.22 kN		
Dead Load (Self Weight)	LH Support 25.15 kN, RH Support 23.14 kN		
Maximum Deflection			
Live Loads (Full Connection)	8.37 (8.37) mm @ 3.726 m < L / 360 = 21.1 mm	8.37 mm	OK
Super Imposed Dead Loads	5.96 mm @ 3.803 m	5.96 mm	
Dead Loads (Self Weight)	16.02 mm @ 3.726 m	16.02 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 58.6, Super Dead 40.3, SW 63.1 < 265	161.95 N/mm²	OK
TOTAL (Compression)	Live 7.1, Super Dead 4.9, SW 63.1 < 265	75.07 N/mm²	OK
Maximum Concrete Stress	Live 4.55, Super Dead 3.13, SW 0 < 20	7.68 N/mm²	OK

Vibration Analysis

Beam Deflection		12 mm	
Natural Frequency	18/√(12.00/1.1) = 5.45 > 4 Hz	5.45 Hz	OK

UNPROPPED COMPOSITE SECONDARY EDGE BEAM
Members 425 and 463 (A4-A2) @ Level 3

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	6.008 m Span and 1.072 m to LH Beam
Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 13.79, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 612 mm², b1= 536 mm and b2= 76 mm
Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³
Composite Section Elastic Properties	ye 127.8 mm, Ix 7177 cm⁴, Zs.t 33608 cm³, Zs.b 460 cm³, Zc.t 7929 cm³
Headed Stud Connector	19 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 64.71 kN, RH Support 45.09 kN	< 169.03 kN	OK
Check @ 1.923 m (Max. Moment)	M = 104.74 kN.m, Fv = 6.19 kN		
Shear Connection	No of shear connectors from nearest support 6 < 10	Partial	
Axial Resistance (kN)	Rc 870.9 kN, Rs 1052.15 kN, Rq 523.2 kN	523.2 kN	
Degree of Shear Connection	Na/Np = 6 / 10 > 0.4	0.601	OK
Reduced Concrete Area	Area required to resist 523.2 kN	47.5x612.5mm²	
Moment Capacity	Plastic neutral axis in top flange @ 136.1 mm	135.86 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(tp.pyp)	1.0, 350(Continuous)	350.00 kN	

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Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 350	567.94 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.54/(0.54+0.08)	251.04 kN	OK

† The Engineer must ensure that the deck contribution Vp for a continuous profile can be achieved for this edge beam

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 13.62 kN, RH Support 6.9 kN	< 169.03 kN	OK
Check @ 1.923 m (Max. Moment)	M = 24.69 kN.m, Fv = 5.18 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 14.21 kN, RH Support 6.49 kN		
Super Imposed Dead Load	LH Support 21.61 kN, RH Support 20.48 kN		
Dead Load (Self Weight)	LH Support 8.37 kN, RH Support 4.31 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	5.25 (6.22) mm @ 2.704 m < L / 360 = 16.6 mm	6.22 mm	OK
Super Imposed Dead Loads	8.25 (9.78) mm @ 3.004 m	9.78 mm	
Dead Loads (Self Weight)	12.73 mm @ 2.764 m	12.73 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 57.6, Super Dead 70.1, SW 68.1 < 275	195.82 N/mm²	OK
TOTAL (Compression)	Live 0.8, Super Dead 1, SW 68.1 < 275	69.84 N/mm²	OK
Maximum Concrete Stress	Live 3.34, Super Dead 4.07, SW 0 < 20	7.41 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	13.51 mm	
Natural Frequency	18/√(13.51/1.1) = 5.14 > 4 Hz	5.14 Hz	OK

UNPROPPED COMPOSITE PRIMARY INTERNAL BEAM
Members 433, 436, 439 and 441 (H5-H2) @ Level 1

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 13.61 kN, RH Support 6.91 kN	< 169.03 kN	OK
Check @ 1.923 m (Max. Moment)	M = 24.7 kN.m, Fv = 5.19 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 14.21 kN, RH Support 6.49 kN		
Super Imposed Dead Load	LH Support 21.61 kN, RH Support 20.48 kN		
Dead Load (Self Weight)	LH Support 8.37 kN, RH Support 4.31 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	5.25 (6.23) mm @ 2.704 m < L / 360 = 16.6 mm	6.23 mm	OK
Super Imposed Dead Loads	8.25 (9.78) mm @ 3.004 m	9.78 mm	
Dead Loads (Self Weight)	12.74 mm @ 2.764 m	12.74 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 57.7, Super Dead 70.1, SW 68.1 < 275	195.89 N/mm²	OK
TOTAL (Compression)	Live 0.8, Super Dead 1, SW 68.1 < 275	69.87 N/mm²	OK
Maximum Concrete Stress	Live 3.34, Super Dead 4.07, SW 0 < 20	7.41 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	13.51 mm	
Natural Frequency	18/√(13.51/1.1) = 5.14 > 4 Hz	5.14 Hz	OK

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UNPROPPED COMPOSITE SECONDARY EDGE BEAM
Members 387-388 (B12-B9) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (86 kg/m)	203x203 UC 86 [S 275]
Floor Area Supported	7.605 m Span and 2.285 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+503 mm²/m
Headed Stud Connector	19x95 mm Placed One per Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

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Summary of Design Data (Integrated Design)

Steel Section (86 kg/m)	203x203 UC 86 [S 275]
Floor Area Supported	7.017 m Span, 1.013 m to LH Beam and 6.85 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+785 mm²/m
Headed Stud Connector	19x95 mm Placed @ 150 mm centre
Transverse Beams	@ 2.005, 2.339 and 4.678 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	122 x 1282 mm², b1= 405 mm and b2= 877 mm
Steel Section Elastic Properties	ye 111.1 mm, A 109.6 cm², Ix 9452 cm4, Zt 851 cm³, Zb 851 cm³
Composite Section Elastic Properties	ye 135.2 mm, Ix 32300 cm4, Zs.t 61999 cm³, Zs.b 1489 cm³, Zc.t 23889 cm³
Headed Stud Connector	46 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)

Ultimate Limit State (Final Stage)

Maximum Shear Support Reactions (kN)	LH Support 196.56 kN, RH Support 185.92 kN	< 448.69 kN	OK
Check @ 2.666 m (Max. Moment)	M = 434.07 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 17 < 32.		
		Partial	
Axial Resistance (kN)	Rc 2814.77 kN, Rs 2905.2 kN, Rq 1482.4 kN	1482.4 kN	
Degree of Shear Connection	Na/Np = 17 / 32.3 > 0.4	0.527	OK
Reduced Concrete Area	Area required to resist 1482.4 kN	64.2x1282.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 142.6 mm	456.43 kN.m	OK
Check @ 2.005 m	M = 391.79 kN.m, Fv = 194.14 kN		
Shear Connection	No of shear connectors from nearest support 13 < 32.		
		Partial	
Axial Resistance (kN)	Rc 2814.77 kN, Rs 2905.2 kN, Rq 1133.6 kN	1133.6 kN	
Reduced Concrete Area	Area required to resist 1133.6 kN	49.1x1282.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 145.8 mm	425.9 kN.m	OK
Check @ 2.339 m	M = 434.01 kN.m, Fv = 126.82 kN		
Shear Connection	No of shear connectors from nearest support 15 < 32.		
		Partial	
Axial Resistance (kN)	Rc 2814.77 kN, Rs 2905.2 kN, Rq 1308 kN	1308 kN	
Reduced Concrete Area	Area required to resist 1308 kN	56.7x1282.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 144.2 mm	441.96 kN.m	OK
Check @ 4.678 m	M = 431.64 kN.m, Fv = 183.1 kN		
Shear Connection	No of shear connectors from nearest support 15 < 32.		
		Partial	
Axial Resistance (kN)	Rc 2814.77 kN, Rs 2905.2 kN, Rq 1308 kN	1308 kN	
Reduced Concrete Area	Area required to resist 1308 kN	56.7x1282.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 144.2 mm	441.96 kN.m	OK

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Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 150 mm	6.67 per m	
Vr = fn(Asv,fy,Acv,fcu)	1037, 460, 79000, 40	399.71 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	6.67x87.2x0.88/(0.41+0.88)	397.64 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear Support Reactions (kN)	LH Support 69.91 kN, RH Support 66.53 kN	< 448.69 kN	OK
Check @ 3.368 m (Max. Moment)	M = 153.35 kN.m, Fv = 0.01 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 2.005 m	M = 137.77 kN.m, Fv = 67.49 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 2.339 m	M = 152.72 kN.m, Fv = 44.81 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 m	258.83 kN.m	OK
Check @ 4.678 m	M = 152.31 kN.m, Fv = 63.71 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.005 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 137.774, 0.6	82.664 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.005 m, 5.34 cm, 1, 0.85, 0.879	258.826 kN.m	OK
Check between 2.005 and 2.339 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	137.774, 152.721, 0.961	146.742 kN.m	
Mb=fn(L,ry,β_w,u,v)	0.334 m, 5.34 cm, 1, 0.85, 0.995	258.826 kN.m	OK
Check between 2.339 and 4.678 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	152.721, 152.308, 0.999	152.556 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.339 m, 5.34 cm, 1, 0.85, 0.85	258.826 kN.m	OK
Check between 4.678 and 7.017 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	152.308, 0, 0.6	91.385 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.339 m, 5.34 cm, 1, 0.85, 0.85	258.826 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 75.75 kN, RH Support 71.41 kN		
Super Imposed Dead Load	LH Support 11.11 kN, RH Support 10.47 kN		
Dead Load (Self Weight)	LH Support 42.72 kN, RH Support 40.72 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	13.37 (16.15) mm @ 3.508 m < L / 360 = 19.4 mm	16.15 mm	OK
Super Imposed Dead Loads	1.96 (2.37) mm @ 3.508 m	2.37 mm	
Dead Loads (Self Weight)	25.45 mm @ 3.508 m	25.45 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 113, Super Dead 16.6, SW 110 < 265	239.54 N/mm²	OK
TOTAL (Compression)	Live 2.7, Super Dead 0.4, SW 110 < 265	113.09 N/mm²	OK
Maximum Concrete Stress	Live 7.04, Super Dead 1.03, SW 0 < 20	8.07 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	11.43 mm	
Natural Frequency	18/√(11.43/1.1) = 5.58 > 4 Hz	5.58 Hz	OK

UNPROPPED NON-COMPOSITE SECONDARY INTERNAL BEAM
Members 435 and 438 (N.123-N.131) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	3.593 m Span, 1.986 m to LH Beam and .841 m to RH Beam

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Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick		
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m		
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame		

Section Properties

Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³		

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 41.57 kN, RH Support 43.67 kN	< 218.38 kN	OK
Check @ 1.797 m (Max. Moment)	M = 37.2 kN.m, Fv = 0.52 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 14.36 kN, RH Support 15.06 kN	< 218.38 kN	OK
Check @ 1.797 m (Max. Moment)	M = 12.85 kN.m, Fv = 0.17 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 16.28 kN, RH Support 17.11 kN		
Super Imposed Dead Load	LH Support 2.39 kN, RH Support 2.51 kN		
Dead Load (Self Weight)	LH Support 8.71 kN, RH Support 9.13 kN		
Maximum Deflection			
Live Loads	3.31 (3.31) mm @ 1.797 m < L / 360 = 9.9 mm	3.31 mm	OK
Super Imposed Dead Loads	0.49 mm @ 1.797 m	0.49 mm	
Dead Loads (Self Weight)	1.77 mm @ 1.797 m	1.77 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 52, Super Dead 7.6, SW 27.8 < 275	87.44 N/mm²	OK
TOTAL (Compression)	Live 52, Super Dead 7.6, SW 27.8 < 275	87.44 N/mm²	OK

Vibration Analysis

Beam Deflection		2.59 mm	
Natural Frequency	18/√(2.59) = 11.18 > 4 Hz	11.18 Hz	OK

UNPROPPED COMPOSITE PRIMARY INTERNAL BEAM
Members 447 and 449 (N.138-J1) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	4.277 m Span, 1.1 m to LH Beam and 5.109 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+393 mm²/m
Headed Stud Connector	19x95 mm Placed @ 300 mm centre
Transverse Beam	@ 2.139 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	122 x 975 mm², b1= 440 mm and b2= 535 mm
Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³
Composite Section Elastic Properties	ye 102.9 mm, Ix 12966 cm⁴, Zs.t 4780 cm³, Zs.b 553 cm³, Zc.t 12576 cm³
Headed Stud Connector	14 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)

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Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 61.75 kN, RH Support 61.77 kN	< 218.38 kN	OK
Check @ 2.139 m (Max. Moment)	M = 110.29 kN.m, Fv = 41.39 kN		
Shear Connection	No of shear connectors from nearest support 7 < 12.1	Partial	
Axial Resistance (kN)	Rc 2139.35 kN, Rs 1050.78 kN, Rq 610.4 kN	610.4 kN	
Degree of Shear Connection	Na/Np = 7 / 12.1 > 0.4	0.581	OK
Reduced Concrete Area	Area required to resist 610.4 kN	34.8x974.6mm²	
Moment Capacity	Plastic neutral axis in top flange @ 135.8 mm	174.74 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 300 mm	3.33 per m	
Vr = fn(Asv,fy,Acv,fcu)	645, 460, 79000, 40	302.49 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.33x87.2x0.53/(0.44+0.53)	159.44 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	15.05 kN each side	< 218.38 kN	OK
Check @ 2.139 m (Max. Moment)	M = 31.23 kN.m, Fv = 14.15 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.139 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 31.232, 0.6	18.739 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.139 m, 3.18 cm, 1, 0.882, 0.905	71.928 kN.m	OK
Check between 2.139 and 4.277 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	31.232, 0, 0.6	18.739 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.138 m, 3.18 cm, 1, 0.882, 0.905	71.944 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	16.29 kN each side		
Super Imposed Dead Load	16.29 kN each side		
Dead Load (Self Weight)	9.2 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	2.00 (2.87) mm @ 2.139 m < L / 360 = 11.8 mm	2.87 mm	OK
Super Imposed Dead Loads	1.36 (1.95) mm @ 2.139 m	1.95 mm	
Dead Loads (Self Weight)	4.92 mm @ 2.139 m	4.92 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 62.9, Super Dead 36.1, SW 67.8 < 275	166.82 N/mm²	OK
TOTAL (Compression)	Live 7.3, Super Dead 4.2, SW 67.8 < 275	79.25 N/mm²	OK
Maximum Concrete Stress	Live 2.77, Super Dead 1.59, SW 0 < 20	4.36 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	3.34 mm	
Natural Frequency	18/√(3.34/1.1) = 10.33 > 4 Hz	10.33 Hz	OK

UNPROPPED COMPOSITE PRIMARY INTERNAL BEAM
Members 448, 450-451 and 453 (M5-M2) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (132 kg/m)	254x254 UC 132 [S 275]
Floor Area Supported	6.926 m Span, 6.848 m to LH Beam and 5.085 m to RH Beam
Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 13.79, Gr 40 with 252+393 mm²/m
Headed Stud Connector	19x95 mm Placed @ 150 mm centre
Transverse Beams	@ 0.5, 2.642 and 4.783 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

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Section Properties

Concrete Effective Area	122 x 1732 mm², b1= 866 mm and b2= 866 mm
Steel Section Elastic Properties	ye 138.2 mm, A 168.1 cm², Ix 22536 cm⁴, Zt 1631 cm³, Zb 1631 cm³
Composite Section Elastic Properties	ye 169.4 mm, Ix 58830 cm⁴, Zs.t 14931 cm³, Zs.b 2483 cm³, Zc.t 47890 cm³
Headed Stud Connector	46 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 283.73 kN, RH Support 234.59 kN	< 672.16 kN	OK
Check @ 2.701 m (Max. Moment)	M = 548.56 kN.m, Fv = 22.2 kN		
Shear Connection	No of shear connectors from nearest support 18 < 43.6	Partial	
Axial Resistance (kN)	Rc 3800.73 kN, Rs 4455.45 kN, Rq 1569.6 kN	1569.6 kN	
Degree of Shear Connection	Na/Np = 18 / 43.6 > 0.4	0.413	OK
Reduced Concrete Area	Area required to resist 1569.6 kN	50.4x1731.5mm²	
Moment Capacity	Plastic neutral axis in top flange @ 150.6 mm	745.68 kN.m	OK
Check @ 0.5 m	M = 141.81 kN.m, Fv = 282.8 kN		
Shear Connection	No of shear connectors from nearest support 3 < 43.6	Partial	
Axial Resistance (kN)	Rc 3800.73 kN, Rs 4455.45 kN, Rq 261.6 kN	261.6 kN	
Reduced Concrete Area	Area required to resist 261.6 kN	8.4x1731.5mm²	
Moment Capacity	Plastic neutral axis in web @ 235.9 mm	556.19 kN.m	OK
Check @ 2.642 m	M = 549.84 kN.m, Fv = 188.59 kN		
Shear Connection	No of shear connectors from nearest support 17 < 43.6	Partial	
Axial Resistance (kN)	Rc 3800.73 kN, Rs 4455.45 kN, Rq 1482.4 kN	1482.4 kN	
Reduced Concrete Area	Area required to resist 1482.4 kN	47.6x1731.5mm²	
Moment Capacity	Plastic neutral axis in top flange @ 151.2 mm	736.79 kN.m	OK
Check @ 4.783 m	M = 498.35 kN.m, Fv = 230.63 kN		
Shear Connection	No of shear connectors from nearest support 15 < 43.6	Partial	
Axial Resistance (kN)	Rc 3800.73 kN, Rs 4455.45 kN, Rq 1308 kN	1308 kN	
Reduced Concrete Area	Area required to resist 1308 kN	42x1731.5mm²	
Moment Capacity	Plastic neutral axis in top flange @ 152.5 mm	718.12 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 150 mm	6.67 per m	
Vr = fn(Asv,fy,Acv,fcu)	645, 460, 79000, 40	302.49 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	6.67x87.2x0.87/(0.87+0.87)	290.67 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 101.48 kN, RH Support 84.81 kN	< 672.16 kN	OK
Check @ 2.701 m (Max. Moment)	M = 195.32 kN.m, Fv = 6.66 kN		
Moment Capacity	Plastic neutral axis in web @ 138.2 mm	495.39 kN.m	OK
Check @ 0.5 m	M = 50.56 kN.m, Fv = 100.56 kN		
Moment Capacity	Plastic neutral axis in web @ 138.2 mm	495.39 kN.m	OK
Check @ 2.642 m	M = 195.71 kN.m, Fv = 65.8 kN		
Moment Capacity	Plastic neutral axis in web @ 138.2 mm	495.39 kN.m	OK
Check @ 4.783 m	M = 177.47 kN.m, Fv = 80.85 kN		
Moment Capacity	Plastic neutral axis in web @ 138.2 mm	495.39 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 0.5 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 50.563, 0.6	30.338 kN.m	
Mb=fn(L,ry,β_w,u,v)	0.5 m, 6.7 cm, 1, 0.851, 0.994	495.391 kN.m	OK
Check between 0.5 and 2.642 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	50.563, 195.707, 0.703	137.649 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.142 m, 6.7 cm, 1, 0.851, 0.907	495.391 kN.m	OK
Check between 2.642 and 4.783 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	195.707, 177.469, 0.963	188.412 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.141 m, 6.7 cm, 1, 0.851, 0.907	495.391 kN.m	OK

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Check between 4.783 and 6.926 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	177.469, 0, 0.6	106.481 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.143 m, 6.7 cm, 1, 0.851, 0.907	495.391 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 109 kN, RH Support 89.58 kN		
Super Imposed Dead Load	LH Support 15.99 kN, RH Support 13.14 kN		
Dead Load (Self Weight)	LH Support 62.11 kN, RH Support 52.05 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	8.55 (10.50) mm @ 3.463 m < L / 360 = 19.2 mm	10.50 mm	OK
Super Imposed Dead Loads	1.25 (1.54) mm @ 3.463 m	1.54 mm	
Dead Loads (Self Weight)	12.67 mm @ 3.463 m	12.67 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 85.1, Super Dead 12.5, SW 73.2 < 265	170.75 N/mm²	OK
TOTAL (Compression)	Live 14.2, Super Dead 2.1, SW 73.2 < 265	89.42 N/mm²	OK
Maximum Concrete Stress	Live 4.41, Super Dead 0.65, SW 0 < 20	5.06 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	7.44 mm	
Natural Frequency	18/√(7.44/1.1) = 6.92 > 4 Hz	6.92 Hz	OK

UNPROPPED COMPOSITE PRIMARY INTERNAL BEAM
Members 515, 518 and 521 (N3-N2) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (73 kg/m)	254x254 UC 73 [S 275]
Floor Area Supported	6.425 m Span, 5.096 m to LH Beam and 4.644 m to RH Beam
Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 13.79, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed @ 250 mm centre
Transverse Beams	@ 2.141 and 4.284 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	122 x 1606 mm², b1= 803 mm and b2= 803 mm
Steel Section Elastic Properties	ye 127.1 mm, A 93.1 cm², Ix 11414 cm⁴, Zt 898 cm³, Zb 898 cm³
Composite Section Elastic Properties	ye 138.6 mm, Ix 34796 cm⁴, Zs.t 40433 cm³, Zs.b 1417 cm³, Zc.t 34619 cm³
Headed Stud Connector	25 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 162.54 kN, RH Support 162.6 kN	< 360.57 kN	OK
Check @ 3.277 m (Max. Moment)	M = 346.34 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 12 < 29.4	Partial	
Axial Resistance (kN)	Rc 3525.8 kN, Rs 2560.25 kN, Rq 1046.4 kN	1046.4 kN	
Degree of Shear Connection	Na/Np = 12 / 29.4 > 0.4	0.409	OK
Reduced Concrete Area	Area required to resist 1046.4 kN	36.2x1606.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 140.5 mm	429.77 kN.m	OK
Check @ 2.141 m	M = 345.68 kN.m, Fv = 160.35 kN		
Shear Connection	No of shear connectors from nearest support 8 < 29.4	Partial	
Axial Resistance (kN)	Rc 3525.8 kN, Rs 2560.25 kN, Rq 697.6 kN	697.6 kN	
Reduced Concrete Area	Area required to resist 697.6 kN	24.1x1606.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 143 mm	390.83 kN.m	OK

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Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 250 mm	4 per m	
Vr = fn(Asv,fy,Acv,fcu)	252, 460, 79000, 40	175.94 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	4x87.2x0.8/(0.8+0.8)	174.40 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 57.74 kN, RH Support 57.76 kN	< 360.57 kN	OK
Check @ 3.213 m (Max. Moment)	M = 121.88 kN.m, Fv = 0.02 kN		
Moment Capacity	Plastic neutral axis in web @ 127.1 mm	272.83 kN.m	OK
Check @ 2.141 m	M = 121.27 kN.m, Fv = 55.55 kN		
Moment Capacity	Plastic neutral axis in web @ 127.1 mm	272.83 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.141 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 121.272, 0.6	72.763 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.141 m, 6.48 cm, 1, 0.849, 0.959	272.828 kN.m	OK
Check between 2.141 and 4.284 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	121.272, 121.272, 1	121.272 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.143 m, 6.48 cm, 1, 0.849, 0.959	272.828 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 62.68 kN, RH Support 62.7 kN		
Super Imposed Dead Load	9.2 kN each side		
Dead Load (Self Weight)	LH Support 35.27 kN, RH Support 35.28 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	8.27 (11.28) mm @ 3.213 m < L / 360 = 17.8 mm	11.28 mm	OK
Super Imposed Dead Loads	1.21 (1.65) mm @ 3.213 m	1.65 mm	
Dead Loads (Self Weight)	13.94 mm @ 3.213 m	13.94 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 94.7, Super Dead 13.9, SW 82.7 < 275	191.29 N/mm²	OK
TOTAL (Compression)	Live 3.3, Super Dead 0.5, SW 82.7 < 275	86.48 N/mm²	OK
Maximum Concrete Stress	Live 3.88, Super Dead 0.57, SW 0 < 20	4.45 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	7.35 mm	
Natural Frequency	18/√(7.35/1.1) = 6.96 > 4 Hz	6.96 Hz	OK

UNPROPPED COMPOSITE PRIMARY INTERNAL BEAM
Members 454-455 (M2-M1) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (132 kg/m)	254x254 UC 132 [S 275]
Floor Area Supported	4.2 m Span, 5.109 m to LH Beam and 5.129 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+252 mm²/m
Headed Stud Connector	19x95 mm Placed @ 175 mm centre
Transverse Beam	@ 2.101 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	122 x 1050 mm², b1= 525 mm and b2= 525 mm
Steel Section Elastic Properties	ye 138.2 mm, A 168.1 cm², Ix 22536 cm⁴, Zt 1631 cm³, Zb 1631 cm³
Composite Section Elastic Properties	ye 178.6 mm, Ix 55321 cm⁴, Zs.t 11387 cm³, Zs.b 2429 cm³, Zc.t 30978 cm³
Headed Stud Connector	24 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)

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Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 86.15 kN, RH Support 86.18 kN	< 672.16 kN	OK
Check @ 2.1 m (Max. Moment)	M = 176.85 kN.m, Fv = 82.27 kN		
Shear Connection	No of shear connectors from nearest support 12 < 26.4	Partial	
Axial Resistance (kN)	Rc 2304.81 kN, Rs 4455.45 kN, Rq 1046.4 kN	1046.4 kN	
Degree of Shear Connection	Na/Np = 12 / 26.4 > 0.4	0.454	OK
Reduced Concrete Area	Area required to resist 1046.4 kN	55.4x1050mm²	
Moment Capacity	Plastic neutral axis in top flange @ 154.4 mm	676.47 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 175 mm	5.71 per m	
Vr = fn(Asv,fy,Acv,fcu)	504, 460, 79000, 40	257.09 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	5.71x87.2x0.53/(0.53+0.53)	249.14 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	32.02 kN each side	< 672.16 kN	OK
Check @ 2.1 m (Max. Moment)	M = 63.17 kN.m, Fv = 28.14 kN		
Moment Capacity	Plastic neutral axis in web @ 138.2 mm	495.39 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.101 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 63.168, 0.6	37.901 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.101 m, 6.7 cm, 1, 0.851, 0.909	495.391 kN.m	OK
Check between 2.101 and 4.2 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	63.168, 0, 0.6	37.901 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.099 m, 6.7 cm, 1, 0.851, 0.91	495.391 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 32.38 kN, RH Support 32.39 kN		
Super Imposed Dead Load	4.75 kN each side		
Dead Load (Self Weight)	19.79 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	0.88 (1.11) mm @ 2.1 m < L / 360 = 11.6 mm	1.11 mm	OK
Super Imposed Dead Loads	0.13 (0.16) mm @ 2.1 m	0.16 mm	
Dead Loads (Self Weight)	1.25 mm @ 2.1 m	1.25 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 28, Super Dead 4.1, SW 23.7 < 265	55.78 N/mm²	OK
TOTAL (Compression)	Live 6, Super Dead 0.9, SW 23.7 < 265	30.54 N/mm²	OK
Maximum Concrete Stress	Live 2.19, Super Dead 0.32, SW 0 < 20	2.52 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	0.78 mm	
Natural Frequency	18/√(0.78/1.1) = 21.33 > 4 Hz	21.33 Hz	OK

UNPROPPED NON-COMPOSITE PRIMARY INTERNAL BEAM
Members 524 and 527 (N2-N1) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (73 kg/m)	254x254 UC 73 [S 275]
Floor Area Supported	4.2 m Span, 5.128 m to LH Beam and 4.645 m to RH Beam
Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m

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Transverse Beam	@ 2.1 m		
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame		

Section Properties

Steel Section Elastic Properties	ye 127.1 mm, A 93.1 cm^2, Ix 11414 cm^4, Zt 898 cm^3, Zb 898 cm^3		

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 80.46 kN, RH Support 80.48 kN	< 360.57 kN	OK
Check @ 2.1 m (Max. Moment)	M = 166.71 kN.m, Fv = 78.32 kN		
Moment Capacity	Plastic neutral axis in web @ 127.1 mm	272.83 kN.m	OK

Lateral Torsional Buckling (Final Stage)

Check between 0 and 2.1 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 166.722, 0.6	100.033 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.1 m, 6.48 cm, 1, 0.849, 0.961	272.828 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	28.94 kN each side	< 360.57 kN	OK
Check @ 2.1 m (Max. Moment)	M = 58.51 kN.m, Fv = 26.79 kN		
Moment Capacity	Plastic neutral axis in web @ 127.1 mm	272.83 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.1 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 58.515, 0.6	35.109 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.1 m, 6.48 cm, 1, 0.849, 0.961	272.828 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	30.82 kN each side		
Super Imposed Dead Load	4.52 kN each side		
Dead Load (Self Weight)	17.73 kN each side		
Maximum Deflection			
Live Loads	4.06 (4.06) mm @ 2.1 m < L / 360 = 11.6 mm	4.06 mm	OK
Super Imposed Dead Loads	0.60 mm @ 2.1 m	0.60 mm	
Dead Loads (Self Weight)	2.26 mm @ 2.1 m	2.26 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 72, Super Dead 10.6, SW 39.7 < 275	122.26 N/mm^2	OK
TOTAL (Compression)	Live 72, Super Dead 10.6, SW 39.7 < 275	122.26 N/mm^2	OK

Vibration Analysis

Beam Deflection		3.27 mm	
Natural Frequency	18/√(3.27) = 9.96 > 4 Hz	9.96 Hz	OK

UNPROPPED COMPOSITE SECONDARY EDGE BEAM
Members 467 and 473 (B12-B9) @ Level 3

Summary of Design Data (Integrated Design)

Steel Section (86 kg/m)	203x203 UC 86 [S 275]
Floor Area Supported	7.605 m Span and 2.285 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m^3, Mod. Ratio 10, Gr 40 with 252+503 mm^2/m
Headed Stud Connector	19x95 mm Placed One per Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

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Section Properties

Concrete Effective Area	79 x 1055 mm², b1= 951 mm and b2= 105 mm		
Steel Section Elastic Properties	ye 111.1 mm, A 109.6 cm², Ix 9452 cm⁴, Zt 851 cm³, Zb 851 cm³		
Composite Section Elastic Properties	ye 154 mm, Ix 29131 cm⁴, Zs.t 12127 cm³, Zs.b 1470 cm³, Zc.t 18913 cm³		
Headed Stud Connector	50 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2		

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 142.45 kN, RH Support 134.98 kN	< 448.69 kN	OK
Check @ 3.27 m (Max. Moment)	M = 294.47 kN.m, Fv = 0.87 kN		
Shear Connection	No of shear connectors from nearest support 21 > 17.2	Full	
Axial Resistance (kN)	Rc 1500.46 kN, Rs 2905.2 kN, Rq 1831.2 kN	1500.46 kN	
Moment Capacity	Plastic neutral axis in top flange @ 142.5 mm	447.34 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 152 mm	6.58 per m	
Vp = fn(N.4.D.tp.pyp)	Min(6.58x4x19,1000)x1.0x350	175.00 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	755, 460, 114000, 40, 175	554.91 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	6.58x87.2x0.95/(0.95+0.1)	516.84 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 40.57 kN, RH Support 37.41 kN	< 448.69 kN	OK
Check @ 2.966 m (Max. Moment)	M = 86.61 kN.m, Fv = 0.08 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 40.23 kN, RH Support 37.63 kN		
Super Imposed Dead Load	LH Support 30.61 kN, RH Support 30.22 kN		
Dead Load (Self Weight)	LH Support 25.15 kN, RH Support 23.14 kN		
Maximum Deflection			
Live Loads (Full Connection)	8.37 (8.37) mm @ 3.726 m < L / 360 = 21.1 mm	8.37 mm	OK
Super Imposed Dead Loads	5.96 mm @ 3.803 m	5.96 mm	
Dead Loads (Self Weight)	16.02 mm @ 3.726 m	16.02 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 58.6, Super Dead 40.3, SW 63.1 < 265	161.95 N/mm²	OK
TOTAL (Compression)	Live 7.1, Super Dead 4.9, SW 63.1 < 265	75.07 N/mm²	OK
Maximum Concrete Stress	Live 4.55, Super Dead 3.13, SW 0 < 20	7.68 N/mm²	OK

Vibration Analysis

Beam Deflection		12 mm	
Natural Frequency	18/√(12.00/1.1) = 5.45 > 4 Hz	5.45 Hz	OK

UNPROPPED COMPOSITE SECONDARY EDGE BEAM
Members 470 and 589 (B12-B9) @ Level 4

Summary of Design Data (Integrated Design)

Steel Section (86 kg/m)	203x203 UC 86 [S 275]
Floor Area Supported	7.605 m Span and 2.285 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+503 mm²/m
Headed Stud Connector	19x95 mm Placed One per Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

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Section Properties

Concrete Effective Area	79 x 1055 mm², b1= 951 mm and b2= 105 mm		
Steel Section Elastic Properties	ye 111.1 mm, A 109.6 cm², Ix 9452 cm⁴, Zt 851 cm³, Zb 851 cm³		
Composite Section Elastic Properties	ye 154 mm, Ix 29131 cm⁴, Zs.t 12127 cm³, Zs.b 1470 cm³, Zc.t 18913 cm³		
Headed Stud Connector	50 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2		

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 142.45 kN, RH Support 134.98 kN	< 448.69 kN	OK
Check @ 3.27 m (Max. Moment)	M = 294.48 kN.m, Fv = 0.87 kN		
Shear Connection	No of shear connectors from nearest support 21 > 17.2	Full	
Axial Resistance (kN)	Rc 1500.46 kN, Rs 2905.2 kN, Rq 1831.2 kN	1500.46 kN	
Moment Capacity	Plastic neutral axis in top flange @ 142.5 mm	447.34 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 152 mm	6.58 per m	
Vp = fn(N.4.D.tp.pyp)	Min(6.58x4x19,1000)x1.0x350	175.00 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	755, 460, 114000, 40, 175	554.91 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	6.58x87.2x0.95/(0.95+0.1)	516.84 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 40.57 kN, RH Support 37.41 kN	< 448.69 kN	OK
Check @ 2.966 m (Max. Moment)	M = 86.62 kN.m, Fv = 0.08 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 40.23 kN, RH Support 37.63 kN		
Super Imposed Dead Load	LH Support 30.61 kN, RH Support 30.22 kN		
Dead Load (Self Weight)	LH Support 25.15 kN, RH Support 23.14 kN		
Maximum Deflection			
Live Loads (Full Connection)	8.37 (8.37) mm @ 3.726 m < L / 360 = 21.1 mm	8.37 mm	OK
Super Imposed Dead Loads	5.96 mm @ 3.803 m	5.96 mm	
Dead Loads (Self Weight)	16.02 mm @ 3.726 m	16.02 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 58.6, Super Dead 40.3, SW 63.1 < 265	161.96 N/mm²	OK
TOTAL (Compression)	Live 7.1, Super Dead 4.9, SW 63.1 < 265	75.08 N/mm²	OK
Maximum Concrete Stress	Live 4.55, Super Dead 3.13, SW 0 < 20	7.68 N/mm²	OK

Vibration Analysis

Beam Deflection		12 mm	
Natural Frequency	18/√(12.00/1.1) = 5.45 > 4 Hz	5.45 Hz	OK

UNPROPPED COMPOSITE PRIMARY INTERNAL BEAM
Members 492, 496, 500 and 503 (H5-H2) @ Level 2

Summary of Design Data (Integrated Design)

Steel Section (167 kg/m)	254x254 UC 167 [S 275]
Floor Area Supported	7.017 m Span, 1.013 m to LH Beam and 6.85 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+785 mm²/m
Headed Stud Connector	19x95 mm Placed @ 150 mm centre
Transverse Beams	@ 2.005, 2.339 and 4.678 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

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Section Properties

Concrete Effective Area	122 x 1282 mm², b1= 405 mm and b2= 877 mm		
Steel Section Elastic Properties	ye 144.6 mm, A 212.9 cm², Ix 30005 cm⁴, Zt 2076 cm³, Zb 2076 cm³		
Composite Section Elastic Properties	ye 184.1 mm, Ix 73063 cm⁴, Zs.t 13506 cm³, Zs.b 3109 cm³, Zc.t 39688 cm³		
Headed Stud Connector	46 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)		

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 200.52 kN, RH Support 189.91 kN	< 882.56 kN	OK
Check @ 3.087 m (Max. Moment)	M = 440.81 kN.m, Fv = 0.05 kN		
Shear Connection	No of shear connectors from nearest support 20 < 32.3	Partial	
Axial Resistance (kN)	Rc 2814.77 kN, Rs 5640.53 kN, Rq 1744 kN	1744 kN	
Degree of Shear Connection	Na/Np = 20 / 32.3 > 0.4	0.62	OK
Reduced Concrete Area	Area required to resist 1744 kN	75.6x1282.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 157.5 mm	917.89 kN.m	OK
Check @ 2.005 m	M = 397.45 kN.m, Fv = 195.83 kN		
Shear Connection	No of shear connectors from nearest support 13 < 32.3	Partial	
Axial Resistance (kN)	Rc 2814.77 kN, Rs 5640.53 kN, Rq 1133.6 kN	1133.6 kN	
Reduced Concrete Area	Area required to resist 1133.6 kN	49.1x1282.3mm²	
Moment Capacity	Plastic neutral axis in web @ 163.2 mm	858.49 kN.m	OK
Check @ 2.339 m	M = 440.2 kN.m, Fv = 128.15 kN		
Shear Connection	No of shear connectors from nearest support 15 < 32.3	Partial	
Axial Resistance (kN)	Rc 2814.77 kN, Rs 5640.53 kN, Rq 1308 kN	1308 kN	
Reduced Concrete Area	Area required to resist 1308 kN	56.7x1282.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 160.6 mm	877.38 kN.m	OK
Check @ 4.678 m	M = 437.78 kN.m, Fv = 184.45 kN		
Shear Connection	No of shear connectors from nearest support 15 < 32.3	Partial	
Axial Resistance (kN)	Rc 2814.77 kN, Rs 5640.53 kN, Rq 1308 kN	1308 kN	
Reduced Concrete Area	Area required to resist 1308 kN	56.7x1282.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 160.6 mm	877.38 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 150 mm	6.67 per m	
Vr = fn(Asv,fy,Acv,fcu)	1037, 460, 79000, 40	399.71 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	6.67x87.2x0.88/(0.41+0.88)	397.64 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 73.88 kN, RH Support 70.51 kN	< 882.56 kN	OK
Check @ 3.438 m (Max. Moment)	M = 160.33 kN.m, Fv = 0.02 kN		
Moment Capacity	Plastic neutral axis in web @ 144.6 mm	642.28 kN.m	OK
Check @ 2.005 m	M = 143.46 kN.m, Fv = 69.19 kN		
Moment Capacity	Plastic neutral axis in web @ 144.6 mm	642.28 kN.m	OK
Check @ 2.339 m	M = 158.94 kN.m, Fv = 46.13 kN		
Moment Capacity	Plastic neutral axis in web @ 144.6 mm	642.28 kN.m	OK
Check @ 4.678 m	M = 158.51 kN.m, Fv = 65.04 kN		
Moment Capacity	Plastic neutral axis in web @ 144.6 mm	642.28 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.005 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 143.464, 0.6	86.078 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.005 m, 6.81 cm, 1, 0.852, 0.889	642.281 kN.m	OK
Check between 2.005 and 2.339 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	143.464, 158.935, 0.961	152.747 kN.m	
Mb=fn(L,ry,β_w,u,v)	0.334 m, 6.81 cm, 1, 0.852, 0.996	642.281 kN.m	OK

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Check between 2.339 and 4.678 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	158.935, 158.512, 0.999	158.766 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.339 m, 6.81 cm, 1, 0.852, 0.861	642.281 kN.m	OK
Check between 4.678 and 7.017 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	158.512, 0, 0.6	95.107 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.339 m, 6.81 cm, 1, 0.852, 0.861	642.281 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 75.74 kN, RH Support 71.42 kN		
Super Imposed Dead Load	LH Support 11.11 kN, RH Support 10.48 kN		
Dead Load (Self Weight)	LH Support 45.56 kN, RH Support 43.56 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	5.91 (6.64) mm @ 3.508 m < L / 360 = 19.4 mm	6.64 mm	OK
Super Imposed Dead Loads	0.87 (0.97) mm @ 3.508 m	0.97 mm	
Dead Loads (Self Weight)	8.43 mm @ 3.508 m	8.43 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 54.1, Super Dead 7.9, SW 47.5 < 265	109.51 N/mm²	OK
TOTAL (Compression)	Live 12.5, Super Dead 1.8, SW 47.5 < 265	61.76 N/mm²	OK
Maximum Concrete Stress	Live 4.24, Super Dead 0.62, SW 0 < 20	4.86 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	5.1 mm	
Natural Frequency	18/√(5.10/1.1) = 8.36 > 4 Hz	8.36 Hz	OK

UNPROPPED NON-COMPOSITE SECONDARY INTERNAL BEAM
Members 494 and 499 (N.193-N.203) @ Level 2

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	3.593 m Span, 1.986 m to LH Beam and .841 m to RH Beam
Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties: ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 41.57 kN, RH Support 43.67 kN	< 218.38 kN	OK
Check @ 1.797 m (Max. Moment)	M = 37.2 kN.m, Fv = 0.52 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 14.36 kN, RH Support 15.06 kN	< 218.38 kN	OK
Check @ 1.797 m (Max. Moment)	M = 12.85 kN.m, Fv = 0.17 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)	
Live Loads	LH Support 16.28 kN, RH Support 17.11 kN
Super Imposed Dead Load	LH Support 2.39 kN, RH Support 2.51 kN
Dead Load (Self Weight)	LH Support 8.71 kN, RH Support 9.13 kN

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Maximum Deflection			
Live Loads	3.31 (3.31) mm @ 1.797 m < L / 360 = 9.9 mm	3.31 mm	OK
Super Imposed Dead Loads	0.49 mm @ 1.797 m	0.49 mm	
Dead Loads (Self Weight)	1.77 mm @ 1.797 m	1.77 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 52, Super Dead 7.6, SW 27.8 < 275	87.44 N/mm²	OK
TOTAL (Compression)	Live 52, Super Dead 7.6, SW 27.8 < 275	87.44 N/mm²	OK

Vibration Analysis

Beam Deflection		2.59 mm	
Natural Frequency	18/√(2.59) = 11.18 > 4 Hz	11.18 Hz	OK

UNPROPPED COMPOSITE PRIMARY EDGE BEAM
Members 508 and 511 (N.211-J1) @ Level 2

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	4.277 m Span and 1.1 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+393 mm²/m
Headed Stud Connector	19x95 mm Placed @ 300 mm centre
Transverse Beam	@ 2.139 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	122 x 494 mm², b1= 440 mm and b2= 54 mm
Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³
Composite Section Elastic Properties	ye 127.9 mm, Ix 10591 cm⁴, Zs.t 51172 cm³, Zs.b 507 cm³, Zc.t 8279 cm³
Headed Stud Connector	14 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 41.32 kN, RH Support 41.34 kN	< 218.38 kN	OK
Check @ 2.139 m (Max. Moment)	M = 66.61 kN.m, Fv = 20.96 kN		
Shear Connection	No of shear connectors from nearest support 7 < 12.1	Partial	
Axial Resistance (kN)	Rc 1083.39 kN, Rs 1050.78 kN, Rq 610.4 kN	610.4 kN	
Degree of Shear Connection	Na/Np = 7 / 12.1 > 0.4	0.581	OK
Reduced Concrete Area	Area required to resist 610.4 kN	68.7x493.6mm²	
Moment Capacity	Plastic neutral axis in top flange @ 135.8 mm	164.39 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 300 mm	3.33 per m	
Vr = fn(Asv,fy,Acv,fcu)	645, 460, 79000, 40	302.49 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.33x87.2x0.44/(0.44+0.05)	259.12 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	8.24 kN each side	< 218.38 kN	OK
Check @ 2.139 m (Max. Moment)	M = 16.67 kN.m, Fv = 7.35 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.139 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 16.672, 0.6	10.003 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.139 m, 3.18 cm, 1, 0.882, 0.905	71.928 kN.m	OK

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Check between 2.139 and 4.277 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	16.672, 0, 0.6	10.003 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.138 m, 3.18 cm, 1, 0.882, 0.905	71.944 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	8.14 kN each side		
Super Imposed Dead Load	15.1 kN each side		
Dead Load (Self Weight)	5.11 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	1.22 (1.63) mm @ 2.139 m < L / 360 = 11.8 mm	1.63 mm	OK
Super Imposed Dead Loads	1.48 (1.98) mm @ 2.139 m	1.98 mm	
Dead Loads (Self Weight)	2.68 mm @ 2.139 m	2.68 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 34.3, Super Dead 34.4, SW 36.6 < 275	105.28 N/mm²	OK
TOTAL (Compression)	Live 0.3, Super Dead 0.3, SW 36.6 < 275	37.27 N/mm²	OK
Maximum Concrete Stress	Live 2.1, Super Dead 2.1, SW 0 < 20	4.21 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	2.88 mm	
Natural Frequency	18/√(2.88/1.1) = 11.13 > 4 Hz	11.13 Hz	OK

UNPROPPED COMPOSITE PRIMARY INTERNAL BEAM
Members 510, 512, 517 and 526 (M5-M2) @ Level 2

Summary of Design Data (Integrated Design)

Steel Section (132 kg/m)	254x254 UC 132 [S 275]
Floor Area Supported	6.926 m Span, 6.848 m to LH Beam and 5.085 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+503 mm²/m
Headed Stud Connector	19x95 mm Placed @ 145 mm centre
Transverse Beams	@ 0.5, 2.642 and 4.783 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	122 x 1732 mm², b1= 866 mm and b2= 866 mm
Steel Section Elastic Properties	ye 138.2 mm, A 168.1 cm², Ix 22536 cm⁴, Zt 1631 cm³, Zb 1631 cm³
Composite Section Elastic Properties	ye 152.8 mm, Ix 65328 cm⁴, Zs.t 28638 cm³, Zs.b 2577 cm³, Zc.t 42750 cm³
Headed Stud Connector (+1)	48 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 283.73 kN, RH Support 234.59 kN	< 672.16 kN	OK
Check @ 2.701 m (Max. Moment)	M = 548.54 kN.m, Fv = 22.2 kN		
Shear Connection	No of shear connectors from nearest support 19 < 43.6	Partial	
Axial Resistance (kN)	Rc 3800.73 kN, Rs 4455.45 kN, Rq 1656.8 kN	1656.8 kN	
Degree of Shear Connection	Na/Np = 19 / 43.6 > 0.4	0.436	OK
Reduced Concrete Area	Area required to resist 1656.8 kN	53.2x1731.5mm²	
Moment Capacity	Plastic neutral axis in top flange @ 149.9 mm	754.27 kN.m	OK
Check @ 0.5 m	M = 141.81 kN.m, Fv = 282.81 kN		
Shear Connection	No of shear connectors from nearest support 4 < 43.6	Partial	
Axial Resistance (kN)	Rc 3800.73 kN, Rs 4455.45 kN, Rq 348.8 kN	348.8 kN	
Reduced Concrete Area	Area required to resist 348.8 kN	11.2x1731.5mm²	
Moment Capacity	Plastic neutral axis in web @ 225.1 mm	575.44 kN.m	OK

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Check @ 2.642 m	M = 549.82 kN.m, Fv = 188.59 kN		
Shear Connection	No of shear connectors from nearest support 19 < 43.6	Partial	
Axial Resistance (kN)	Rc 3800.73 kN, Rs 4455.45 kN, Rq 1656.8 kN	1656.8 kN	
Reduced Concrete Area	Area required to resist 1656.8 kN	53.2x1731.5mm²	
Moment Capacity	Plastic neutral axis in top flange @ 149.9 mm	754.27 kN.m	OK
Check @ 4.783 m	M = 498.33 kN.m, Fv = 230.63 kN		
Shear Connection	No of shear connectors from nearest support 16 < 43.6	Partial	
Axial Resistance (kN)	Rc 3800.73 kN, Rs 4455.45 kN, Rq 1395.2 kN	1395.2 kN	
Reduced Concrete Area	Area required to resist 1395.2 kN	44.8x1731.5mm²	
Moment Capacity	Plastic neutral axis in top flange @ 151.8 mm	727.61 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 145 mm	6.9 per m	
Vr = fn(Asv,fy,Acv,fcu)	755, 460, 79000, 40	337.91 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	6.9x87.2x0.87/(0.87+0.87)	300.69 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 101.49 kN, RH Support 84.81 kN	< 672.16 kN	OK
Check @ 2.701 m (Max. Moment)	M = 195.3 kN.m, Fv = 6.66 kN		
Moment Capacity	Plastic neutral axis in web @ 138.2 mm	495.39 kN.m	OK
Check @ 0.5 m	M = 50.56 kN.m, Fv = 100.56 kN		
Moment Capacity	Plastic neutral axis in web @ 138.2 mm	495.39 kN.m	OK
Check @ 2.642 m	M = 195.69 kN.m, Fv = 65.8 kN		
Moment Capacity	Plastic neutral axis in web @ 138.2 mm	495.39 kN.m	OK
Check @ 4.783 m	M = 177.45 kN.m, Fv = 80.85 kN		
Moment Capacity	Plastic neutral axis in web @ 138.2 mm	495.39 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 0.5 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 50.563, 0.6	30.338 kN.m	
Mb=fn(L,ry,β_w,u,v)	0.5 m, 6.7 cm, 1, 0.851, 0.994	495.391 kN.m	OK
Check between 0.5 and 2.642 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	50.563, 195.685, 0.703	137.636 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.142 m, 6.7 cm, 1, 0.851, 0.907	495.391 kN.m	OK
Check between 2.642 and 4.783 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	195.685, 177.45, 0.963	188.391 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.141 m, 6.7 cm, 1, 0.851, 0.907	495.391 kN.m	OK
Check between 4.783 and 6.926 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	177.45, 0, 0.6	106.47 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.143 m, 6.7 cm, 1, 0.851, 0.907	495.391 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 109 kN, RH Support 89.58 kN		
Super Imposed Dead Load	LH Support 15.99 kN, RH Support 13.14 kN		
Dead Load (Self Weight)	LH Support 62.11 kN, RH Support 52.05 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	7.70 (9.67) mm @ 3.463 m < L / 360 = 19.2 mm	9.67 mm	OK
Super Imposed Dead Loads	1.13 (1.42) mm @ 3.463 m	1.42 mm	
Dead Loads (Self Weight)	12.67 mm @ 3.463 m	12.67 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 82, Super Dead 12, SW 73.2 < 265	167.18 N/mm²	OK
TOTAL (Compression)	Live 7.4, Super Dead 1.1, SW 73.2 < 265	81.64 N/mm²	OK
Maximum Concrete Stress	Live 4.94, Super Dead 0.72, SW 0 < 20	5.67 N/mm²	OK

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Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	6.76 mm	
Natural Frequency	$18/\sqrt{(6.76/1.1)} = 7.26 > 4$ Hz	7.26 Hz	OK

UNPROPPED COMPOSITE PRIMARY EDGE BEAM
Members 522, 525 and 528 (Q3-Q2) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (107 kg/m)	254x254 UC 107 [S 275]
Floor Area Supported	6.425 m Span and 4.644 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+393 mm²/m
Headed Stud Connector	19x95 mm Placed @ 300 mm centre
Transverse Beams	@ 2.141 and 4.283 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	122 x 907 mm², b1= 803 mm and b2= 104 mm
Steel Section Elastic Properties	ye 133.4 mm, A 136.4 cm², Ix 17517 cm⁴, Zt 1314 cm³, Zb 1314 cm³
Composite Section Elastic Properties	ye 172.7 mm, Ix 43896 cm⁴, Zs.t 10270 cm³, Zs.b 1960 cm³, Zc.t 25411 cm³
Headed Stud Connector	21 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	109.87 kN each side	< 542.79 kN	OK
Check @ 3.212 m (Max. Moment)	M = 217.04 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 10 < 22.8	Partial	
Axial Resistance (kN)	Rc 1990.13 kN, Rs 3614.07 kN, Rq 872 kN	872 kN	
Degree of Shear Connection	Na/Np = 10 / 22.8 > 0.4	0.438	OK
Reduced Concrete Area	Area required to resist 872 kN	53.4x906.6mm²	
Moment Capacity	Plastic neutral axis in top flange @ 149.7 mm	540.43 kN.m	OK
Check @ 2.141 m	M = 210.97 kN.m, Fv = 87.19 kN		
Shear Connection	No of shear connectors from nearest support 7 < 22.8	Partial	
Axial Resistance (kN)	Rc 1990.13 kN, Rs 3614.07 kN, Rq 610.4 kN	610.4 kN	
Reduced Concrete Area	Area required to resist 610.4 kN	37.4x906.6mm²	
Moment Capacity	Plastic neutral axis in web @ 173.4 mm	511.21 kN.m	OK
Check @ 4.283 m	M = 210.99 kN.m, Fv = 87.19 kN		
Shear Connection	No of shear connectors from nearest support 7 < 22.8	Partial	
Axial Resistance (kN)	Rc 1990.13 kN, Rs 3614.07 kN, Rq 610.4 kN	610.4 kN	
Reduced Concrete Area	Area required to resist 610.4 kN	37.4x906.6mm²	
Moment Capacity	Plastic neutral axis in web @ 173.4 mm	511.21 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 300 mm	3.33 per m	
Vr = fn(Asv,fy,Acv,fcu)	645, 460, 79000, 40	302.49 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.33x87.2x0.8/(0.8+0.1)	257.48 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	30.74 kN each side	< 542.79 kN	OK
Check @ 3.212 m (Max. Moment)	M = 63.25 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK
Check @ 2.141 m	M = 62.39 kN.m, Fv = 27.53 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK

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Check @ 4.283 m	M = 62.4 kN.m, Fv = 27.53 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.141 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 62.389, 0.6	37.433 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.141 m, 6.6 cm, 1, 0.848, 0.929	393.366 kN.m	OK
Check between 2.141 and 4.283 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	62.389, 62.396, 1	62.393 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.142 m, 6.6 cm, 1, 0.848, 0.929	393.366 kN.m	OK
Check between 4.283 and 6.425 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	62.396, 0, 0.6	37.438 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.142 m, 6.6 cm, 1, 0.848, 0.929	393.366 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	29.84 kN each side		
Super Imposed Dead Load	25.26 kN each side		
Dead Load (Self Weight)	19.12 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	3.12 (3.91) mm @ 3.212 m < L / 360 = 17.8 mm	3.91 mm	OK
Super Imposed Dead Loads	2.06 (2.58) mm @ 3.212 m	2.58 mm	
Dead Loads (Self Weight)	4.77 mm @ 3.212 m	4.77 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 32.6, Super Dead 21.9, SW 29.8 < 265	84.26 N/mm²	OK
TOTAL (Compression)	Live 6.2, Super Dead 4.2, SW 29.8 < 265	40.16 N/mm²	OK
Maximum Concrete Stress	Live 2.52, Super Dead 1.69, SW 0 < 20	4.20 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	4.88 mm	
Natural Frequency	18/√(4.88/1.1) = 8.55 > 4 Hz	8.55 Hz	OK

UNPROPPED COMPOSITE PRIMARY EDGE BEAM
Members 530 and 532 (Q2-Q1) @ Level 1

Summary of Design Data (Integrated Design)

Steel Section (107 kg/m)	254x254 UC 107 [S 275]
Floor Area Supported	4.2 m Span and 4.645 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+393 mm²/m
Headed Stud Connector	19x95 mm Placed @ 300 mm centre
Transverse Beam	@ 2.1 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	122 x 629 mm², b1= 525 mm and b2= 104 mm
Steel Section Elastic Properties	ye 133.4 mm, A 136.4 cm², Ix 17517 cm⁴, Zt 1314 cm³, Zb 1314 cm³
Composite Section Elastic Properties	ye 190.5 mm, Ix 38564 cm⁴, Zs.t 6370 cm³, Zs.b 1871 cm³, Zc.t 20240 cm³
Headed Stud Connector (+1)	15 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)

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Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	59.45 kN each side	< 542.79 kN	OK
Check @ 2.1 m (Max. Moment)	M = 101.45 kN.m, Fv = 37.19 kN		
Shear Connection	No of shear connectors from nearest support 7 < 15.8	Partial	
Axial Resistance (kN)	Rc 1379.64 kN, Rs 3614.07 kN, Rq 610.4 kN	610.4 kN	
Degree of Shear Connection	Na/Np = 7 / 15.8 > 0.4	0.442	OK
Reduced Concrete Area	Area required to resist 610.4 kN	54x628.5mm²	
Moment Capacity	Plastic neutral axis in web @ 173.4 mm	506.16 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 300 mm	3.33 per m	
Vr = fn(Asv,fy,Acv,fcu)	645, 460, 79000, 40	302.49 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.33x87.2x0.53/(0.53+0.1)	242.79 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	15.87 kN each side	< 542.79 kN	OK
Check @ 2.1 m (Max. Moment)	M = 30.01 kN.m, Fv = 12.72 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.1 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 30.011, 0.6	18.007 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.1 m, 6.6 cm, 1, 0.848, 0.931	393.366 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	14.63 kN each side		
Super Imposed Dead Load	15.8 kN each side		
Dead Load (Self Weight)	9.94 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	0.57 (0.69) mm @ 2.1 m < L / 360 = 11.6 mm	0.69 mm	OK
Super Imposed Dead Loads	0.42 (0.50) mm @ 2.1 m	0.50 mm	
Dead Loads (Self Weight)	0.78 mm @ 2.1 m	0.78 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 16.4, Super Dead 10.1, SW 14.1 < 265	40.59 N/mm²	OK
TOTAL (Compression)	Live 4.8, Super Dead 3, SW 14.1 < 265	21.87 N/mm²	OK
Maximum Concrete Stress	Live 1.52, Super Dead 0.93, SW 0 < 20	2.45 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	0.92 mm	
Natural Frequency	18/√(0.92/1.1) = 19.64 > 4 Hz	19.64 Hz	OK

UNPROPPED COMPOSITE PRIMARY INTERNAL BEAM
Members 520, 529 and 534 (N3-N2) @ Level 2

Summary of Design Data (Integrated Design)

Steel Section (73 kg/m)	254x254 UC 73 [S 275]
Floor Area Supported	6.425 m Span, 5.096 m to LH Beam and 4.644 m to RH Beam
Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 13.79, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed @ 250 mm centre
Transverse Beams	@ 2.141 and 4.284 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

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Section Properties

Concrete Effective Area	122 x 1606 mm², b1= 803 mm and b2= 803 mm		
Steel Section Elastic Properties	ye 127.1 mm, A 93.1 cm², Ix 11414 cm⁴, Zt 898 cm³, Zb 898 cm³		
Composite Section Elastic Properties	ye 138.6 mm, Ix 34796 cm⁴, Zs.t 40433 cm³, Zs.b 1417 cm³, Zc.t 34619 cm³		
Headed Stud Connector	25 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)		

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 162.54 kN, RH Support 162.6 kN	< 360.57 kN	OK
Check @ 3.277 m (Max. Moment)	M = 346.34 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 12 < 29.4	Partial	
Axial Resistance (kN)	Rc 3525.8 kN, Rs 2560.25 kN, Rq 1046.4 kN	1046.4 kN	
Degree of Shear Connection	Na/Np = 12 / 29.4 > 0.4	0.409	OK
Reduced Concrete Area	Area required to resist 1046.4 kN	36.2x1606.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 140.5 mm	429.77 kN.m	OK
Check @ 2.141 m	M = 345.68 kN.m, Fv = 160.35 kN		
Shear Connection	No of shear connectors from nearest support 8 < 29.4	Partial	
Axial Resistance (kN)	Rc 3525.8 kN, Rs 2560.25 kN, Rq 697.6 kN	697.6 kN	
Reduced Concrete Area	Area required to resist 697.6 kN	24.1x1606.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 143 mm	390.83 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 250 mm	4 per m	
Vr = fn(Asv,fy,Acv,fcu)	252, 460, 79000, 40	175.94 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	4x87.2x0.8/(0.8+0.8)	174.40 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 57.74 kN, RH Support 57.76 kN	< 360.57 kN	OK
Check @ 3.213 m (Max. Moment)	M = 121.88 kN.m, Fv = 0.02 kN		
Moment Capacity	Plastic neutral axis in web @ 127.1 mm	272.83 kN.m	OK
Check @ 2.141 m	M = 121.27 kN.m, Fv = 55.55 kN		
Moment Capacity	Plastic neutral axis in web @ 127.1 mm	272.83 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.141 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 121.272, 0.6	72.763 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.141 m, 6.48 cm, 1, 0.849, 0.959	272.828 kN.m	OK
Check between 2.141 and 4.284 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	121.272, 121.272, 1	121.272 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.143 m, 6.48 cm, 1, 0.849, 0.959	272.828 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 62.68 kN, RH Support 62.7 kN		
Super Imposed Dead Load	9.2 kN each side		
Dead Load (Self Weight)	LH Support 35.27 kN, RH Support 35.28 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	8.27 (11.28) mm @ 3.213 m < L / 360 = 17.8 mm	11.28 mm	OK
Super Imposed Dead Loads	1.21 (1.65) mm @ 3.213 m	1.65 mm	
Dead Loads (Self Weight)	13.94 mm @ 3.213 m	13.94 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 94.7, Super Dead 13.9, SW 82.7 < 275	191.29 N/mm²	OK
TOTAL (Compression)	Live 3.3, Super Dead 0.5, SW 82.7 < 275	86.48 N/mm²	OK
Maximum Concrete Stress	Live 3.88, Super Dead 0.57, SW 0 < 20	4.45 N/mm²	OK

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Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	7.35 mm	
Natural Frequency	18/√(7.35/1.1) = 6.96 > 4 Hz	6.96 Hz	OK

UNPROPPED COMPOSITE PRIMARY EDGE BEAM
Members 533 and 536 (M2-M1) @ Level 2

Summary of Design Data (Integrated Design)

Steel Section (132 kg/m)	254x254 UC 132 [S 275]
Floor Area Supported	4.2 m Span and 5.129 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+252 mm²/m
Headed Stud Connector	19x95 mm Placed @ 300 mm centre
Transverse Beam	@ 2.101 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	122 x 630 mm², b1= 525 mm and b2= 105 mm
Steel Section Elastic Properties	ye 138.2 mm, A 168.1 cm², Ix 22536 cm⁴, Zt 1631 cm³, Zb 1631 cm³
Composite Section Elastic Properties	ye 203.2 mm, Ix 46108 cm⁴, Zs.t 6298 cm³, Zs.b 2270 cm³, Zc.t 22690 cm³
Headed Stud Connector	14 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 65.85 kN, RH Support 65.88 kN	< 672.16 kN	OK
Check @ 2.1 m (Max. Moment)	M = 134.22 kN.m, Fv = 61.97 kN		
Shear Connection	No of shear connectors from nearest support 7 < 15.8	Partial	
Axial Resistance (kN)	Rc 1381.83 kN, Rs 4455.45 kN, Rq 610.4 kN	610.4 kN	
Degree of Shear Connection	Na/Np = 7 / 15.8 > 0.4	0.442	OK
Reduced Concrete Area	Area required to resist 610.4 kN	53.9x629.5mm²	
Moment Capacity	Plastic neutral axis in web @ 192.9 mm	615.62 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 300 mm	3.33 per m	
Vr = fn(Asv,fy,Acv,fcu)	504, 460, 79000, 40	257.09 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.33x87.2x0.53/(0.53+0.1)	242.41 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	25.25 kN each side	< 672.16 kN	OK
Check @ 2.1 m (Max. Moment)	M = 48.96 kN.m, Fv = 21.38 kN		
Moment Capacity	Plastic neutral axis in web @ 138.2 mm	495.39 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.101 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 48.96, 0.6	29.376 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.101 m, 6.7 cm, 1, 0.851, 0.909	495.391 kN.m	OK
Check between 2.101 and 4.2 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	48.96, 0, 0.6	29.376 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.099 m, 6.7 cm, 1, 0.851, 0.91	495.391 kN.m	OK

Serviceability Limit State

Support Reactions (kN)	
Live Loads	24.28 kN each side
Super Imposed Dead Load	3.56 kN each side

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Dead Load (Self Weight)	15.73 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	0.79 (0.95) mm @ 2.1 m < L / 360 = 11.6 mm	0.95 mm	OK
Super Imposed Dead Loads	0.12 (0.14) mm @ 2.1 m	0.14 mm	
Dead Loads (Self Weight)	0.98 mm @ 2.1 m	0.98 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 22.5, Super Dead 3.3, SW 18.5 < 265	44.22 N/mm²	OK
TOTAL (Compression)	Live 8.1, Super Dead 1.2, SW 18.5 < 265	27.75 N/mm²	OK
Maximum Concrete Stress	Live 2.25, Super Dead 0.33, SW 0 < 20	2.58 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	0.71 mm	
Natural Frequency	$18/\sqrt{(0.71/1.1)} = 22.35 > 4$ Hz	22.35 Hz	OK

UNPROPPED NON-COMPOSITE PRIMARY INTERNAL BEAM
Members 537 and 539 (N2-N1) @ Level 2

Summary of Design Data (Integrated Design)

Steel Section (73 kg/m)	254x254 UC 73 [S 275]
Floor Area Supported	4.2 m Span, 5.128 m to LH Beam and 4.645 m to RH Beam
Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m
Transverse Beam	@ 2.1 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties	ye 127.1 mm, A 93.1 cm², Ix 11414 cm⁴, Zt 898 cm³, Zb 898 cm³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 80.46 kN, RH Support 80.48 kN	< 360.57 kN	OK
Check @ 2.1 m (Max. Moment)	M = 166.71 kN.m, Fv = 78.32 kN		
Moment Capacity	Plastic neutral axis in web @ 127.1 mm	272.83 kN.m	OK

Lateral Torsional Buckling (Final Stage)

Check between 0 and 2.1 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 166.722, 0.6	100.033 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.1 m, 6.48 cm, 1, 0.849, 0.961	272.828 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	28.94 kN each side	< 360.57 kN	OK
Check @ 2.1 m (Max. Moment)	M = 58.51 kN.m, Fv = 26.79 kN		
Moment Capacity	Plastic neutral axis in web @ 127.1 mm	272.83 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.1 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 58.515, 0.6	35.109 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.1 m, 6.48 cm, 1, 0.849, 0.961	272.828 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	30.82 kN each side		
Super Imposed Dead Load	4.52 kN each side		
Dead Load (Self Weight)	17.73 kN each side		
Maximum Deflection			
Live Loads	4.06 (4.06) mm @ 2.1 m < L / 360 = 11.6 mm	4.06 mm	OK

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Super Imposed Dead Loads	0.60 mm @ 2.1 m	0.60 mm	
Dead Loads (Self Weight)	2.26 mm @ 2.1 m	2.26 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 72, Super Dead 10.6, SW 39.7 < 275	122.26 N/mm²	OK
TOTAL (Compression)	Live 72, Super Dead 10.6, SW 39.7 < 275	122.26 N/mm²	OK

Vibration Analysis

Beam Deflection		3.27 mm	
Natural Frequency	$18/\sqrt{(3.27)} = 9.96 > 4$ Hz	9.96 Hz	OK

UNPROPPED COMPOSITE PRIMARY INTERNAL BEAM
Members 550, 554, 558 and 561 (H5-H2) @ Level 3

Summary of Design Data (Integrated Design)

Steel Section (167 kg/m)	254x254 UC 167 [S 275]
Floor Area Supported	7.017 m Span, 1.013 m to LH Beam and 6.85 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+785 mm²/m
Headed Stud Connector	19x95 mm Placed @ 150 mm centre
Transverse Beams	@ 2.005, 2.339 and 4.678 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	122 x 1282 mm², b1= 405 mm and b2= 877 mm
Steel Section Elastic Properties	ye 144.6 mm, A 212.9 cm², Ix 30005 cm⁴, Zt 2076 cm³, Zb 2076 cm³
Composite Section Elastic Properties	ye 184.1 mm, Ix 73063 cm⁴, Zs.t 13506 cm³, Zs.b 3109 cm³, Zc.t 39688 cm³
Headed Stud Connector	46 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 200.52 kN, RH Support 189.91 kN	< 882.56 kN	OK
Check @ 3.087 m (Max. Moment)	M = 440.81 kN.m, Fv = 0.05 kN		
Shear Connection	No of shear connectors from nearest support 20 < 32.3	Partial	
Axial Resistance (kN)	Rc 2814.77 kN, Rs 5640.53 kN, Rq 1744 kN	1744 kN	
Degree of Shear Connection	Na/Np = 20 / 32.3 > 0.4	0.62	OK
Reduced Concrete Area	Area required to resist 1744 kN	75.6x1282.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 157.5 mm	917.89 kN.m	OK
Check @ 2.005 m	M = 397.45 kN.m, Fv = 195.83 kN		
Shear Connection	No of shear connectors from nearest support 13 < 32.3	Partial	
Axial Resistance (kN)	Rc 2814.77 kN, Rs 5640.53 kN, Rq 1133.6 kN	1133.6 kN	
Reduced Concrete Area	Area required to resist 1133.6 kN	49.1x1282.3mm²	
Moment Capacity	Plastic neutral axis in web @ 163.2 mm	858.49 kN.m	OK
Check @ 2.339 m	M = 440.2 kN.m, Fv = 128.17 kN		
Shear Connection	No of shear connectors from nearest support 15 < 32.3	Partial	
Axial Resistance (kN)	Rc 2814.77 kN, Rs 5640.53 kN, Rq 1308 kN	1308 kN	
Reduced Concrete Area	Area required to resist 1308 kN	56.7x1282.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 160.6 mm	877.38 kN.m	OK
Check @ 4.678 m	M = 437.78 kN.m, Fv = 184.45 kN		
Shear Connection	No of shear connectors from nearest support 15 < 32.3	Partial	
Axial Resistance (kN)	Rc 2814.77 kN, Rs 5640.53 kN, Rq 1308 kN	1308 kN	
Reduced Concrete Area	Area required to resist 1308 kN	56.7x1282.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 160.6 mm	877.38 kN.m	OK

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Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 150 mm	6.67 per m	
Vr = fn(Asv,fy,Acv,fcu)	1037, 460, 79000, 40	399.71 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	6.67x87.2x0.88/(0.41+0.88)	397.64 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 73.88 kN, RH Support 70.51 kN	< 882.56 kN	OK
Check @ 3.438 m (Max. Moment)	M = 160.33 kN.m, Fv = 0.02 kN		
Moment Capacity	Plastic neutral axis in web @ 144.6 mm	642.28 kN.m	OK
Check @ 2.005 m	M = 143.46 kN.m, Fv = 69.19 kN		
Moment Capacity	Plastic neutral axis in web @ 144.6 mm	642.28 kN.m	OK
Check @ 2.339 m	M = 158.94 kN.m, Fv = 46.13 kN		
Moment Capacity	Plastic neutral axis in web @ 144.6 mm	642.28 kN.m	OK
Check @ 4.678 m	M = 158.51 kN.m, Fv = 65.04 kN		
Moment Capacity	Plastic neutral axis in web @ 144.6 mm	642.28 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.005 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 143.464, 0.6	86.078 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.005 m, 6.81 cm, 1, 0.852, 0.889	642.281 kN.m	OK
Check between 2.005 and 2.339 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	143.464, 158.937, 0.961	152.748 kN.m	
Mb=fn(L,ry,β_w,u,v)	0.334 m, 6.81 cm, 1, 0.852, 0.996	642.281 kN.m	OK
Check between 2.339 and 4.678 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	158.937, 158.513, 0.999	158.767 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.339 m, 6.81 cm, 1, 0.852, 0.861	642.281 kN.m	OK
Check between 4.678 and 7.017 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	158.513, 0, 0.6	95.108 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.339 m, 6.81 cm, 1, 0.852, 0.861	642.281 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 75.74 kN, RH Support 71.42 kN		
Super Imposed Dead Load	LH Support 11.11 kN, RH Support 10.48 kN		
Dead Load (Self Weight)	LH Support 45.56 kN, RH Support 43.56 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	5.91 (6.64) mm @ 3.508 m < L / 360 = 19.4 mm	6.64 mm	OK
Super Imposed Dead Loads	0.87 (0.97) mm @ 3.508 m	0.97 mm	
Dead Loads (Self Weight)	8.43 mm @ 3.508 m	8.43 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 54.1, Super Dead 7.9, SW 47.5 < 265	109.51 N/mm²	OK
TOTAL (Compression)	Live 12.5, Super Dead 1.8, SW 47.5 < 265	61.76 N/mm²	OK
Maximum Concrete Stress	Live 4.24, Super Dead 0.62, SW 0 < 20	4.86 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	5.1 mm	
Natural Frequency	18/√(5.10/1.1) = 8.36 > 4 Hz	8.36 Hz	OK

UNPROPPED NON-COMPOSITE SECONDARY INTERNAL BEAM
Members 553 and 557 (N.267-N.276) @ Level 3

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	3.593 m Span, 1.986 m to LH Beam and .841 m to RH Beam

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Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick		
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m		
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame		

Section Properties

Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³		

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 41.57 kN, RH Support 43.67 kN	< 218.38 kN	OK
Check @ 1.797 m (Max. Moment)	M = 37.2 kN.m, Fv = 0.52 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 14.36 kN, RH Support 15.06 kN	< 218.38 kN	OK
Check @ 1.797 m (Max. Moment)	M = 12.85 kN.m, Fv = 0.17 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 16.28 kN, RH Support 17.11 kN		
Super Imposed Dead Load	LH Support 2.39 kN, RH Support 2.51 kN		
Dead Load (Self Weight)	LH Support 8.71 kN, RH Support 9.13 kN		
Maximum Deflection			
Live Loads	3.31 (3.31) mm @ 1.797 m < L / 360 = 9.9 mm	3.31 mm	OK
Super Imposed Dead Loads	0.49 mm @ 1.797 m	0.49 mm	
Dead Loads (Self Weight)	1.77 mm @ 1.797 m	1.77 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 52, Super Dead 7.6, SW 27.8 < 275	87.44 N/mm²	OK
TOTAL (Compression)	Live 52, Super Dead 7.6, SW 27.8 < 275	87.44 N/mm²	OK

Vibration Analysis

Beam Deflection		2.59 mm	
Natural Frequency	18/√(2.59) = 11.18 > 4 Hz	11.18 Hz	OK

UNPROPPED COMPOSITE PRIMARY INTERNAL BEAM
Members 569, 574, 579 and 583 (M5-M2) @ Level 3

Summary of Design Data (Integrated Design)

Steel Section (132 kg/m)	254x254 UC 132 [S 275]
Floor Area Supported	6.926 m Span, 6.848 m to LH Beam and 5.085 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+503 mm²/m
Headed Stud Connector	19x95 mm Placed @ 145 mm centre
Transverse Beams	@ 0.5, 2.642 and 4.783 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	122 x 1732 mm², b1= 866 mm and b2= 866 mm
Steel Section Elastic Properties	ye 138.2 mm, A 168.1 cm², Ix 22536 cm⁴, Zt 1631 cm³, Zb 1631 cm³
Composite Section Elastic Properties	ye 152.8 mm, Ix 65328 cm⁴, Zs.t 28638 cm³, Zs.b 2577 cm³, Zc.t 42750 cm³
Headed Stud Connector (+1)	48 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)

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Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 283.73 kN, RH Support 234.59 kN	< 672.16 kN	OK
Check @ 2.701 m (Max. Moment)	M = 548.54 kN.m, Fv = 22.2 kN		
Shear Connection	No of shear connectors from nearest support 19 < 43.6	Partial	
Axial Resistance (kN)	Rc 3800.73 kN, Rs 4455.45 kN, Rq 1656.8 kN	1656.8 kN	
Degree of Shear Connection	Na/Np = 19 / 43.6 > 0.4	0.436	OK
Reduced Concrete Area	Area required to resist 1656.8 kN	53.2x1731.5mm²	
Moment Capacity	Plastic neutral axis in top flange @ 149.9 mm	754.27 kN.m	OK
Check @ 0.5 m	M = 141.81 kN.m, Fv = 282.81 kN		
Shear Connection	No of shear connectors from nearest support 4 < 43.6	Partial	
Axial Resistance (kN)	Rc 3800.73 kN, Rs 4455.45 kN, Rq 348.8 kN	348.8 kN	
Reduced Concrete Area	Area required to resist 348.8 kN	11.2x1731.5mm²	
Moment Capacity	Plastic neutral axis in web @ 225.1 mm	575.44 kN.m	OK
Check @ 2.642 m	M = 549.82 kN.m, Fv = 188.59 kN		
Shear Connection	No of shear connectors from nearest support 19 < 43.6	Partial	
Axial Resistance (kN)	Rc 3800.73 kN, Rs 4455.45 kN, Rq 1656.8 kN	1656.8 kN	
Reduced Concrete Area	Area required to resist 1656.8 kN	53.2x1731.5mm²	
Moment Capacity	Plastic neutral axis in top flange @ 149.9 mm	754.27 kN.m	OK
Check @ 4.783 m	M = 498.33 kN.m, Fv = 230.63 kN		
Shear Connection	No of shear connectors from nearest support 16 < 43.6	Partial	
Axial Resistance (kN)	Rc 3800.73 kN, Rs 4455.45 kN, Rq 1395.2 kN	1395.2 kN	
Reduced Concrete Area	Area required to resist 1395.2 kN	44.8x1731.5mm²	
Moment Capacity	Plastic neutral axis in top flange @ 151.8 mm	727.61 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 145 mm	6.9 per m	
Vr = fn(Asv,fy,Acv,fcu)	755, 460, 79000, 40	337.91 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	6.9x87.2x0.87/(0.87+0.87)	300.69 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 101.49 kN, RH Support 84.81 kN	< 672.16 kN	OK
Check @ 2.701 m (Max. Moment)	M = 195.3 kN.m, Fv = 6.66 kN		
Moment Capacity	Plastic neutral axis in web @ 138.2 mm	495.39 kN.m	OK
Check @ 0.5 m	M = 50.56 kN.m, Fv = 100.56 kN		
Moment Capacity	Plastic neutral axis in web @ 138.2 mm	495.39 kN.m	OK
Check @ 2.642 m	M = 195.69 kN.m, Fv = 65.8 kN		
Moment Capacity	Plastic neutral axis in web @ 138.2 mm	495.39 kN.m	OK
Check @ 4.783 m	M = 177.45 kN.m, Fv = 80.85 kN		
Moment Capacity	Plastic neutral axis in web @ 138.2 mm	495.39 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 0.5 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 50.563, 0.6	30.338 kN.m	
Mb=fn(L,ry,β_w,u,v)	0.5 m, 6.7 cm, 1, 0.851, 0.994	495.391 kN.m	OK
Check between 0.5 and 2.642 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	50.563, 195.685, 0.703	137.636 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.142 m, 6.7 cm, 1, 0.851, 0.907	495.391 kN.m	OK
Check between 2.642 and 4.783 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	195.685, 177.45, 0.963	188.391 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.141 m, 6.7 cm, 1, 0.851, 0.907	495.391 kN.m	OK
Check between 4.783 and 6.926 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	177.45, 0, 0.6	106.47 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.143 m, 6.7 cm, 1, 0.851, 0.907	495.391 kN.m	OK

Serviceability Limit State

Support Reactions (kN)	
Live Loads	LH Support 109 kN, RH Support 89.58 kN

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Super Imposed Dead Load	LH Support 15.99 kN, RH Support 13.14 kN		
Dead Load (Self Weight)	LH Support 62.11 kN, RH Support 52.05 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	7.70 (9.67) mm @ 3.463 m < L / 360 = 19.2 mm	9.67 mm	OK
Super Imposed Dead Loads	1.13 (1.42) mm @ 3.463 m	1.42 mm	
Dead Loads (Self Weight)	12.67 mm @ 3.463 m	12.67 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 82, Super Dead 12, SW 73.2 < 265	167.18 N/mm²	OK
TOTAL (Compression)	Live 7.4, Super Dead 1.1, SW 73.2 < 265	81.64 N/mm²	OK
Maximum Concrete Stress	Live 4.94, Super Dead 0.72, SW 0 < 20	5.67 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	6.76 mm	
Natural Frequency	18/√(6.76/1.1) = 7.26 > 4 Hz	7.26 Hz	OK

UNPROPPED COMPOSITE PRIMARY EDGE BEAM
Members 572, 575 and 577 (Q3-Q2) @ Level 2

Summary of Design Data (Integrated Design)

Steel Section (107 kg/m)	254x254 UC 107 [S 275]
Floor Area Supported	6.425 m Span and 4.644 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+393 mm²/m
Headed Stud Connector	19x95 mm Placed @ 300 mm centre
Transverse Beams	@ 2.141 and 4.283 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	122 x 907 mm², b1= 803 mm and b2= 104 mm
Steel Section Elastic Properties	ye 133.4 mm, A 136.4 cm², Ix 17517 cm⁴, Zt 1314 cm³, Zb 1314 cm³
Composite Section Elastic Properties	ye 172.7 mm, Ix 43896 cm⁴, Zs.t 10270 cm³, Zs.b 1960 cm³, Zc.t 25411 cm³
Headed Stud Connector	21 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	109.87 kN each side	< 542.79 kN	OK
Check @ 3.212 m (Max. Moment)	M = 217.04 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 10 < 22.8	Partial	
Axial Resistance (kN)	Rc 1990.13 kN, Rs 3614.07 kN, Rq 872 kN	872 kN	
Degree of Shear Connection	Na/Np = 10 / 22.8 > 0.4	0.438	OK
Reduced Concrete Area	Area required to resist 872 kN	53.4x906.6mm²	
Moment Capacity	Plastic neutral axis in top flange @ 149.7 mm	540.43 kN.m	OK
Check @ 2.141 m	M = 210.97 kN.m, Fv = 87.19 kN		
Shear Connection	No of shear connectors from nearest support 7 < 22.8	Partial	
Axial Resistance (kN)	Rc 1990.13 kN, Rs 3614.07 kN, Rq 610.4 kN	610.4 kN	
Reduced Concrete Area	Area required to resist 610.4 kN	37.4x906.6mm²	
Moment Capacity	Plastic neutral axis in web @ 173.4 mm	511.21 kN.m	OK
Check @ 4.283 m	M = 210.99 kN.m, Fv = 87.19 kN		
Shear Connection	No of shear connectors from nearest support 7 < 22.8	Partial	
Axial Resistance (kN)	Rc 1990.13 kN, Rs 3614.07 kN, Rq 610.4 kN	610.4 kN	
Reduced Concrete Area	Area required to resist 610.4 kN	37.4x906.6mm²	
Moment Capacity	Plastic neutral axis in web @ 173.4 mm	511.21 kN.m	OK

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Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 300 mm	3.33 per m	
Vr = fn(Asv,fy,Acv,fcu)	645, 460, 79000, 40	302.49 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.33x87.2x0.8/(0.8+0.1)	257.48 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	30.74 kN each side	< 542.79 kN	OK
Check @ 3.212 m (Max. Moment)	M = 63.25 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK
Check @ 2.141 m	M = 62.39 kN.m, Fv = 27.53 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK
Check @ 4.283 m	M = 62.4 kN.m, Fv = 27.53 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.141 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 62.389, 0.6	37.433 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.141 m, 6.6 cm, 1, 0.848, 0.929	393.366 kN.m	OK
Check between 2.141 and 4.283 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	62.389, 62.396, 1	62.393 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.142 m, 6.6 cm, 1, 0.848, 0.929	393.366 kN.m	OK
Check between 4.283 and 6.425 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	62.396, 0, 0.6	37.438 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.142 m, 6.6 cm, 1, 0.848, 0.929	393.366 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	29.84 kN each side		
Super Imposed Dead Load	25.26 kN each side		
Dead Load (Self Weight)	19.12 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	3.12 (3.91) mm @ 3.212 m < L / 360 = 17.8 mm	3.91 mm	OK
Super Imposed Dead Loads	2.06 (2.58) mm @ 3.212 m	2.58 mm	
Dead Loads (Self Weight)	4.77 mm @ 3.212 m	4.77 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 32.6, Super Dead 21.9, SW 29.8 < 265	84.26 N/mm²	OK
TOTAL (Compression)	Live 6.2, Super Dead 4.2, SW 29.8 < 265	40.16 N/mm²	OK
Maximum Concrete Stress	Live 2.52, Super Dead 1.69, SW 0 < 20	4.20 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	4.88 mm	
Natural Frequency	18/√(4.88/1.1) = 8.55 > 4 Hz	8.55 Hz	OK

UNPROPPED COMPOSITE PRIMARY INTERNAL BEAM
Members 581, 584 and 586 (N3-N2) @ Level 3

Summary of Design Data (Integrated Design)

Steel Section (73 kg/m)	254x254 UC 73 [S 275]
Floor Area Supported	6.425 m Span, 5.096 m to LH Beam and 4.644 m to RH Beam
Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 13.79, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed @ 250 mm centre
Transverse Beams	@ 2.141 and 4.284 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

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Section Properties

Concrete Effective Area	122 x 1606 mm², b1= 803 mm and b2= 803 mm		
Steel Section Elastic Properties	ye 127.1 mm, A 93.1 cm², Ix 11414 cm⁴, Zt 898 cm³, Zb 898 cm³		
Composite Section Elastic Properties	ye 138.6 mm, Ix 34796 cm⁴, Zs.t 40433 cm³, Zs.b 1417 cm³, Zc.t 34619 cm³		
Headed Stud Connector	25 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)		

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 162.54 kN, RH Support 162.6 kN	< 360.57 kN	OK
Check @ 3.277 m (Max. Moment)	M = 346.34 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 12 < 29.4	Partial	
Axial Resistance (kN)	Rc 3525.8 kN, Rs 2560.25 kN, Rq 1046.4 kN	1046.4 kN	
Degree of Shear Connection	Na/Np = 12 / 29.4 > 0.4	0.409	OK
Reduced Concrete Area	Area required to resist 1046.4 kN	36.2x1606.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 140.5 mm	429.77 kN.m	OK
Check @ 2.141 m	M = 345.68 kN.m, Fv = 160.35 kN		
Shear Connection	No of shear connectors from nearest support 8 < 29.4	Partial	
Axial Resistance (kN)	Rc 3525.8 kN, Rs 2560.25 kN, Rq 697.6 kN	697.6 kN	
Reduced Concrete Area	Area required to resist 697.6 kN	24.1x1606.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 143 mm	390.83 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 250 mm	4 per m	
Vr = fn(Asv,fy,Acv,fcu)	252, 460, 79000, 40	175.94 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	4x87.2x0.8/(0.8+0.8)	174.40 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 57.74 kN, RH Support 57.76 kN	< 360.57 kN	OK
Check @ 3.213 m (Max. Moment)	M = 121.88 kN.m, Fv = 0.02 kN		
Moment Capacity	Plastic neutral axis in web @ 127.1 mm	272.83 kN.m	OK
Check @ 2.141 m	M = 121.27 kN.m, Fv = 55.55 kN		
Moment Capacity	Plastic neutral axis in web @ 127.1 mm	272.83 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.141 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 121.272, 0.6	72.763 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.141 m, 6.48 cm, 1, 0.849, 0.959	272.828 kN.m	OK
Check between 2.141 and 4.284 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	121.272, 121.272, 1	121.272 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.143 m, 6.48 cm, 1, 0.849, 0.959	272.828 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 62.68 kN, RH Support 62.7 kN		
Super Imposed Dead Load	9.2 kN each side		
Dead Load (Self Weight)	LH Support 35.27 kN, RH Support 35.28 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	8.27 (11.28) mm @ 3.213 m < L / 360 = 17.8 mm	11.28 mm	OK
Super Imposed Dead Loads	1.21 (1.65) mm @ 3.213 m	1.65 mm	
Dead Loads (Self Weight)	13.94 mm @ 3.213 m	13.94 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 94.7, Super Dead 13.9, SW 82.7 < 275	191.29 N/mm²	OK
TOTAL (Compression)	Live 3.3, Super Dead 0.5, SW 82.7 < 275	86.48 N/mm²	OK
Maximum Concrete Stress	Live 3.88, Super Dead 0.57, SW 0 < 20	4.45 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	7.35 mm	
Natural Frequency	18/√(7.35/1.1) = 6.96 > 4 Hz	6.96 Hz	OK

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UNPROPPED COMPOSITE PRIMARY EDGE BEAM
Members 578 and 580 (Q2-Q1) @ Level 2

Summary of Design Data (Integrated Design)

Steel Section (107 kg/m)	254x254 UC 107 [S 275]
Floor Area Supported	4.2 m Span and 4.645 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+393 mm²/m
Headed Stud Connector	19x95 mm Placed @ 275 mm centre
Transverse Beam	@ 2.1 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	122 x 629 mm², b1= 525 mm and b2= 104 mm
Steel Section Elastic Properties	ye 133.4 mm, A 136.4 cm², Ix 17517 cm⁴, Zt 1314 cm³, Zb 1314 cm³
Composite Section Elastic Properties	ye 190.5 mm, Ix 38564 cm⁴, Zs.t 6370 cm³, Zs.b 1871 cm³, Zc.t 20240 cm³
Headed Stud Connector	15 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	59.45 kN each side	< 542.79 kN	OK
Check @ 2.1 m (Max. Moment)	M = 101.45 kN.m, Fv = 37.19 kN		
Shear Connection	No of shear connectors from nearest support 7 < 15.8	Partial	
Axial Resistance (kN)	Rc 1379.64 kN, Rs 3614.07 kN, Rq 610.4 kN	610.4 kN	
Degree of Shear Connection	Na/Np = 7 / 15.8 > 0.4	0.442	OK
Reduced Concrete Area	Area required to resist 610.4 kN	54x628.5mm²	
Moment Capacity	Plastic neutral axis in web @ 173.4 mm	506.16 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 275 mm	3.64 per m	
Vr = fn(Asv,fy,Acv,fcu)	645, 460, 79000, 40	302.49 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.64x87.2x0.53/(0.53+0.1)	264.86 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	15.87 kN each side	< 542.79 kN	OK
Check @ 2.1 m (Max. Moment)	M = 30.01 kN.m, Fv = 12.72 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.1 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 30.011, 0.6	18.007 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.1 m, 6.6 cm, 1, 0.848, 0.931	393.366 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	14.63 kN each side		
Super Imposed Dead Load	15.8 kN each side		
Dead Load (Self Weight)	9.94 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	0.57 (0.69) mm @ 2.1 m < L / 360 = 11.6 mm	0.69 mm	OK
Super Imposed Dead Loads	0.42 (0.50) mm @ 2.1 m	0.50 mm	
Dead Loads (Self Weight)	0.78 mm @ 2.1 m	0.78 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 16.4, Super Dead 10.1, SW 14.1 < 265	40.59 N/mm²	OK
TOTAL (Compression)	Live 4.8, Super Dead 3, SW 14.1 < 265	21.87 N/mm²	OK

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Maximum Concrete Stress	Live 1.52, Super Dead 0.93, SW 0 < 20	2.45 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	0.92 mm	
Natural Frequency	18/√(0.92/1.1) = 19.64 > 4 Hz	19.64 Hz	OK

UNPROPPED COMPOSITE SECONDARY EDGE BEAM
Members 593-594 (A4-A2) @ Level 4

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	6.008 m Span and 1.072 m to LH Beam
Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 13.79, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed @ 400 mm centres
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 612 mm², b1= 536 mm and b2= 76 mm
Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³
Composite Section Elastic Properties	ye 127.8 mm, Ix 7177 cm⁴, Zs.t 33608 cm³, Zs.b 460 cm³, Zc.t 7929 cm³
Headed Stud Connector	15 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 64.71 kN, RH Support 45.09 kN	< 169.03 kN	OK
Check @ 1.923 m (Max. Moment)	M = 104.74 kN.m, Fv = 6.19 kN		
Shear Connection	No of shear connectors from nearest support 4 < 10	Partial	
Axial Resistance (kN)	Rc 870.9 kN, Rs 1052.15 kN, Rq 348.8 kN	348.8 kN	
Degree of Shear Connection	Na/Np = 4 / 10 > 0.4	0.401	OK
Reduced Concrete Area	Area required to resist 348.8 kN	31.6x612.5mm²	
Moment Capacity	Plastic neutral axis in top flange @ 138.2 mm	118.84 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 400 mm	2.5 per m	
Vp = fn(tp.pyp)	1.0, 350(Continuous)	350.00 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 350	567.94 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	2.5x87.2x0.54/(0.54+0.08)	190.79 kN	OK

† The Engineer must ensure that the deck contribution Vp for a continuous profile can be achieved for this edge beam

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 13.62 kN, RH Support 6.9 kN	< 169.03 kN	OK
Check @ 1.923 m (Max. Moment)	M = 24.69 kN.m, Fv = 5.18 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 14.21 kN, RH Support 6.49 kN		
Super Imposed Dead Load	LH Support 21.61 kN, RH Support 20.48 kN		
Dead Load (Self Weight)	LH Support 8.37 kN, RH Support 4.31 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	5.25 (7.20) mm @ 2.704 m < L / 360 = 16.6 mm	7.20 mm	OK
Super Imposed Dead Loads	8.25 (11.32) mm @ 3.004 m	11.32 mm	
Dead Loads (Self Weight)	12.73 mm @ 2.764 m	12.73 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 57.6, Super Dead 70.1, SW 68.1 < 275	195.82 N/mm²	OK
TOTAL (Compression)	Live 0.8, Super Dead 1, SW 68.1 < 275	69.84 N/mm²	OK
Maximum Concrete Stress	Live 3.34, Super Dead 4.07, SW 0 < 20	7.41 N/mm²	OK

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Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	15.15 mm	
Natural Frequency	$18/\sqrt{(15.15/1.1)} = 4.85 > 4$ Hz	4.85 Hz	OK

UNPROPPED COMPOSITE SECONDARY EDGE BEAM
Members 596 and 625 (B12-B9) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (86 kg/m)	203x203 UC 86 [S 275]
Floor Area Supported	7.605 m Span and 2.285 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+193 mm²/m
Headed Stud Connector	19x95 mm Placed One per Alternate Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1055 mm², b1= 951 mm and b2= 105 mm
Steel Section Elastic Properties	ye 111.1 mm, A 109.6 cm², Ix 9452 cm⁴, Zt 851 cm³, Zb 851 cm³
Composite Section Elastic Properties	ye 154 mm, Ix 29131 cm⁴, Zs.t 12127 cm³, Zs.b 1470 cm³, Zc.t 18913 cm³
Headed Stud Connector	25 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 142.45 kN, RH Support 134.98 kN	< 448.69 kN	OK
Check @ 3.27 m (Max. Moment)	M = 294.5 kN.m, Fv = 0.88 kN		
Shear Connection	No of shear connectors from nearest support 10 < 17.2	Partial	
Axial Resistance (kN)	Rc 1500.46 kN, Rs 2905.2 kN, Rq 872 kN	872 kN	
Degree of Shear Connection	Na/Np = 10 / 17.2 > 0.4	0.581	OK
Reduced Concrete Area	Area required to resist 872 kN	45.9x1055.2mm²	
Moment Capacity	Plastic neutral axis in top flange @ 148.1 mm	395.28 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	445, 460, 114000, 40, 87.5	367.59 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.95/(0.95+0.1)	258.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 40.57 kN, RH Support 37.41 kN	< 448.69 kN	OK
Check @ 2.966 m (Max. Moment)	M = 86.62 kN.m, Fv = 0.08 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 40.23 kN, RH Support 37.63 kN		
Super Imposed Dead Load	LH Support 30.61 kN, RH Support 30.22 kN		
Dead Load (Self Weight)	LH Support 25.15 kN, RH Support 23.14 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	8.37 (9.95) mm @ 3.726 m < L / 360 = 21.1 mm	9.95 mm	OK
Super Imposed Dead Loads	5.96 (7.09) mm @ 3.803 m	7.09 mm	
Dead Loads (Self Weight)	16.02 mm @ 3.726 m	16.02 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 58.6, Super Dead 40.3, SW 63.1 < 265	161.96 N/mm²	OK
TOTAL (Compression)	Live 7.1, Super Dead 4.9, SW 63.1 < 265	75.08 N/mm²	OK

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Maximum Concrete Stress	Live 4.55, Super Dead 3.13, SW 0 < 20	7.68 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	13.28 mm	
Natural Frequency	18/√(13.28/1.1) = 5.18 > 4 Hz	5.18 Hz	OK

UNPROPPED COMPOSITE PRIMARY INTERNAL BEAM
Members 616, 619, 622 and 624 (H5-H2) @ Level 4

Summary of Design Data (Integrated Design)

Steel Section (167 kg/m)	254x254 UC 167 [S 275]
Floor Area Supported	7.017 m Span, 1.013 m to LH Beam and 6.85 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+785 mm²/m
Headed Stud Connector	19x95 mm Placed @ 150 mm centre
Transverse Beams	@ 2.005, 2.339 and 4.678 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	122 x 1282 mm², b1= 405 mm and b2= 877 mm
Steel Section Elastic Properties	ye 144.6 mm, A 212.9 cm², Ix 30005 cm⁴, Zt 2076 cm³, Zb 2076 cm³
Composite Section Elastic Properties	ye 184.1 mm, Ix 73063 cm⁴, Zs.t 13506 cm³, Zs.b 3109 cm³, Zc.t 39688 cm³
Headed Stud Connector	46 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)

Ultimate Limit State (Final Stage)

Maximum Shear Support Reactions (kN)	LH Support 200.52 kN, RH Support 189.91 kN	< 882.56 kN	OK
Check @ 3.017 m (Max. Moment)	M = 440.81 kN.m, Fv = 0.11 kN		
Shear Connection	No of shear connectors from nearest support 20 < 32.3	Partial	
Axial Resistance (kN)	Rc 2814.77 kN, Rs 5640.53 kN, Rq 1744 kN	1744 kN	
Degree of Shear Connection	Na/Np = 20 / 32.3 > 0.4	0.62	OK
Reduced Concrete Area	Area required to resist 1744 kN	75.6x1282.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 157.5 mm	917.89 kN.m	OK
Check @ 2.005 m	M = 397.45 kN.m, Fv = 195.83 kN		
Shear Connection	No of shear connectors from nearest support 13 < 32.3	Partial	
Axial Resistance (kN)	Rc 2814.77 kN, Rs 5640.53 kN, Rq 1133.6 kN	1133.6 kN	
Reduced Concrete Area	Area required to resist 1133.6 kN	49.1x1282.3mm²	
Moment Capacity	Plastic neutral axis in web @ 163.2 mm	858.49 kN.m	OK
Check @ 2.339 m	M = 440.2 kN.m, Fv = 128.16 kN		
Shear Connection	No of shear connectors from nearest support 15 < 32.3	Partial	
Axial Resistance (kN)	Rc 2814.77 kN, Rs 5640.53 kN, Rq 1308 kN	1308 kN	
Reduced Concrete Area	Area required to resist 1308 kN	56.7x1282.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 160.6 mm	877.38 kN.m	OK
Check @ 4.678 m	M = 437.78 kN.m, Fv = 184.45 kN		
Shear Connection	No of shear connectors from nearest support 15 < 32.3	Partial	
Axial Resistance (kN)	Rc 2814.77 kN, Rs 5640.53 kN, Rq 1308 kN	1308 kN	
Reduced Concrete Area	Area required to resist 1308 kN	56.7x1282.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 160.6 mm	877.38 kN.m	OK

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Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 150 mm	6.67 per m	
Vr = fn(Asv,fy,Acv,fcu)	1037, 460, 79000, 40	399.71 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	6.67x87.2x0.88/(0.41+0.88)	397.64 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 73.88 kN, RH Support 70.51 kN	< 882.56 kN	OK
Check @ 3.438 m (Max. Moment)	M = 160.33 kN.m, Fv = 0.02 kN		
Moment Capacity	Plastic neutral axis in web @ 144.6 mm	642.28 kN.m	OK
Check @ 2.005 m	M = 143.46 kN.m, Fv = 69.19 kN		
Moment Capacity	Plastic neutral axis in web @ 144.6 mm	642.28 kN.m	OK
Check @ 2.339 m	M = 158.94 kN.m, Fv = 46.13 kN		
Moment Capacity	Plastic neutral axis in web @ 144.6 mm	642.28 kN.m	OK
Check @ 4.678 m	M = 158.51 kN.m, Fv = 65.04 kN		
Moment Capacity	Plastic neutral axis in web @ 144.6 mm	642.28 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.005 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 143.462, 0.6	86.077 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.005 m, 6.81 cm, 1, 0.852, 0.889	642.281 kN.m	OK
Check between 2.005 and 2.339 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	143.462, 158.935, 0.961	152.746 kN.m	
Mb=fn(L,ry,β_w,u,v)	0.334 m, 6.81 cm, 1, 0.852, 0.996	642.281 kN.m	OK
Check between 2.339 and 4.678 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	158.935, 158.511, 0.999	158.765 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.339 m, 6.81 cm, 1, 0.852, 0.861	642.281 kN.m	OK
Check between 4.678 and 7.017 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	158.511, 0, 0.6	95.107 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.339 m, 6.81 cm, 1, 0.852, 0.861	642.281 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 75.74 kN, RH Support 71.42 kN		
Super Imposed Dead Load	LH Support 11.11 kN, RH Support 10.48 kN		
Dead Load (Self Weight)	LH Support 45.56 kN, RH Support 43.56 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	5.91 (6.64) mm @ 3.508 m < L / 360 = 19.4 mm	6.64 mm	OK
Super Imposed Dead Loads	0.87 (0.97) mm @ 3.508 m	0.97 mm	
Dead Loads (Self Weight)	8.43 mm @ 3.508 m	8.43 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 54.1, Super Dead 7.9, SW 47.5 < 265	109.51 N/mm²	OK
TOTAL (Compression)	Live 12.5, Super Dead 1.8, SW 47.5 < 265	61.76 N/mm²	OK
Maximum Concrete Stress	Live 4.24, Super Dead 0.62, SW 0 < 20	4.86 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	5.1 mm	
Natural Frequency	18/√(5.10/1.1) = 8.36 > 4 Hz	8.36 Hz	OK

UNPROPPED NON-COMPOSITE SECONDARY INTERNAL BEAM
Members 618 and 621 (N.346-N.353) @ Level 4

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	3.593 m Span, 1.986 m to LH Beam and .841 m to RH Beam
Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick

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Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m		
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame		

Section Properties

Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³		

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 41.57 kN, RH Support 43.67 kN	< 218.38 kN	OK
Check @ 1.797 m (Max. Moment)	M = 37.2 kN.m, Fv = 0.52 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 14.36 kN, RH Support 15.06 kN	< 218.38 kN	OK
Check @ 1.797 m (Max. Moment)	M = 12.85 kN.m, Fv = 0.17 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 16.28 kN, RH Support 17.11 kN		
Super Imposed Dead Load	LH Support 2.39 kN, RH Support 2.51 kN		
Dead Load (Self Weight)	LH Support 8.71 kN, RH Support 9.13 kN		
Maximum Deflection			
Live Loads	3.31 (3.31) mm @ 1.797 m < L / 360 = 9.9 mm	3.31 mm	OK
Super Imposed Dead Loads	0.49 mm @ 1.797 m	0.49 mm	
Dead Loads (Self Weight)	1.77 mm @ 1.797 m	1.77 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 52, Super Dead 7.6, SW 27.8 < 275	87.44 N/mm²	OK
TOTAL (Compression)	Live 52, Super Dead 7.6, SW 27.8 < 275	87.44 N/mm²	OK

Vibration Analysis

Beam Deflection		2.59 mm	
Natural Frequency	18/√(2.59) = 11.18 > 4 Hz	11.18 Hz	OK

UNPROPPED COMPOSITE PRIMARY INTERNAL BEAM
Members 630, 632, 634 and 638 (M5-M2) @ Level 4

Summary of Design Data (Integrated Design)

Steel Section (132 kg/m)	254x254 UC 132 [S 275]
Floor Area Supported	6.926 m Span, 6.848 m to LH Beam and 5.085 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+503 mm²/m
Headed Stud Connector	19x95 mm Placed @ 145 mm centre
Transverse Beams	@ 0.5, 2.642 and 4.783 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	122 x 1732 mm², b1= 866 mm and b2= 866 mm
Steel Section Elastic Properties	ye 138.2 mm, A 168.1 cm², Ix 22536 cm⁴, Zt 1631 cm³, Zb 1631 cm³
Composite Section Elastic Properties	ye 152.8 mm, Ix 65328 cm⁴, Zs.t 28638 cm³, Zs.b 2577 cm³, Zc.t 42750 cm³
Headed Stud Connector (+1)	48 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 283.73 kN, RH Support 234.59 kN	< 672.16 kN	OK

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Check @ 2.701 m (Max. Moment)	M = 548.54 kN.m, Fv = 22.2 kN		
Shear Connection	No of shear connectors from nearest support 19 < 43.6	Partial	
Axial Resistance (kN)	Rc 3800.73 kN, Rs 4455.45 kN, Rq 1656.8 kN	1656.8 kN	
Degree of Shear Connection	Na/Np = 19 / 43.6 > 0.4	0.436	OK
Reduced Concrete Area	Area required to resist 1656.8 kN	53.2x1731.5mm²	
Moment Capacity	Plastic neutral axis in top flange @ 149.9 mm	754.27 kN.m	OK
Check @ 0.5 m	M = 141.81 kN.m, Fv = 282.81 kN		
Shear Connection	No of shear connectors from nearest support 4 < 43.6	Partial	
Axial Resistance (kN)	Rc 3800.73 kN, Rs 4455.45 kN, Rq 348.8 kN	348.8 kN	
Reduced Concrete Area	Area required to resist 348.8 kN	11.2x1731.5mm²	
Moment Capacity	Plastic neutral axis in web @ 225.1 mm	575.44 kN.m	OK
Check @ 2.642 m	M = 549.82 kN.m, Fv = 188.59 kN		
Shear Connection	No of shear connectors from nearest support 19 < 43.6	Partial	
Axial Resistance (kN)	Rc 3800.73 kN, Rs 4455.45 kN, Rq 1656.8 kN	1656.8 kN	
Reduced Concrete Area	Area required to resist 1656.8 kN	53.2x1731.5mm²	
Moment Capacity	Plastic neutral axis in top flange @ 149.9 mm	754.27 kN.m	OK
Check @ 4.783 m	M = 498.33 kN.m, Fv = 230.63 kN		
Shear Connection	No of shear connectors from nearest support 16 < 43.6	Partial	
Axial Resistance (kN)	Rc 3800.73 kN, Rs 4455.45 kN, Rq 1395.2 kN	1395.2 kN	
Reduced Concrete Area	Area required to resist 1395.2 kN	44.8x1731.5mm²	
Moment Capacity	Plastic neutral axis in top flange @ 151.8 mm	727.61 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 145 mm	6.9 per m	
Vr = fn(Asv,fy,Acv,fcu)	755, 460, 79000, 40	337.91 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	6.9x87.2x0.87/(0.87+0.87)	300.69 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 101.49 kN, RH Support 84.81 kN	< 672.16 kN	OK
Check @ 2.701 m (Max. Moment)	M = 195.3 kN.m, Fv = 6.66 kN		
Moment Capacity	Plastic neutral axis in web @ 138.2 mm	495.39 kN.m	OK
Check @ 0.5 m	M = 50.56 kN.m, Fv = 100.56 kN		
Moment Capacity	Plastic neutral axis in web @ 138.2 mm	495.39 kN.m	OK
Check @ 2.642 m	M = 195.69 kN.m, Fv = 65.8 kN		
Moment Capacity	Plastic neutral axis in web @ 138.2 mm	495.39 kN.m	OK
Check @ 4.783 m	M = 177.45 kN.m, Fv = 80.85 kN		
Moment Capacity	Plastic neutral axis in web @ 138.2 mm	495.39 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 0.5 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 50.562, 0.6	30.337 kN.m	
Mb=fn(L,ry,β_w,u,v)	0.5 m, 6.7 cm, 1, 0.851, 0.994	495.391 kN.m	OK
Check between 0.5 and 2.642 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	50.562, 195.685, 0.703	137.636 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.142 m, 6.7 cm, 1, 0.851, 0.907	495.391 kN.m	OK
Check between 2.642 and 4.783 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	195.685, 177.45, 0.963	188.391 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.141 m, 6.7 cm, 1, 0.851, 0.907	495.391 kN.m	OK
Check between 4.783 and 6.926 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	177.45, 0, 0.6	106.47 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.143 m, 6.7 cm, 1, 0.851, 0.907	495.391 kN.m	OK

Serviceability Limit State

Support Reactions (kN)	
Live Loads	LH Support 109 kN, RH Support 89.58 kN
Super Imposed Dead Load	LH Support 15.99 kN, RH Support 13.14 kN

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Dead Load (Self Weight)	LH Support 62.11 kN, RH Support 52.05 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	7.70 (9.67) mm @ 3.463 m < L / 360 = 19.2 mm	9.67 mm	OK
Super Imposed Dead Loads	1.13 (1.42) mm @ 3.463 m	1.42 mm	
Dead Loads (Self Weight)	12.67 mm @ 3.463 m	12.67 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 82, Super Dead 12, SW 73.2 < 265	167.18 N/mm²	OK
TOTAL (Compression)	Live 7.4, Super Dead 1.1, SW 73.2 < 265	81.64 N/mm²	OK
Maximum Concrete Stress	Live 4.94, Super Dead 0.72, SW 0 < 20	5.67 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	6.76 mm	
Natural Frequency	$18/\sqrt{(6.76/1.1)} = 7.26 > 4$ Hz	7.26 Hz	OK

UNPROPPED COMPOSITE PRIMARY EDGE BEAM
Members 635, 637 and 639 (Q3-Q2) @ Level 3

Summary of Design Data (Integrated Design)

Steel Section (107 kg/m)	254x254 UC 107 [S 275]
Floor Area Supported	6.425 m Span and 4.644 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+393 mm²/m
Headed Stud Connector	19x95 mm Placed @ 300 mm centre
Transverse Beams	@ 2.141 and 4.283 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	122 x 907 mm², b1= 803 mm and b2= 104 mm
Steel Section Elastic Properties	ye 133.4 mm, A 136.4 cm², Ix 17517 cm⁴, Zt 1314 cm³, Zb 1314 cm³
Composite Section Elastic Properties	ye 172.7 mm, Ix 43896 cm⁴, Zs.t 10270 cm³, Zs.b 1960 cm³, Zc.t 25411 cm³
Headed Stud Connector	21 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	109.87 kN each side	< 542.79 kN	OK
Check @ 3.212 m (Max. Moment)	M = 217.04 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 10 < 22.8	Partial	
Axial Resistance (kN)	Rc 1990.13 kN, Rs 3614.07 kN, Rq 872 kN	872 kN	
Degree of Shear Connection	Na/Np = 10 / 22.8 > 0.4	0.438	OK
Reduced Concrete Area	Area required to resist 872 kN	53.4x906.6mm²	
Moment Capacity	Plastic neutral axis in top flange @ 149.7 mm	540.43 kN.m	OK
Check @ 2.141 m	M = 210.97 kN.m, Fv = 87.19 kN		
Shear Connection	No of shear connectors from nearest support 7 < 22.8	Partial	
Axial Resistance (kN)	Rc 1990.13 kN, Rs 3614.07 kN, Rq 610.4 kN	610.4 kN	
Reduced Concrete Area	Area required to resist 610.4 kN	37.4x906.6mm²	
Moment Capacity	Plastic neutral axis in web @ 173.4 mm	511.21 kN.m	OK
Check @ 4.283 m	M = 210.99 kN.m, Fv = 87.19 kN		
Shear Connection	No of shear connectors from nearest support 7 < 22.8	Partial	
Axial Resistance (kN)	Rc 1990.13 kN, Rs 3614.07 kN, Rq 610.4 kN	610.4 kN	
Reduced Concrete Area	Area required to resist 610.4 kN	37.4x906.6mm²	
Moment Capacity	Plastic neutral axis in web @ 173.4 mm	511.21 kN.m	OK

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Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 300 mm	3.33 per m	
Vr = fn(Asv,fy,Acv,fcu)	645, 460, 79000, 40	302.49 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.33x87.2x0.8/(0.8+0.1)	257.48 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	30.74 kN each side	< 542.79 kN	OK
Check @ 3.212 m (Max. Moment)	M = 63.25 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK
Check @ 2.141 m	M = 62.39 kN.m, Fv = 27.53 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK
Check @ 4.283 m	M = 62.4 kN.m, Fv = 27.53 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.141 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 62.389, 0.6	37.433 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.141 m, 6.6 cm, 1, 0.848, 0.929	393.366 kN.m	OK
Check between 2.141 and 4.283 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	62.389, 62.396, 1	62.393 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.142 m, 6.6 cm, 1, 0.848, 0.929	393.366 kN.m	OK
Check between 4.283 and 6.425 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	62.396, 0, 0.6	37.438 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.142 m, 6.6 cm, 1, 0.848, 0.929	393.366 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	29.84 kN each side		
Super Imposed Dead Load	25.26 kN each side		
Dead Load (Self Weight)	19.12 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	3.12 (3.91) mm @ 3.212 m < L / 360 = 17.8 mm	3.91 mm	OK
Super Imposed Dead Loads	2.06 (2.58) mm @ 3.212 m	2.58 mm	
Dead Loads (Self Weight)	4.77 mm @ 3.212 m	4.77 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 32.6, Super Dead 21.9, SW 29.8 < 265	84.26 N/mm²	OK
TOTAL (Compression)	Live 6.2, Super Dead 4.2, SW 29.8 < 265	40.16 N/mm²	OK
Maximum Concrete Stress	Live 2.52, Super Dead 1.69, SW 0 < 20	4.20 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	4.88 mm	
Natural Frequency	18/√(4.88/1.1) = 8.55 > 4 Hz	8.55 Hz	OK

UNPROPPED COMPOSITE PRIMARY INTERNAL BEAM
Members 636, 640 and 643 (N3-N2) @ Level 4

Summary of Design Data (Integrated Design)

Steel Section (73 kg/m)	254x254 UC 73 [S 275]
Floor Area Supported	6.425 m Span, 5.096 m to LH Beam and 4.644 m to RH Beam
Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 13.79, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed @ 250 mm centre
Transverse Beams	@ 2.141 and 4.284 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

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Section Properties

Concrete Effective Area	122 x 1606 mm², b1= 803 mm and b2= 803 mm		
Steel Section Elastic Properties	ye 127.1 mm, A 93.1 cm², Ix 11414 cm⁴, Zt 898 cm³, Zb 898 cm³		
Composite Section Elastic Properties	ye 138.6 mm, Ix 34796 cm⁴, Zs.t 40433 cm³, Zs.b 1417 cm³, Zc.t 34619 cm³		
Headed Stud Connector	25 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)		

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 162.54 kN, RH Support 162.6 kN	< 360.57 kN	OK
Check @ 3.277 m (Max. Moment)	M = 346.34 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 12 < 29.4	Partial	
Axial Resistance (kN)	Rc 3525.8 kN, Rs 2560.25 kN, Rq 1046.4 kN	1046.4 kN	
Degree of Shear Connection	Na/Np = 12 / 29.4 > 0.4	0.409	OK
Reduced Concrete Area	Area required to resist 1046.4 kN	36.2x1606.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 140.5 mm	429.77 kN.m	OK
Check @ 2.141 m	M = 345.68 kN.m, Fv = 160.35 kN		
Shear Connection	No of shear connectors from nearest support 8 < 29.4	Partial	
Axial Resistance (kN)	Rc 3525.8 kN, Rs 2560.25 kN, Rq 697.6 kN	697.6 kN	
Reduced Concrete Area	Area required to resist 697.6 kN	24.1x1606.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 143 mm	390.83 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 250 mm	4 per m	
Vr = fn(Asv,fy,Acv,fcu)	252, 460, 79000, 40	175.94 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	4x87.2x0.8/(0.8+0.8)	174.40 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 57.74 kN, RH Support 57.76 kN	< 360.57 kN	OK
Check @ 3.213 m (Max. Moment)	M = 121.88 kN.m, Fv = 0.02 kN		
Moment Capacity	Plastic neutral axis in web @ 127.1 mm	272.83 kN.m	OK
Check @ 2.141 m	M = 121.27 kN.m, Fv = 55.55 kN		
Moment Capacity	Plastic neutral axis in web @ 127.1 mm	272.83 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.141 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 121.272, 0.6	72.763 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.141 m, 6.48 cm, 1, 0.849, 0.959	272.828 kN.m	OK
Check between 2.141 and 4.284 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	121.272, 121.272, 1	121.272 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.143 m, 6.48 cm, 1, 0.849, 0.959	272.828 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 62.68 kN, RH Support 62.7 kN		
Super Imposed Dead Load	9.2 kN each side		
Dead Load (Self Weight)	LH Support 35.27 kN, RH Support 35.28 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	8.27 (11.28) mm @ 3.213 m < L / 360 = 17.8 mm	11.28 mm	OK
Super Imposed Dead Loads	1.21 (1.65) mm @ 3.213 m	1.65 mm	
Dead Loads (Self Weight)	13.94 mm @ 3.213 m	13.94 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 94.7, Super Dead 13.9, SW 82.7 < 275	191.29 N/mm²	OK
TOTAL (Compression)	Live 3.3, Super Dead 0.5, SW 82.7 < 275	86.48 N/mm²	OK
Maximum Concrete Stress	Live 3.88, Super Dead 0.57, SW 0 < 20	4.45 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	7.35 mm	
Natural Frequency	18/√(7.35/1.1) = 6.96 > 4 Hz	6.96 Hz	OK

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UNPROPPED NON-COMPOSITE SECONDARY EDGE BEAM
Members 645-646 (A4-A2) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (107 kg/m)	254x254 UC 107 [S 275]		
Floor Area Supported	6.008 m Span and 1.072 m to LH Beam		
Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick		
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m		
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame		

Section Properties

Steel Section Elastic Properties	ye 133.4 mm, A 136.4 cm², Ix 17517 cm⁴, Zt 1314 cm³, Zb 1314 cm³		

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 67.95 kN, RH Support 48.33 kN	< 542.79 kN	OK
Check @ 1.923 m (Max. Moment)	M = 108.98 kN.m, Fv = 5.03 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 16.86 kN, RH Support 10.14 kN	< 542.79 kN	OK
Check @ 1.923 m (Max. Moment)	M = 28.93 kN.m, Fv = 4.02 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 14.21 kN, RH Support 6.49 kN		
Super Imposed Dead Load	LH Support 21.61 kN, RH Support 20.48 kN		
Dead Load (Self Weight)	LH Support 10.69 kN, RH Support 6.63 kN		
Maximum Deflection			
Live Loads	2.15 (2.15) mm @ 2.704 m < L / 360 = 16.6 mm	2.15 mm	OK
Super Imposed Dead Loads	3.38 mm @ 3.004 m	3.38 mm	
Dead Loads (Self Weight)	1.63 mm @ 2.824 m	1.63 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 20.2, Super Dead 24.6, SW 13.8 < 265	58.53 N/mm²	OK
TOTAL (Compression)	Live 20.2, Super Dead 24.6, SW 13.8 < 265	58.53 N/mm²	OK

Vibration Analysis

Beam Deflection		5.23 mm	
Natural Frequency	18/√(5.23) = 7.87 > 4 Hz	7.87 Hz	OK

UNPROPPED COMPOSITE PRIMARY INTERNAL BEAM
Members 670, 673, 677 and 680 (H5-H2) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (167 kg/m)	254x254 UC 167 [S 275]
Floor Area Supported	7.017 m Span, 1.013 m to LH Beam and 6.85 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+785 mm²/m
Headed Stud Connector	19x95 mm Placed @ 150 mm centre

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Transverse Beams	@ 2.005, 2.339 and 4.678 m		
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame		

Section Properties

Concrete Effective Area	122 x 1282 mm², b1= 405 mm and b2= 877 mm		
Steel Section Elastic Properties	ye 144.6 mm, A 212.9 cm², Ix 30005 cm⁴, Zt 2076 cm³, Zb 2076 cm³		
Composite Section Elastic Properties	ye 184.1 mm, Ix 73063 cm⁴, Zs.t 13506 cm³, Zs.b 3109 cm³, Zc.t 39688 cm³		
Headed Stud Connector	46 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)		

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 200.52 kN, RH Support 189.91 kN	< 882.56 kN	OK
Check @ 3.087 m (Max. Moment)	M = 440.82 kN.m, Fv = 0.05 kN		
Shear Connection	No of shear connectors from nearest support 20 < 32.3	Partial	
Axial Resistance (kN)	Rc 2814.77 kN, Rs 5640.53 kN, Rq 1744 kN	1744 kN	
Degree of Shear Connection	Na/Np = 20 / 32.3 > 0.4	0.62	OK
Reduced Concrete Area	Area required to resist 1744 kN	75.6x1282.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 157.5 mm	917.89 kN.m	OK
Check @ 2.005 m	M = 397.45 kN.m, Fv = 195.83 kN		
Shear Connection	No of shear connectors from nearest support 13 < 32.3	Partial	
Axial Resistance (kN)	Rc 2814.77 kN, Rs 5640.53 kN, Rq 1133.6 kN	1133.6 kN	
Reduced Concrete Area	Area required to resist 1133.6 kN	49.1x1282.3mm²	
Moment Capacity	Plastic neutral axis in web @ 163.2 mm	858.49 kN.m	OK
Check @ 2.339 m	M = 440.2 kN.m, Fv = 128.18 kN		
Shear Connection	No of shear connectors from nearest support 15 < 32.3	Partial	
Axial Resistance (kN)	Rc 2814.77 kN, Rs 5640.53 kN, Rq 1308 kN	1308 kN	
Reduced Concrete Area	Area required to resist 1308 kN	56.7x1282.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 160.6 mm	877.38 kN.m	OK
Check @ 4.678 m	M = 437.79 kN.m, Fv = 184.45 kN		
Shear Connection	No of shear connectors from nearest support 15 < 32.3	Partial	
Axial Resistance (kN)	Rc 2814.77 kN, Rs 5640.53 kN, Rq 1308 kN	1308 kN	
Reduced Concrete Area	Area required to resist 1308 kN	56.7x1282.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 160.6 mm	877.38 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 150 mm	6.67 per m	
Vr = fn(Asv,fy,Acv,fcu)	1037, 460, 79000, 40	399.71 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	6.67x87.2x0.88/(0.41+0.88)	397.64 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 73.88 kN, RH Support 70.51 kN	< 882.56 kN	OK
Check @ 3.438 m (Max. Moment)	M = 160.33 kN.m, Fv = 0.02 kN		
Moment Capacity	Plastic neutral axis in web @ 144.6 mm	642.28 kN.m	OK
Check @ 2.005 m	M = 143.47 kN.m, Fv = 69.19 kN		
Moment Capacity	Plastic neutral axis in web @ 144.6 mm	642.28 kN.m	OK
Check @ 2.339 m	M = 158.94 kN.m, Fv = 46.14 kN		
Moment Capacity	Plastic neutral axis in web @ 144.6 mm	642.28 kN.m	OK
Check @ 4.678 m	M = 158.52 kN.m, Fv = 65.04 kN		
Moment Capacity	Plastic neutral axis in web @ 144.6 mm	642.28 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.005 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 143.466, 0.6	86.08 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.005 m, 6.81 cm, 1, 0.852, 0.889	642.281 kN.m	OK
Check between 2.005 and 2.339 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	143.466, 158.938, 0.961	152.749 kN.m	
Mb=fn(L,ry,β_w,u,v)	0.334 m, 6.81 cm, 1, 0.852, 0.996	642.281 kN.m	OK

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Check between 2.339 and 4.678 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	158.938, 158.518, 0.999	158.77 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.339 m, 6.81 cm, 1, 0.852, 0.861	642.281 kN.m	OK
Check between 4.678 and 7.017 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	158.518, 0, 0.6	95.111 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.339 m, 6.81 cm, 1, 0.852, 0.861	642.281 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 75.74 kN, RH Support 71.41 kN		
Super Imposed Dead Load	LH Support 11.11 kN, RH Support 10.47 kN		
Dead Load (Self Weight)	LH Support 45.56 kN, RH Support 43.56 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	5.91 (6.64) mm @ 3.508 m < L / 360 = 19.4 mm	6.64 mm	OK
Super Imposed Dead Loads	0.87 (0.97) mm @ 3.508 m	0.97 mm	
Dead Loads (Self Weight)	8.43 mm @ 3.508 m	8.43 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 54.1, Super Dead 7.9, SW 47.5 < 265	109.51 N/mm²	OK
TOTAL (Compression)	Live 12.5, Super Dead 1.8, SW 47.5 < 265	61.76 N/mm²	OK
Maximum Concrete Stress	Live 4.24, Super Dead 0.62, SW 0 < 20	4.86 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	5.1 mm	
Natural Frequency	18/√(5.10/1.1) = 8.36 > 4 Hz	8.36 Hz	OK

UNPROPPED NON-COMPOSITE SECONDARY INTERNAL BEAM
Members 672 and 676 (N.414-N.423) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	3.593 m Span, 1.986 m to LH Beam and .841 m to RH Beam
Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³ with 252 mm²/m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 30.25 kN, RH Support 32.41 kN	< 218.38 kN	OK
Check @ 2.336 m (Max. Moment)	M = 20.07 kN.m, Fv = 0.38 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 1.56 kN, RH Support 2.2 kN	< 218.38 kN	OK
Check @ 1.797 m (Max. Moment)	M = -10.15 kN.m, Fv = 12.63 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 2.48 kN, RH Support 3.25 kN		
Super Imposed Dead Load	LH Support 4.01 kN, RH Support 4.2 kN		
Dead Load (Self Weight)	LH Support 1.1 kN, RH Support 1.49 kN		
Maximum Deflection			
Live Loads	1.19 (1.19) mm @ 1.797 m < L / 360 = 9.9 mm	1.19 mm	OK
Super Imposed Dead Loads	1.03 mm @ 1.797 m	1.03 mm	

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Dead Loads (Self Weight)	0.71 mm @ 1.797 m	0.71 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live -36.5, Super Dead 18.2, SW -21 < 275	-39.21 N/mm²	OK
TOTAL (Compression)	Live -36.5, Super Dead 18.2, SW -21 < 275	-39.21 N/mm²	OK

Vibration Analysis

Beam Deflection		1.85 mm	
Natural Frequency	18/√(1.85) = 13.22 > 4 Hz	13.22 Hz	OK

UNPROPPED COMPOSITE PRIMARY INTERNAL BEAM
Members 690, 693, 697 and 701 (M5-M2) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (132 kg/m)	254x254 UC 132 [S 275]
Floor Area Supported	6.926 m Span, 6.848 m to LH Beam and 5.085 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+503 mm²/m
Headed Stud Connector	19x95 mm Placed @ 145 mm centre
Transverse Beams	@ 0.5, 2.642 and 4.783 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	122 x 1732 mm², b1= 866 mm and b2= 866 mm
Steel Section Elastic Properties	ye 138.2 mm, A 168.1 cm², Ix 22536 cm⁴, Zt 1631 cm³, Zb 1631 cm³
Composite Section Elastic Properties	ye 152.8 mm, Ix 65328 cm⁴, Zs.t 28638 cm³, Zs.b 2577 cm³, Zc.t 42750 cm³
Headed Stud Connector (+1)	48 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 283.73 kN, RH Support 234.59 kN	< 672.16 kN	OK
Check @ 2.701 m (Max. Moment)	M = 548.54 kN.m, Fv = 22.2 kN		
Shear Connection	No of shear connectors from nearest support 19 < 43.6	Partial	
Axial Resistance (kN)	Rc 3800.73 kN, Rs 4455.45 kN, Rq 1656.8 kN	1656.8 kN	
Degree of Shear Connection	Na/Np = 19 / 43.6 > 0.4	0.436	OK
Reduced Concrete Area	Area required to resist 1656.8 kN	53.2x1731.5mm²	
Moment Capacity	Plastic neutral axis in top flange @ 149.9 mm	754.27 kN.m	OK
Check @ 0.5 m	M = 141.81 kN.m, Fv = 282.81 kN		
Shear Connection	No of shear connectors from nearest support 4 < 43.6	Partial	
Axial Resistance (kN)	Rc 3800.73 kN, Rs 4455.45 kN, Rq 348.8 kN	348.8 kN	
Reduced Concrete Area	Area required to resist 348.8 kN	11.2x1731.5mm²	
Moment Capacity	Plastic neutral axis in web @ 225.1 mm	575.44 kN.m	OK
Check @ 2.642 m	M = 549.83 kN.m, Fv = 188.59 kN		
Shear Connection	No of shear connectors from nearest support 19 < 43.6	Partial	
Axial Resistance (kN)	Rc 3800.73 kN, Rs 4455.45 kN, Rq 1656.8 kN	1656.8 kN	
Reduced Concrete Area	Area required to resist 1656.8 kN	53.2x1731.5mm²	
Moment Capacity	Plastic neutral axis in top flange @ 149.9 mm	754.27 kN.m	OK
Check @ 4.783 m	M = 498.33 kN.m, Fv = 230.63 kN		
Shear Connection	No of shear connectors from nearest support 16 < 43.6	Partial	
Axial Resistance (kN)	Rc 3800.73 kN, Rs 4455.45 kN, Rq 1395.2 kN	1395.2 kN	
Reduced Concrete Area	Area required to resist 1395.2 kN	44.8x1731.5mm²	
Moment Capacity	Plastic neutral axis in top flange @ 151.8 mm	727.61 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 145 mm	6.9 per m	
Vr = fn(Asv,fy,Acv,fcu)	755, 460, 79000, 40	337.91 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	6.9x87.2x0.87/(0.87+0.87)	300.69 kN	OK

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Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 101.48 kN, RH Support 84.81 kN	< 672.16 kN	OK
Check @ 2.701 m (Max. Moment)	M = 195.3 kN.m, Fv = 6.66 kN		
Moment Capacity	Plastic neutral axis in web @ 138.2 mm	495.39 kN.m	OK
Check @ 0.5 m	M = 50.56 kN.m, Fv = 100.56 kN		
Moment Capacity	Plastic neutral axis in web @ 138.2 mm	495.39 kN.m	OK
Check @ 2.642 m	M = 195.69 kN.m, Fv = 65.8 kN		
Moment Capacity	Plastic neutral axis in web @ 138.2 mm	495.39 kN.m	OK
Check @ 4.783 m	M = 177.45 kN.m, Fv = 80.85 kN		
Moment Capacity	Plastic neutral axis in web @ 138.2 mm	495.39 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 0.5 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 50.563, 0.6	30.338 kN.m	
Mb=fn(L,ry,β_w,u,v)	0.5 m, 6.7 cm, 1, 0.851, 0.994	495.391 kN.m	OK
Check between 0.5 and 2.642 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	50.563, 195.686, 0.703	137.637 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.142 m, 6.7 cm, 1, 0.851, 0.907	495.391 kN.m	OK
Check between 2.642 and 4.783 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	195.686, 177.45, 0.963	188.392 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.141 m, 6.7 cm, 1, 0.851, 0.907	495.391 kN.m	OK
Check between 4.783 and 6.926 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	177.45, 0, 0.6	106.47 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.143 m, 6.7 cm, 1, 0.851, 0.907	495.391 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 109 kN, RH Support 89.58 kN		
Super Imposed Dead Load	LH Support 15.99 kN, RH Support 13.14 kN		
Dead Load (Self Weight)	LH Support 62.11 kN, RH Support 52.05 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	7.70 (9.67) mm @ 3.463 m < L / 360 = 19.2 mm	9.67 mm	OK
Super Imposed Dead Loads	1.13 (1.42) mm @ 3.463 m	1.42 mm	
Dead Loads (Self Weight)	12.67 mm @ 3.463 m	12.67 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 82, Super Dead 12, SW 73.2 < 265	167.18 N/mm²	OK
TOTAL (Compression)	Live 7.4, Super Dead 1.1, SW 73.2 < 265	81.64 N/mm²	OK
Maximum Concrete Stress	Live 4.94, Super Dead 0.72, SW 0 < 20	5.67 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	6.76 mm	
Natural Frequency	18/√(6.76/1.1) = 7.26 > 4 Hz	7.26 Hz	OK

UNPROPPED COMPOSITE PRIMARY EDGE BEAM
Members 694, 696 and 698 (Q3-Q2) @ Level 4

Summary of Design Data (Integrated Design)

Steel Section (107 kg/m)	254x254 UC 107 [S 275]
Floor Area Supported	6.425 m Span and 4.644 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+393 mm²/m
Headed Stud Connector	19x95 mm Placed @ 300 mm centre

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Transverse Beams	@ 2.141 and 4.283 m		
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame		

Section Properties

Concrete Effective Area	122 x 907 mm², b1= 803 mm and b2= 104 mm		
Steel Section Elastic Properties	ye 133.4 mm, A 136.4 cm², Ix 17517 cm⁴, Zt 1314 cm³, Zb 1314 cm³		
Composite Section Elastic Properties	ye 172.7 mm, Ix 43896 cm⁴, Zs.t 10270 cm³, Zs.b 1960 cm³, Zc.t 25411 cm³		
Headed Stud Connector	21 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)		

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	109.87 kN each side	< 542.79 kN	OK
Check @ 3.212 m (Max. Moment)	M = 217.04 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 10 < 22.8	Partial	
Axial Resistance (kN)	Rc 1990.13 kN, Rs 3614.07 kN, Rq 872 kN	872 kN	
Degree of Shear Connection	Na/Np = 10 / 22.8 > 0.4	0.438	OK
Reduced Concrete Area	Area required to resist 872 kN	53.4x906.6mm²	
Moment Capacity	Plastic neutral axis in top flange @ 149.7 mm	540.43 kN.m	OK
Check @ 2.141 m	M = 210.97 kN.m, Fv = 87.19 kN		
Shear Connection	No of shear connectors from nearest support 7 < 22.8	Partial	
Axial Resistance (kN)	Rc 1990.13 kN, Rs 3614.07 kN, Rq 610.4 kN	610.4 kN	
Reduced Concrete Area	Area required to resist 610.4 kN	37.4x906.6mm²	
Moment Capacity	Plastic neutral axis in web @ 173.4 mm	511.21 kN.m	OK
Check @ 4.283 m	M = 210.99 kN.m, Fv = 87.19 kN		
Shear Connection	No of shear connectors from nearest support 7 < 22.8	Partial	
Axial Resistance (kN)	Rc 1990.13 kN, Rs 3614.07 kN, Rq 610.4 kN	610.4 kN	
Reduced Concrete Area	Area required to resist 610.4 kN	37.4x906.6mm²	
Moment Capacity	Plastic neutral axis in web @ 173.4 mm	511.21 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 300 mm	3.33 per m	
Vr = fn(Asv,fy,Acv,fcu)	645, 460, 79000, 40	302.49 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.33x87.2x0.8/(0.8+0.1)	257.48 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	30.74 kN each side	< 542.79 kN	OK
Check @ 3.212 m (Max. Moment)	M = 63.25 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK
Check @ 2.141 m	M = 62.39 kN.m, Fv = 27.53 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK
Check @ 4.283 m	M = 62.4 kN.m, Fv = 27.53 kN		
Moment Capacity	Plastic neutral axis in web @ 133.4 mm	393.37 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.141 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 62.389, 0.6	37.433 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.141 m, 6.6 cm, 1, 0.848, 0.929	393.366 kN.m	OK
Check between 2.141 and 4.283 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	62.389, 62.396, 1	62.393 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.142 m, 6.6 cm, 1, 0.848, 0.929	393.366 kN.m	OK
Check between 4.283 and 6.425 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	62.396, 0, 0.6	37.438 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.142 m, 6.6 cm, 1, 0.848, 0.929	393.366 kN.m	OK

Serviceability Limit State

Support Reactions (kN)	
Live Loads	29.84 kN each side
Super Imposed Dead Load	25.26 kN each side

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Dead Load (Self Weight)	19.12 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	3.12 (3.91) mm @ 3.212 m < L / 360 = 17.8 mm	3.91 mm	OK
Super Imposed Dead Loads	2.06 (2.58) mm @ 3.212 m	2.58 mm	
Dead Loads (Self Weight)	4.77 mm @ 3.212 m	4.77 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 32.6, Super Dead 21.9, SW 29.8 < 265	84.26 N/mm²	OK
TOTAL (Compression)	Live 6.2, Super Dead 4.2, SW 29.8 < 265	40.16 N/mm²	OK
Maximum Concrete Stress	Live 2.52, Super Dead 1.69, SW 0 < 20	4.20 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	4.88 mm	
Natural Frequency	18/√(4.88/1.1) = 8.55 > 4 Hz	8.55 Hz	OK

UNPROPPED COMPOSITE PRIMARY INTERNAL BEAM
Members 699, 702 and 704 (N3-N2) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (73 kg/m)	254x254 UC 73 [S 275]
Floor Area Supported	6.425 m Span, 5.096 m to LH Beam and 4.644 m to RH Beam
Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 13.79, Gr 40 with 252+193 mm²/m
Headed Stud Connector	19x95 mm Placed @ 225 mm centre
Transverse Beams	@ 2.141 and 4.284 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	122 x 1606 mm², b1= 803 mm and b2= 803 mm
Steel Section Elastic Properties	ye 127.1 mm, A 93.1 cm², Ix 11414 cm⁴, Zt 898 cm³, Zb 898 cm³
Composite Section Elastic Properties	ye 138.6 mm, Ix 34796 cm⁴, Zs.t 40433 cm³, Zs.b 1417 cm³, Zc.t 34619 cm³
Headed Stud Connector	28 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 162.54 kN, RH Support 162.6 kN	< 360.57 kN	OK
Check @ 3.277 m (Max. Moment)	M = 346.34 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 14 < 29.4	Partial	
Axial Resistance (kN)	Rc 3525.8 kN, Rs 2560.25 kN, Rq 1220.8 kN	1220.8 kN	
Degree of Shear Connection	Na/Np = 14 / 29.4 > 0.4	0.477	OK
Reduced Concrete Area	Area required to resist 1220.8 kN	42.2x1606.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 139.3 mm	447.33 kN.m	OK
Check @ 2.141 m	M = 345.68 kN.m, Fv = 160.35 kN		
Shear Connection	No of shear connectors from nearest support 9 < 29.4	Partial	
Axial Resistance (kN)	Rc 3525.8 kN, Rs 2560.25 kN, Rq 784.8 kN	784.8 kN	
Reduced Concrete Area	Area required to resist 784.8 kN	27.1x1606.3mm²	
Moment Capacity	Plastic neutral axis in top flange @ 142.4 mm	401.04 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 225 mm	4.44 per m	
Vr = fn(Asv,fy,Acv,fcu)	445, 460, 79000, 40	238.09 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	4.44x87.2x0.8/(0.8+0.8)	193.78 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 57.74 kN, RH Support 57.76 kN	< 360.57 kN	OK

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Check @ 3.213 m (Max. Moment)	M = 121.89 kN.m, Fv = 0.02 kN		
Moment Capacity	Plastic neutral axis in web @ 127.1 mm	272.83 kN.m	OK
Check @ 2.141 m	M = 121.28 kN.m, Fv = 55.55 kN		
Moment Capacity	Plastic neutral axis in web @ 127.1 mm	272.83 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.141 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 121.275, 0.6	72.765 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.141 m, 6.48 cm, 1, 0.849, 0.959	272.828 kN.m	OK
Check between 2.141 and 4.284 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	121.275, 121.275, 1	121.275 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.143 m, 6.48 cm, 1, 0.849, 0.959	272.828 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 62.68 kN, RH Support 62.7 kN		
Super Imposed Dead Load	9.2 kN each side		
Dead Load (Self Weight)	LH Support 35.27 kN, RH Support 35.28 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	8.27 (10.93) mm @ 3.213 m < L / 360 = 17.8 mm	10.93 mm	OK
Super Imposed Dead Loads	1.21 (1.60) mm @ 3.213 m	1.60 mm	
Dead Loads (Self Weight)	13.94 mm @ 3.213 m	13.94 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 94.7, Super Dead 13.9, SW 82.7 < 275	191.29 N/mm²	OK
TOTAL (Compression)	Live 3.3, Super Dead 0.5, SW 82.7 < 275	86.49 N/mm²	OK
Maximum Concrete Stress	Live 3.88, Super Dead 0.57, SW 0 < 20	4.45 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	7.27 mm	
Natural Frequency	18/√(7.27/1.1) = 7 > 4 Hz	7.00 Hz	OK

UNPROPPED COMPOSITE PRIMARY EDGE BEAM
Members 734 and 736-737 (Q3-Q2) @ Level 5

Summary of Design Data (Integrated Design)

Steel Section (86 kg/m)	203x203 UC 86 [S 275]
Floor Area Supported	6.425 m Span and 4.644 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+393 mm²/m
Headed Stud Connector	19x95 mm Placed @ 300 mm centre
Transverse Beams	@ 2.141 and 4.283 m
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	122 x 887 mm², b1= 803 mm and b2= 84 mm
Steel Section Elastic Properties	ye 111.1 mm, A 109.6 cm², Ix 9452 cm⁴, Zt 851 cm³, Zb 851 cm³
Composite Section Elastic Properties	ye 151.7 mm, Ix 28455 cm⁴, Zs.t 13141 cm³, Zs.b 1419 cm³, Zc.t 18763 cm³
Headed Stud Connector	21 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2 (pair k 1)

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	108.92 kN each side	< 448.69 kN	OK

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Shear Connection	No of shear connectors from nearest support 10 < 22.3	Partial	
Axial Resistance (kN)	Rc 1946.5 kN, Rs 2905.2 kN, Rq 872 kN	872 kN	
Degree of Shear Connection	Na/Np = 10 / 22.3 > 0.4	0.44	
			OK
Reduced Concrete Area	Area required to resist 872 kN	54.6x886.8mm²	
Moment Capacity	Plastic neutral axis in top flange @ 148.1 mm	391.48 kN.m	OK
Check @ 2.141 m	M = 209.61 kN.m, Fv = 86.87 kN		
Shear Connection	No of shear connectors from nearest support 7 < 22.3	Partial	
Axial Resistance (kN)	Rc 1946.5 kN, Rs 2905.2 kN, Rq 610.4 kN	610.4 kN	
Reduced Concrete Area	Area required to resist 610.4 kN	38.2x886.8mm²	
Moment Capacity	Plastic neutral axis in top flange @ 150.5 mm	364.56 kN.m	OK
Check @ 4.283 m	M = 209.64 kN.m, Fv = 86.87 kN		
Shear Connection	No of shear connectors from nearest support 7 < 22.3	Partial	
Axial Resistance (kN)	Rc 1946.5 kN, Rs 2905.2 kN, Rq 610.4 kN	610.4 kN	
Reduced Concrete Area	Area required to resist 610.4 kN	38.2x886.8mm²	
Moment Capacity	Plastic neutral axis in top flange @ 150.5 mm	364.56 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 300 mm	3.33 per m	
Vr = fn(Asv,fy,Acv,fcu)	645, 460, 79000, 40	302.49 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.33x87.2x0.8/(0.8+0.08)	263.25 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	29.8 kN each side	< 448.69 kN	OK
Check @ 3.212 m (Max. Moment)	M = 61.73 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 2.141 m	M = 61.04 kN.m, Fv = 27.22 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK
Check @ 4.283 m	M = 61.04 kN.m, Fv = 27.22 kN		
Moment Capacity	Plastic neutral axis in web @ 111.1 mm	258.83 kN.m	OK

Lateral Torsional Buckling (Construction Stage)

Check between 0 and 2.141 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	0, 61.036, 0.6	36.622 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.141 m, 5.34 cm, 1, 0.85, 0.867	258.826 kN.m	OK
Check between 2.141 and 4.283 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	61.036, 61.044, 1	61.041 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.142 m, 5.34 cm, 1, 0.85, 0.867	258.826 kN.m	OK
Check between 4.283 and 6.425 m			
m_{LT}.MA=fn(M1,M2,m_{LT})	61.044, 0, 0.6	36.626 kN.m	
Mb=fn(L,ry,β_w,u,v)	2.142 m, 5.34 cm, 1, 0.85, 0.867	258.826 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	29.84 kN each side		
Super Imposed Dead Load	25.26 kN each side		
Dead Load (Self Weight)	18.44 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	4.81 (6.42) mm @ 3.212 m < L / 360 = 17.8 mm	6.42 mm	OK
Super Imposed Dead Loads	3.18 (4.24) mm @ 3.212 m	4.24 mm	
Dead Loads (Self Weight)	8.60 mm @ 3.212 m	8.60 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 45, Super Dead 30.2, SW 44.7 < 265	119.96 N/mm²	OK
TOTAL (Compression)	Live 4.9, Super Dead 3.3, SW 44.7 < 265	52.80 N/mm²	OK
Maximum Concrete Stress	Live 3.41, Super Dead 2.29, SW 0 < 20	5.69 N/mm²	OK

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Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	7.73 mm	
Natural Frequency	$18/\sqrt{(7.73/1.1)} = 6.79 > 4$ Hz	6.79 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Beam Reference (New Brief) Member 213 (N.307-N.309) @ Level 3

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	5.139 m Span, 2.099 m to LH Beam and 2.1 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+142 mm²/m
Headed Stud Connector	19x95 mm Placed One per Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1285 mm², b1= 642 mm and b2= 642 mm
Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³
Composite Section Elastic Properties	ye 92.5 mm, Ix 13861 cm⁴, Zs.t 3702 cm³, Zs.b 568 cm³, Zc.t 14991 cm³
Headed Stud Connector	33 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	82.28 kN each side	< 218.38 kN	OK
Check @ 2.569 m (Max. Moment)	M = 105.69 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 16 > 12.1	Full	
Axial Resistance (kN)	Rc 1826.92 kN, Rs 1050.78 kN, Rq 1395.2 kN	1050.78 kN	
Moment Capacity	Plastic neutral axis in concrete slab @ 44.8 mm	218.82 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 152 mm	6.58 per m	
Vp = fn(N.4.D.tp.pyp)	Min(6.58x4x19,1000)x1.0x350	175.00 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	394, 460, 114000, 40, 175	438.67 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	6.58x87.2x0.64/(0.64+0.64)	286.84 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	28.14 kN each side	< 218.38 kN	OK
Check @ 2.569 m (Max. Moment)	M = 36.15 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	32.38 kN each side		
Super Imposed Dead Load	4.75 kN each side		
Dead Load (Self Weight)	17.02 kN each side		
Maximum Deflection			
Live Loads (Full Connection)	4.03 (4.03) mm @ 2.569 m < L / 360 = 14.2 mm	4.03 mm	OK
Super Imposed Dead Loads	0.59 mm @ 2.569 m	0.59 mm	
Dead Loads (Self Weight)	10.13 mm @ 2.569 m	10.13 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 73.2, Super Dead 10.7, SW 78.1 < 275	162.04 N/mm²	OK
TOTAL (Compression)	Live 11.2, Super Dead 1.6, SW 78.1 < 275	90.94 N/mm²	OK
Maximum Concrete Stress	Live 2.77, Super Dead 0.41, SW 0 < 20	3.18 N/mm²	OK

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Vibration Analysis

Beam Deflection		3.11 mm	
Natural Frequency	$18/\sqrt{(3.11/1.1)} = 10.71 > 4$ Hz	10.71 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Beam Reference Member 215 (N.309-N.375) @ Level 3

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	4.646 m Span, 2.099 m to LH Beam and 2.099 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+142 mm²/m
Headed Stud Connector	19x95 mm Placed One per Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1162 mm², b1= 581 mm and b2= 581 mm
Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³
Composite Section Elastic Properties	ye 96.5 mm, Ix 13516 cm⁴, Zs.t 4042 cm³, Zs.b 563 cm³, Zc.t 14027 cm³
Headed Stud Connector	30 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	74.38 kN each side	< 218.38 kN	OK
Check @ 2.323 m (Max. Moment)	M = 86.39 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 15 > 12.1	Full	
Axial Resistance (kN)	Rc 1651.65 kN, Rs 1050.78 kN, Rq 1308 kN	1050.78 kN	
Moment Capacity	Plastic neutral axis in concrete slab @ 49.6 mm	216.35 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 152 mm	6.58 per m	
Vp = fn(N.4.D.tp.pyp)	Min(6.58x4x19,1000)x1.0x350	175.00 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	394, 460, 114000, 40, 175	438.67 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	6.58x87.2x0.58/(0.58+0.58)	286.84 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	25.44 kN each side	< 218.38 kN	OK
Check @ 2.323 m (Max. Moment)	M = 29.55 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	29.27 kN each side		
Super Imposed Dead Load	4.29 kN each side		
Dead Load (Self Weight)	15.39 kN each side		
Maximum Deflection			
Live Loads (Full Connection)	2.76 (2.76) mm @ 2.323 m < L / 360 = 12.9 mm	2.76 mm	OK
Super Imposed Dead Loads	0.40 mm @ 2.323 m	0.40 mm	
Dead Loads (Self Weight)	6.77 mm @ 2.323 m	6.77 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 60.3, Super Dead 8.9, SW 63.8 < 275	133.00 N/mm²	OK
TOTAL (Compression)	Live 8.4, Super Dead 1.2, SW 63.8 < 275	73.45 N/mm²	OK
Maximum Concrete Stress	Live 2.42, Super Dead 0.36, SW 0 < 20	2.78 N/mm²	OK

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Vibration Analysis

Beam Deflection		2.13 mm	
Natural Frequency	$18/\sqrt{(2.13/1.1)} = 12.93 > 4$ Hz	12.93 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Beam Reference Member 202 (N.290-N.307) @ Level 3

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	203x133 UB 30 [S 275]
Floor Area Supported	5.11 m Span, 2.099 m to LH Beam and 2.1 m to RH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+142 mm²/m
Headed Stud Connector	19x95 mm Placed One per Trough
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 1278 mm², b1= 639 mm and b2= 639 mm
Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³
Composite Section Elastic Properties	ye 92.8 mm, Ix 13842 cm⁴, Zs.t 3719 cm³, Zs.b 568 cm³, Zc.t 14936 cm³
Headed Stud Connector	33 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 82.8 kN, RH Support 82.3 kN	< 218.38 kN	OK
Check @ 2.529 m (Max. Moment)	M = 105.45 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 16 > 12.1	Full	
Axial Resistance (kN)	Rc 1816.61 kN, Rs 1050.78 kN, Rq 1395.2 kN	1050.78 kN	
Moment Capacity	Plastic neutral axis in concrete slab @ 45.1 mm	218.68 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 152 mm	6.58 per m	
Vp = fn(N.4.D.tp.pyp)	Min(6.58x4x19,1000)x1.0x350	175.00 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	394, 460, 114000, 40, 175	438.67 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	6.58x87.2x0.64/(0.64+0.64)	286.84 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 28.31 kN, RH Support 28.15 kN	< 218.38 kN	OK
Check @ 2.529 m (Max. Moment)	M = 36.06 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 32.59 kN, RH Support 32.39 kN		
Super Imposed Dead Load	LH Support 4.78 kN, RH Support 4.75 kN		
Dead Load (Self Weight)	LH Support 17.12 kN, RH Support 17.02 kN		
Maximum Deflection			
Live Loads (Full Connection)	3.98 (3.98) mm @ 2.529 m < L / 360 = 14.1 mm	3.98 mm	OK
Super Imposed Dead Loads	0.58 mm @ 2.529 m	0.58 mm	
Dead Loads (Self Weight)	9.99 mm @ 2.529 m	9.99 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 73.1, Super Dead 10.7, SW 77.9 < 275	161.69 N/mm²	OK
TOTAL (Compression)	Live 11.2, Super Dead 1.6, SW 77.9 < 275	90.65 N/mm²	OK
Maximum Concrete Stress	Live 2.78, Super Dead 0.41, SW 0 < 20	3.19 N/mm²	OK

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Vibration Analysis

Beam Deflection		3.07 mm	
Natural Frequency	$18/\sqrt{(3.07/1.1)} = 10.77 > 4$ Hz	10.77 Hz	OK

UNPROPPED COMPOSITE SECONDARY EDGE BEAM
Beam Reference Member 218 (N1-Q1) @ Level 3

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	4.645 m Span and 2.099 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252+142 mm²/m
Headed Stud Connector	19x95 mm Placed @ 400 mm centres
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 657 mm², b1= 581 mm and b2= 76 mm
Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³
Composite Section Elastic Properties	ye 111.3 mm, Ix 8332 cm⁴, Zs.t 4504 cm³, Zs.b 477 cm³, Zc.t 7550 cm³
Headed Stud Connector	11 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	37.66 kN each side	< 169.03 kN	OK
Check @ 2.323 m (Max. Moment)	M = 43.74 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 5 < 10.7	Partial	
Axial Resistance (kN)	Rc 934.36 kN, Rs 1052.15 kN, Rq 436 kN	436 kN	
Degree of Shear Connection	Na/Np = 5 / 10.7 > 0.4	0.467	OK
Reduced Concrete Area	Area required to resist 436 kN	36.9x657.1mm²	
Moment Capacity	Plastic neutral axis in top flange @ 137.2 mm	128.33 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 400 mm	2.5 per m	
Vp = fn(N.4.D.tp.pyp)	Min(2.5x4x19,1000)x1.0x350	66.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	394, 460, 114000, 40, 66.5	330.17 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	2.5x87.2x0.58/(0.58+0.08)	192.64 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	13.21 kN each side	< 169.03 kN	OK
Check @ 2.323 m (Max. Moment)	M = 15.34 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	14.63 kN each side		
Super Imposed Dead Load	2.15 kN each side		
Dead Load (Self Weight)	8.04 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	2.24 (3.58) mm @ 2.323 m < L / 360 = 12.9 mm	3.58 mm	OK
Super Imposed Dead Loads	0.33 (0.52) mm @ 2.323 m	0.52 mm	
Dead Loads (Self Weight)	5.85 mm @ 2.323 m	5.85 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 35.6, Super Dead 5.2, SW 42.1 < 275	82.92 N/mm²	OK
TOTAL (Compression)	Live 3.8, Super Dead 0.6, SW 42.1 < 275	46.40 N/mm²	OK

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Maximum Concrete Stress	Live 2.25, Super Dead 0.33, SW 0 < 20	2.58 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	2.11 mm	
Natural Frequency	18/√(2.11/1.1) = 12.99 > 4 Hz	12.99 Hz	OK

UNPROPPED COMPOSITE SECONDARY EDGE BEAM
Beam Reference (New Brief) Member 216 (M1-N1) @ Level 3

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	5.15 m Span and 2.099 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed @ 400 mm centres
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 720 mm², b1= 644 mm and b2= 76 mm
Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³
Composite Section Elastic Properties	ye 107.6 mm, Ix 8602 cm⁴, Zs.t 3860 cm³, Zs.b 481 cm³, Zc.t 8048 cm³
Headed Stud Connector	12 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	41.76 kN each side	< 169.03 kN	OK
Check @ 2.575 m (Max. Moment)	M = 53.76 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 6 < 11.7	Partial	
Axial Resistance (kN)	Rc 1024.12 kN, Rs 1052.15 kN, Rq 523.2 kN	523.2 kN	
Degree of Shear Connection	Na/Np = 6 / 11.7 > 0.4	0.511	OK
Reduced Concrete Area	Area required to resist 523.2 kN	40.4x720.2mm²	
Moment Capacity	Plastic neutral axis in top flange @ 136.1 mm	137.72 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 400 mm	2.5 per m	
Vp = fn(N.4.D.tp.pyp)	Min(2.5x4x19,1000)x1.0x350	66.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 66.5	284.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	2.5x87.2x0.64/(0.64+0.08)	194.86 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	14.64 kN each side	< 169.03 kN	OK
Check @ 2.575 m (Max. Moment)	M = 18.85 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	16.22 kN each side		
Super Imposed Dead Load	2.38 kN each side		
Dead Load (Self Weight)	8.91 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	3.27 (5.48) mm @ 2.575 m < L / 360 = 14.3 mm	5.48 mm	OK
Super Imposed Dead Loads	0.48 (0.80) mm @ 2.575 m	0.80 mm	
Dead Loads (Self Weight)	8.84 mm @ 2.575 m	8.84 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 43.4, Super Dead 6.4, SW 51.7 < 275	101.50 N/mm²	OK
TOTAL (Compression)	Live 5.4, Super Dead 0.8, SW 51.7 < 275	57.91 N/mm²	OK

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Maximum Concrete Stress	Live 2.59, Super Dead 0.38, SW 0 < 20	2.98 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	3.15 mm	
Natural Frequency	18/√(3.15/1.1) = 10.64 > 4 Hz	10.64 Hz	OK

UNPROPPED COMPOSITE SECONDARY EDGE BEAM
Beam Reference (New Brief) Member 205 (J1-M1) @ Level 3

Summary of Design Data (Integrated Design)

Steel Section (30 kg/m)	152x152 UC 30 [S 275]
Floor Area Supported	5.11 m Span and 2.1 m to LH Beam
Non-Continuous Holorib Z35	Trough Spacing 152, Height 51, Average Width 128 in 1 mm thick
Concrete Slab	130 mm Thick @ 2350 kg/m³, Mod. Ratio 10, Gr 40 with 252 mm²/m
Headed Stud Connector	19x95 mm Placed @ 400 mm centres
IMPORTANT: Beam Loads	All internal forces and deflection values are obtained directly from MasterFrame

Section Properties

Concrete Effective Area	79 x 715 mm², b1= 639 mm and b2= 76 mm
Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³
Composite Section Elastic Properties	ye 107.9 mm, Ix 8581 cm⁴, Zs.t 3901 cm³, Zs.b 481 cm³, Zc.t 8009 cm³
Headed Stud Connector	12 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear

Support Reactions (kN)	LH Support 41.93 kN, RH Support 41.68 kN	< 169.03 kN	OK
Check @ 2.529 m (Max. Moment)	M = 53.41 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 6 < 11.7	Partial	
Axial Resistance (kN)	Rc 1017.01 kN, Rs 1052.15 kN, Rq 523.2 kN	523.2 kN	
Degree of Shear Connection	Na/Np = 6 / 11.7 > 0.4	0.514	OK
Reduced Concrete Area	Area required to resist 523.2 kN	40.6x715.2mm²	
Moment Capacity	Plastic neutral axis in top flange @ 136.1 mm	137.65 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 400 mm	2.5 per m	
Vp = fn(N.4.D.tp.pyp)	Min(2.5x4x19,1000)x1.0x350	66.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 66.5	284.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	2.5x87.2x0.64/(0.64+0.08)	194.70 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear

Support Reactions (kN)	LH Support 14.69 kN, RH Support 14.61 kN	< 169.03 kN	OK
Check @ 2.529 m (Max. Moment)	M = 18.72 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)

Live Loads	LH Support 16.29 kN, RH Support 16.19 kN		
Super Imposed Dead Load	LH Support 2.39 kN, RH Support 2.38 kN		
Dead Load (Self Weight)	LH Support 8.94 kN, RH Support 8.89 kN		

Maximum Deflection (Partial Connection All Loads)

Live Loads	3.21 (5.36) mm @ 2.529 m < L / 360 = 14.1 mm	5.36 mm	OK
Super Imposed Dead Loads	0.47 (0.79) mm @ 2.529 m	0.79 mm	
Dead Loads (Self Weight)	8.64 mm @ 2.529 m	8.64 mm	

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Maximum Steel Stress			
TOTAL (Tension)	Live 43.2, Super Dead 6.3, SW 51.3 < 275	100.85 N/mm²	OK
TOTAL (Compression)	Live 5.3, Super Dead 0.8, SW 51.3 < 275	57.44 N/mm²	OK
Maximum Concrete Stress	Live 2.59, Super Dead 0.38, SW 0 < 20	2.97 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	3.08 mm	
Natural Frequency	18/√(3.08/1.1) = 10.75 > 4 Hz	10.75 Hz	OK

UNPROPPED NON-COMPOSITE SECONDARY INTERNAL BEAM
Member 383 (N.63-N.132) @ Level 1

Section Properties

Concrete Effective Area	79 x 1280 mm², b1= 640 mm and b2= 640 mm
Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³
Composite Section Elastic Properties	ye 92.7 mm, Ix 13847 cm⁴, Zs.t 3714 cm³, Zs.b 568 cm³, Zc.t 14951 cm³
Headed Stud Connector	16 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	83.55 kN each side	< 218.38 kN	OK
Check @ 2.559 m (Max. Moment)	M = 106.9 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 8 < 12.1 Partial		
Axial Resistance (kN)	Rc 1819.45 kN, Rs 1050.78 kN, Rq 697.6 kN	697.6 kN	
Degree of Shear Connection	Na/Np = 8 / 12.1 > 0.4	0.664	OK
Reduced Concrete Area	Area required to resist 697.6 kN	30.3x1279.5mm²	
Moment Capacity	Plastic neutral axis in top flange @ 134.6 mm	186.58 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.64/(0.64+0.64)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	28.56 kN each side	< 218.38 kN	OK
Check @ 2.559 m (Max. Moment)	M = 36.55 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	32.88 kN each side		
Super Imposed Dead Load	4.82 kN each side		
Dead Load (Self Weight)	17.27 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	4.04 (5.97) mm @ 2.559 m < L / 360 = 14.2 mm	5.97 mm	OK
Super Imposed Dead Loads	0.59 (0.87) mm @ 2.559 m	0.87 mm	
Dead Loads (Self Weight)	10.15 mm @ 2.559 m	10.15 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 74.1, Super Dead 10.9, SW 78.9 < 275	163.88 N/mm²	OK
TOTAL (Compression)	Live 11.3, Super Dead 1.7, SW 78.9 < 275	91.88 N/mm²	OK
Maximum Concrete Stress	Live 2.81, Super Dead 0.41, SW 0 < 20	3.23 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	3.6 mm	
Natural Frequency	18/√(3.60/1.1) = 9.96 > 4 Hz	9.96 Hz	OK

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UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 193 (N.277-N.302) @ Level 3

Section Properties

Concrete Effective Area	79 x 657 mm², b1= 581 mm and b2= 76 mm		
Steel Section Elastic Properties	ye 78.8 mm, A 38.3 cm², Ix 1749 cm⁴, Zt 222 cm³, Zb 222 cm³		
Composite Section Elastic Properties	ye 111.3 mm, Ix 8332 cm⁴, Zs.t 4504 cm³, Zs.b 477 cm³, Zc.t 7550 cm³		
Headed Stud Connector	15 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2		

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	58.8 kN each side	< 169.03 kN	OK
Check @ 2.323 m (Max. Moment)	M = 68.29 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 7 < 10.7	Partial	
Axial Resistance (kN)	Rc 934.36 kN, Rs 1052.15 kN, Rq 610.4 kN	610.4 kN	
Degree of Shear Connection	Na/Np = 7 / 10.7 > 0.4	0.653	OK
Reduced Concrete Area	Area required to resist 610.4 kN	51.6x657.1mm²	
Moment Capacity	Plastic neutral axis in top flange @ 135.1 mm	144.35 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.58/(0.58+0.08)	253.47 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	13.21 kN each side	< 169.03 kN	OK
Check @ 2.323 m (Max. Moment)	M = 15.34 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 78.8 mm	68.12 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	14.63 kN each side		
Super Imposed Dead Load	17.24 kN each side		
Dead Load (Self Weight)	8.04 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	2.24 (3.11) mm @ 2.323 m < L / 360 = 12.9 mm	3.11 mm	OK
Super Imposed Dead Loads	2.63 (3.67) mm @ 2.323 m	3.67 mm	
Dead Loads (Self Weight)	5.85 mm @ 2.323 m	5.85 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 35.6, Super Dead 42, SW 42.1 < 275	119.68 N/mm²	OK
TOTAL (Compression)	Live 3.8, Super Dead 4.4, SW 42.1 < 275	50.29 N/mm²	OK
Maximum Concrete Stress	Live 2.25, Super Dead 2.65, SW 0 < 20	4.90 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	5.21 mm	
Natural Frequency	18/√(5.21/1.1) = 8.27 > 4 Hz	8.27 Hz	OK

UNPROPPED NON-COMPOSITE SECONDARY INTERNAL BEAM
Member 175 (D4-H5) @ Level 3

Section Properties

Concrete Effective Area	79 x 1280 mm², b1= 640 mm and b2= 640 mm
Steel Section Elastic Properties	ye 103.4 mm, A 38.2 cm², Ix 2897 cm⁴, Zt 280 cm³, Zb 280 cm³

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Composite Section Elastic Properties	ye 92.7 mm, Ix 13847 cm^4, Zs.t 3714 cm^3, Zs.b 568 cm^3, Zc.t 14951 cm^3		
Headed Stud Connector	16 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2		

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	83.55 kN each side	< 218.38 kN	OK
Check @ 2.559 m (Max. Moment)	M = 106.9 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 8 < 12.1	Partial	
Axial Resistance (kN)	Rc 1819.45 kN, Rs 1050.78 kN, Rq 697.6 kN	697.6 kN	
Degree of Shear Connection	Na/Np = 8 / 12.1 > 0.4	0.664	OK
Reduced Concrete Area	Area required to resist 697.6 kN	30.3x1279.5mm^2	
Moment Capacity	Plastic neutral axis in top flange @ 134.6 mm	186.58 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.64/(0.64+0.64)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	28.56 kN each side	< 218.38 kN	OK
Check @ 2.559 m (Max. Moment)	M = 36.55 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 103.4 mm	86.46 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	32.88 kN each side		
Super Imposed Dead Load	4.82 kN each side		
Dead Load (Self Weight)	17.27 kN each side		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	4.04 (5.97) mm @ 2.559 m < L / 360 = 14.2 mm	5.97 mm	OK
Super Imposed Dead Loads	0.59 (0.87) mm @ 2.559 m	0.87 mm	
Dead Loads (Self Weight)	10.15 mm @ 2.559 m	10.15 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 74.1, Super Dead 10.9, SW 78.9 < 275	163.88 N/mm^2	OK
TOTAL (Compression)	Live 11.3, Super Dead 1.7, SW 78.9 < 275	91.88 N/mm^2	OK
Maximum Concrete Stress	Live 2.81, Super Dead 0.41, SW 0 < 20	3.23 N/mm^2	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	3.6 mm	
Natural Frequency	18/√(3.60/1.1) = 9.96 > 4 Hz	9.96 Hz	OK

UNPROPPED COMPOSITE SECONDARY INTERNAL BEAM
Member 161 (N.236-N.292) @ Level 2

Section Properties

Concrete Effective Area	79 x 1791 mm^2, b1= 896 mm and b2= 896 mm
Steel Section Elastic Properties	ye 129.8 mm, A 54.8 cm^2, Ix 6545 cm^4, Zt 504 cm^3, Zb 504 cm^3
Composite Section Elastic Properties	ye 101 mm, Ix 26444 cm^4, Zs.t 9134 cm^3, Zs.b 918 cm^3, Zc.t 26250 cm^3
Headed Stud Connector	23 No. 19x95 mm, Qk 109 kN, Qp 87.2 kN, k 1, Pd 87.2

Ultimate Limit State (Final Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 124.62 kN, RH Support 121.03 kN	< 308.40 kN	OK
Check @ 3.545 m (Max. Moment)	M = 219.99 kN.m, Fv = 0 kN		
Shear Connection	No of shear connectors from nearest support 11 < 17.3	Partial	

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Axial Resistance (kN)	Rc 2546.8 kN, Rs 1506.18 kN, Rq 959.2 kN	959.2 kN	
Degree of Shear Connection	Na/Np = 11 / 17.3 > 0.4	0.637	OK
Reduced Concrete Area	Area required to resist 959.2 kN	29.8x1791mm²	
Moment Capacity	Plastic neutral axis in top flange @ 136.6 mm	302.41 kN.m	OK

Transverse Reinforcement

Max. No. of Shear Connectors (N)	Average minimum spacing 304 mm	3.29 per m	
Vp = fn(N.4.D.tp.pyp)	Min(3.29x4x19,1000)x1.0x350	87.50 kN	
Vr = fn(Asv,fy,Acv,fcu,Vp)	252, 460, 114000, 40, 87.5	305.44 kN	
V=N.Pd.Max(b1,b2)/(b1+b2)	3.29x87.2x0.9/(0.9+0.9)	143.42 kN	OK

Ultimate Limit State (Construction Stage)

Maximum Shear			
Support Reactions (kN)	LH Support 42.98 kN, RH Support 41.78 kN	< 308.40 kN	OK
Check @ 3.545 m (Max. Moment)	M = 75.91 kN.m, Fv = 0 kN		
Moment Capacity	Plastic neutral axis in web @ 129.8 mm	155.73 kN.m	OK

Serviceability Limit State

Support Reactions (kN)			
Live Loads	LH Support 48.83 kN, RH Support 47.4 kN		
Super Imposed Dead Load	LH Support 7.16 kN, RH Support 6.95 kN		
Dead Load (Self Weight)	LH Support 26.05 kN, RH Support 25.33 kN		
Maximum Deflection (Partial Connection All Loads)			
Live Loads	8.50 (11.31) mm @ 3.545 m < L / 360 = 19.9 mm	11.31 mm	OK
Super Imposed Dead Loads	1.25 (1.66) mm @ 3.545 m	1.66 mm	
Dead Loads (Self Weight)	18.33 mm @ 3.545 m	18.33 mm	
Maximum Steel Stress			
TOTAL (Tension)	Live 93.8, Super Dead 13.8, SW 91.2 < 275	198.84 N/mm²	OK
TOTAL (Compression)	Live 9.4, Super Dead 1.4, SW 91.2 < 275	102.07 N/mm²	OK
Maximum Concrete Stress	Live 3.28, Super Dead 0.48, SW 0 < 20	3.76 N/mm²	OK

Vibration Analysis (Partial Connection)

Beam Deflection	Including Partial Connection	7.33 mm	
Natural Frequency	18/√(7.33/1.1) = 6.97 > 4 Hz	6.97 Hz	OK

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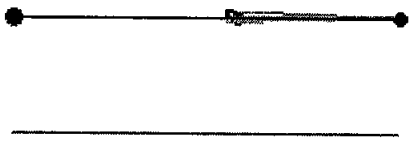
DESIGN OF ROOF BEAMS

AXIAL WITH MOMENTS (MEMBER)
Members 273 and 276 (B12-E12) @ Level 6
Between 0 and 2.4 m, in Load Case 1

Member Loading and Member Forces

Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6 L1 + 1.4 A1

A1 D 078.500 (kN/m³)



Member Forces in Load Case 1 and Maximum Deflection from Load Case 8										
Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	384	0.68C	0.00	1.38	0.00	0.00	0.00	-13.48	0.00	1.35
	390	0.32T	-0.01	6.10	0.00	0.00	0.00	@ 2.285	@ 2.285	@ 2.285

Classification and Properties (BS 5950: 2000)

Section (86.06 kg/m)	203x203 UC 86 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	5.1, 12.66, 265, 0.68, 13.48, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	8.349 / 448.688 =	0.019	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	265 x 976.7≤1.2 x 265 x 850.7 =	258.826 kN.m	
Pz = Ag.py	109.63 x 265 =	2905.195 kN	
n = F/Pz	0.68 / 2905.195 =	0.000	OK
Srx = Fn(Sxx, n)	976.7, 0	976.7 cm³	
Mrx = Srx.py	976.7 x 265	258.826 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(13.478/258.826)^2+(0)^1$=	0.003	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x4.15/9.29 =	44.7	OK
Pcx = Area.pcx	109.63x235.73/10 =	2584.311 kN	Table 24 b
λy = Ley/ryy	100x1x2.4/5.34 =	44.9	OK
Pcy = Area.pcy	109.63x221.98/10 =	2433.559 kN	Table 24 c

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x1+.5x1+.15x1)/13 ≥0.44	0.44	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x1+.6x0+.1x-7)/13 ≥.8x13/13	0.8	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2.4 =	2.4 m	
λ = Le/ry	2.4 / 5.34	44.91	OK
v = Fn (x,Le,ry,λ)	10.21, 2.4, 5.34, 44.91	0.844	Table 19
λ_{LT} = u.v.λ.$\sqrt{\beta_W}$	0.85 x 0.844 x 44.91 √ 1	32.25	
pb = Fn (py,λ_{LT})	265, 32.25	265 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	976.7 x 265 ≤ 258.826 =	258.826 kN.m	

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Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.44x-13.3/258.8	0.023	
$r_c=F_c/P_{cy}$	0.7/2433.6	0.000	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.023•32.3+0•44.9)/(0.023+0)	32.405	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1.019(2•0.023+0)/(0.023+0)	34.728	
$M_{ob}=M_b(1-F_c/P_{cy})$	258.826(1-0.7/2433.6)	258.753	
$M_{xy}=M_{cx}(1-F_c/P_{cy})^{½}$	258.826(1-0.7/2433.6)^{½}	258.789	
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	258.826(1-0.7/2584.3)/(1+0.5•0.7/2584.3)	258.723	
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	95.209(1-0.7/2433.6)/(1+1.0(0.7/2433.6))	95.156	
$M_{ab}=fn(\lambda_r, \lambda_{ro}, \varepsilon, M_{xy}, M_{ob})$	32.405, 34.728, 1.019, 258.789, 258.753	258.789	
$M_{ax}=fn(\lambda_x, \varepsilon, M_{rx}, M_{ox})$	44.695, 1.019, 258.826, 258.723	258.786	
$M_{ay}=fn(\lambda_y, \varepsilon, M_{ry}, M_{oy})$	44.914, 1.019, 95.209, 95.156	95.188	
$m_x.M_x/M_{ax}$	0.8x13.5/258.8	0.042	OK
$m_{LT}.M_{LT}/M_{ab}$	0.44x-13.3/258.8	0.023	OK
$m_x.M_x/M_{ax}$	0.8x13.5/258.8	0.041	OK
Compare with Simplied to 4.8.3.3	0.048, 0.023, 0.023	0.048	
Compare with MoreExact to 4.8.3.3	0.042, 0.023, 0.023	0.042	

Deflection Check - Load Case 8

$\delta \le$ Span/360	1.35 ≤ 4150 / 360	1.35 mm	OK

AXIAL WITH MOMENTS (MEMBER)

Members 273 and 276 (B12-E12) @ Level 6

Between 2.4 and 4.15 m, in Load Case 1

Member Loading and Member Forces

Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6 L1 + 1.4 A1

A1 D 078.500 (kN/m³)

Member Forces in Load Case 1 and Maximum Deflection from Load Case 8									
Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	384	0.68C	0.00	1.38	0.00	0.00	0.00	-13.48	0.00	1.35
	390	0.32T	-0.01	6.10	0.00	0.00	0.00	@ 2.285	@ 2.285	@ 2.285

Classification and Properties (BS 5950: 2000)

Section (86.06 kg/m)	203x203 UC 86 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	5.1, 12.66, 265, 0.68, 13.48, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	8.211 / 448.688 =	0.018	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	265 x 976.7≤1.2 x 265 x 850.7 =	258.826 kN.m	
Pz = Ag.py	109.63 x 265 =	2905.195 kN	
n = F/Pz	0.68 / 2905.195 =	0.000	OK
Srx = Fn(Sxx, n)	976.7, 0	976.7 cm³	
Mrx = Srx.py	976.7 x 265	258.826 kN.m	

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$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(12.525/258.826)^2+(0)^1=$	0.002	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x4.15/9.29 =	44.7	OK
Pcx = Area.pcx	109.63x235.73/10 =	2584.311 kN	Table 24 b
λy = Ley/ryy	100x1x1.75/5.34 =	32.7	OK
Pcy = Area.pcy	109.63x241.71/10 =	2649.869 kN	Table 24 c

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x9+.5x6+.15x3)/13 ≥0.44	0.574	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x1+.6x0+.1x-7)/13 ≥.8x13/13	0.8	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 1.75 =	1.75 m	
λ = Le/ry	1.75 / 5.34	32.75	OK
v = Fn (x,Le,ry,λ)	10.21, 1.75, 5.34, 32.75	0.901	Table 19
λ_{LT} = u.v.λ.$\sqrt{\beta_W}$	0.85 x 0.901 x 32.75 √ 1	25.11	
pb = Fn (py,λ_{LT})	265, 25.11	265 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	976.7 x 265 ≤ 258.826 =	258.826 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.574x-12.5/258.8	0.028	
$r_c=F_c/P_{cy}$	0.7/2649.9	0.000	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.028•25.1+0•32.7)/(0.028+0)	25.176	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1.019(2•0.028+0)/(0.028+0)	34.781	
$M_{ob}=M_b(1-F_c/P_{cy})$	258.826(1-0.7/2649.9)	258.759	
$M_{xy}=M_{cx}\ (1-F_c/P_{cy})^{½}$	258.826(1-0.7/2649.9)^{½}	258.792	
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	258.826(1-0.7/2584.3)/(1+0.5•0.7/2584.3)	258.723	
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	95.209(1-0.7/2649.9)/(1+1.0(0.7/2649.9))	95.160	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	25.176, 34.781, 1.019, 258.792, 258.759	258.792	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	44.695, 1.019, 258.826, 258.723	258.786	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	32.750, 1.019, 95.209, 95.160	95.199	
$m_x.M_x/M_{ax}$	0.8x13.5/258.8	0.042	OK
$m_{LT}.M_{LT}/M_{ab}$	0.574x-12.5/258.8	0.028	OK
$m_x.M_x/M_{ax}$	0.8x13.5/258.8	0.039	OK
Compare with Simplied to 4.8.3.3	0.048, 0.028, 0.028	0.048	
Compare with MoreExact to 4.8.3.3	0.042, 0.028, 0.028	0.042	

Deflection Check - Load Case 8

δ ≤ Span/360	1.35 ≤ 4150 / 360	1.35 mm	OK

AXIAL WITH MOMENTS (MEMBER)
Members 279, 301 and 304 (E12-K12) @ Level 6
Between 0 and 2.4 m, in Load Case 1

Member Loading and Member Forces

Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6 L1 + 1.4 A1

A1 D 078.500 (kN/m³)

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Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	390	1.44C	0.01	11.62	0.00	0.00	0.00	23.39		3.49
	425	1.00C	-0.01	-11.25	0.00	0.00	0.00	@ 3.436		@ 3.238

Classification and Properties (BS 5950: 2000)

Section (86.06 kg/m)	203x203 UC 86 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	5.1, 12.66, 265, 1.61, 23.39, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	1.258 / 448.688 =	0.003	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	265 x 976.7≤1.2 x 265 x 850.7 =	258.826 kN.m	
Pz = Ag.py	109.63 x 265 =	2905.195 kN	
n = F/Pz	1.615 / 2905.195 =	0.001	OK
Srx = Fn(Sxx, n)	976.7, 0.001	976.7 cm³	
Mrx = Srx.py	976.7 x 265	258.825 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(22.734/258.825)^2+(0)^1$=	0.008	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x6.497/9.29 =	70	OK
Pcx = Area.pcx	109.63x196.299/10 =	2152.021 kN	Table 24 b
λy = Ley/ryy	100x1x2.4/5.34 =	44.9	OK
Pcy = Area.pcy	109.63x221.98/10 =	2433.559 kN	Table 24 c

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x7+.5x13+.15x19)/23 ≥0.44	0.657	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x17+.6x23+.1x17)/23 ≥.8x23/23	0.945	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2.4 =	2.4 m	
λ = Le/ry	2.4 / 5.34	44.91	OK
v = Fn (x,Le,ry,λ)	10.21, 2.4, 5.34, 44.91	0.844	Table 19
λ_{LT} = u.v.λ.$\sqrt{\beta_W}$	0.85 x 0.844 x 44.91 √ 1	32.25	
pb = Fn (py,λ_{LT})	265, 32.25	265 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	976.7 x 265 ≤ 258.826 =	258.826 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.657x22.7/258.8	0.058
$r_c=F_c/P_{cy}$	1.6/2433.6	0.001
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.058•32.3+0.001•44.9)/(0.058+0.001)	32.395
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1.019(2•0.058+0.001)/(0.058+0.001)	34.743
$M_{ob}=M_b(1-F_c/P_{cy})$	258.826(1-1.6/2433.6)	258.654
$M_{xy}=M_{cx}(1-F_c/P_{cy})^{½}$	258.826(1-1.6/2433.6)^{½}	258.740
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	258.826(1-1.6/2152)/(1+0.5•1.6/2152)	258.534
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	95.209(1-1.6/2433.6)/(1+1.0(1.6/2433.6))	95.083
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	32.395, 34.743, 1.019, 258.740, 258.654	258.740
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	69.972, 1.019, 258.825, 258.534	258.607
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	44.914, 1.019, 95.209, 95.083	95.160
$m_x.M_x/M_{ax}$	0.945x23.4/258.6	0.086 OK
$m_{LT}.M_{LT}/M_{ab}$	0.657x22.7/258.7	0.058 OK
$m_x.M_x/M_{ax}$	0.945x23.4/258.6	0.083 OK
Compare with Simplied to 4.8.3.3	0.099, 0.058, 0.058	0.099
Compare with MoreExact to 4.8.3.3	0.086, 0.058, 0.058	0.086

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Deflection Check - Load Case 10

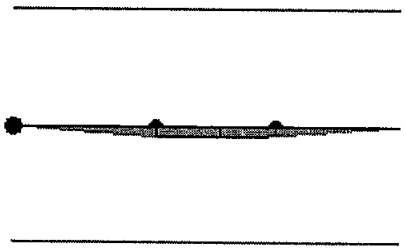
$\delta \leq$ Span/360	3.49 ≤ 6497 / 360	3.49 mm	OK

AXIAL WITH MOMENTS (MEMBER)
Members 279, 301 and 304 (E12-K12) @ Level 6
Between 2.4 and 4.4 m, in Load Case 1

Member Loading and Member Forces

Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6 L1 + 1.4 A1

A1 D 078.500 (kN/m³)



Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	390	1.44C	0.01	11.62	0.00	0.00	0.00	23.39		3.49
	425	1.00C	-0.01	-11.25	0.00	0.00	0.00	@ 3.436		@ 3.238

Classification and Properties (BS 5950: 2000)

Section (86.06 kg/m)	203x203 UC 86 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	5.1, 12.66, 265, 1.61, 23.39, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	0.038 / 448.688 =	0	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	265 x 976.7≤1.2 x 265 x 850.7 =	258.826 kN.m	
Pz = Ag.py	109.63 x 265 =	2905.195 kN	
n = F/Pz	1.615 / 2905.195 =	0.001	OK
Srx = Fn(Sxx, n)	976.7, 0.001	976.7 cm³	
Mrx = Srx.py	976.7 x 265	258.825 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(23.391/258.825)^2+(0)^1=$	0.008	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x6.497/9.29 =	70	OK
Pcx = Area.pcx	109.63x196.299/10 =	2152.021 kN	Table 24 b
λy = Ley/ryy	100x1x2/5.34 =	37.4	OK
Pcy = Area.pcy	109.63x234.31/10 =	2568.716 kN	Table 24 c

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x23+.5x23+.15x23)/23 ≥0.44	0.998	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x17+.6x23+.1x17)/23 ≥.8x23/23	0.945	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2 =	2 m	
λ = Le/ry	2 / 5.34	37.43	OK
v = Fn (x,Le,ry,λ)	10.21, 2, 5.34, 37.43	0.879	Table 19
λ_{LT} = u.v.λ.√βw	0.85 x 0.879 x 37.43 √ 1	27.99	
pb = Fn (py,λ_{LT})	265, 27.99	265 N/mm²	Table 16

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Mb = Sx.pb ≤ Mc	976.7 x 265 ≤ 258.826 =	258.826 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.998x23.4/258.8	0.090	
$r_c=F_c/P_{cy}$	1.6/2568.7	0.001	
$\lambda_r=(r_b \lambda_{LT}+r_c \lambda_y)/(r_b+r_c)$	(0.09•28+0.001•37.4)/(0.09+0.001)	28.057	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1.019(2•0.09+0.001)/(0.09+0.001)	34.820	
$M_{ob}=M_b(1-F_c/P_{cy})$	258.826(1-1.6/2568.7)	258.663	
$M_{xy}=M_{cx}(1-F_c/P_{cy})^{½}$	258.826(1-1.6/2568.7)^{½}	258.744	
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	258.826(1-1.6/2152)/(1+0.5•1.6/2152)	258.534	
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	95.209(1-1.6/2568.7)/(1+1.0(1.6/2568.7))	95.090	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	28.057, 34.820, 1.019, 258.744, 258.663	258.744	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	69.972, 1.019, 258.825, 258.534	258.607	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	37.428, 1.019, 95.209, 95.090	95.175	
$m_x.M_x/M_{ax}$	0.945x23.4/258.6	0.086	OK
$m_{LT}.M_{LT}/M_{ab}$	0.998x23.4/258.7	0.090	OK
$m_x.M_x/M_{ax}$	0.945x23.4/258.6	0.085	OK
Compare with Simplied to 4.8.3.3	0.099, 0.091, 0.091	0.099	
Compare with MoreExact to 4.8.3.3	0.086, 0.091, 0.09	0.091	

Deflection Check - Load Case 10

δ ≤ Span/360	3.49 ≤ 6497 / 360	3.49 mm	OK

AXIAL WITH MOMENTS (MEMBER)

Members 284 and 333 (A8-D8) @ Level 6 in Load Case 1

Member Loading and Member Forces

Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6 L1 + 1.4 A1

A1 D 078.500 (kN/m³)

Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	395	0.69C	0.00	17.56	0.00	0.00	0.00	17.60	0.00	0.70
	467	1.53C	0.00	-8.08	0.00	0.00	0.00	@ 1.040	@ 1.040	@ 1.725

Classification and Properties (BS 5950: 2000)

Section (86.06 kg/m)	203x203 UC 86 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	5.1, 12.66, 265, 1.53, 17.61, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	16.306 / 448.688 =	0.036	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	265 x 976.7≤1.2 x 265 x 850.7 =	258.826 kN.m	
Pz = Ag.py	109.63 x 265 =	2905.195 kN	
n = F/Pz	1.533 / 2905.195 =	0.001	OK
Srx = Fn(Sxx, n)	976.7, 0.001	976.7 cm³	
Mrx = Srx.py	976.7 x 265	258.825 kN.m	

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$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(17.607/258.825)^2+(0)^1=$	0.005	OK

Compression Resistance Pc

$\lambda x = Lex/rxx$	100x1x3.78/9.29 =	40.7	OK
$Pcx = Area.pcx$	109.63x240.628/10 =	2638.007 kN	Table 24 b
$\lambda y = Ley/ryy$	100x1x3.78/5.34 =	70.7	OK
$Pcy = Area.pcy$	109.63x174.8/10 =	1916.290 kN	Table 24 c

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x16+.5x13+.15x7)/18 ≥0.44	0.769	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x16+.6x13+.1x7)/18 ≥.8x18/18	0.8	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 3.78 =	3.78 m	
$\lambda = Le/ry$	3.78 / 5.34	70.74	OK
$v = Fn(x,Le,ry,\lambda)$	10.21, 3.78, 5.34, 70.74	0.736	Table 19
$\lambda_{LT} = u.v.\lambda.\sqrt{\beta_W}$	0.85 x 0.736 x 70.74 √ 1	44.3	
$pb = Fn(py,\lambda_{LT})$	265, 44.3	244.07 N/mm²	Table 16
$Mb = Sx.pb \le Mc$	976.7 x 244.07 ≤ 258.826 =	238.381 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.769x17.6/238.4	0.057	
$r_c=F_c/P_{cy}$	1.5/1916.3	0.001	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.057•44.3+0.001•70.7)/(0.057+0.001)	44.670	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1.019(2•0.057+0.001)/(0.057+0.001)	34.699	
$M_{ob} = M_b(1-F_c/P_{cy})$	238.381(1-1.5/1916.3)	238.190	
$M_{xy} = M_{cx}(1-F_c/P_{cy})^{½}$	258.826(1-1.5/1916.3)^{½}	258.722	
$M_{ox} = M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	258.826(1-1.5/2638)/(1+0.5•1.5/2638)	258.600	
$M_{oy} = M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	95.209(1-1.5/1916.3)/(1+1.0(1.5/1916.3))	95.057	
$M_{ab}=fn(\lambda_r, \lambda_{ro}, \varepsilon, M_{xy}, M_{ob})$	44.670, 34.699, 1.019, 258.722, 238.190	254.921	
$M_{ax}=fn(\lambda_x, \varepsilon, M_{rx}, M_{ox})$	40.710, 1.019, 258.825, 258.600	258.750	
$M_{ay}=fn(\lambda_y, \varepsilon, M_{ry}, M_{oy})$	70.740, 1.019, 95.209, 95.057	95.093	
$m_x.M_x/M_{ax}$	0.8x17.6/258.8	0.054	OK
$m_{LT}.M_{LT}/M_{ab}$	0.769x17.6/254.9	0.053	OK
$m_x.M_x/M_{ax}$	0.8x17.6/258.8	0.054	OK
Compare with Simplied to 4.8.3.3	0.063, 0.058, 0.058	0.063	
Compare with MoreExact to 4.8.3.3	0.055, 0.058, 0.052	0.058	

Deflection Check - Load Case 10

$\delta \le$ Span/360	0.7 ≤ 3780 / 360	0.7 mm	OK

AXIAL WITH MOMENTS (MEMBER)

Members 308-309 and 313 (N.428-E10) @ Level 6

Between 0 and 2.4 m, in Load Case 1

Member Loading and Member Forces

Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6 L1 + 1.4 A1

A1 D 078.500 (kN/m³)

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Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	428	0.43C	0.04	-5.25	0.00	0.02	0.00		0.00	1.38
	439	1.10C	-0.04	-31.89	0.00	-65.98	0.00		@ 2.745	@ 2.616

Classification and Properties (BS 5950: 2000)

Section (86.06 kg/m)	203x203 UC 86 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	5.1, 12.66, 265, 1.1, 65.98, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	15.619 / 448.688 =	0.035	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	265 x 976.7≤1.2 x 265 x 850.7 =	258.826 kN.m	
Pz =Ae.py	109.63x265 =	2905.195 kN	
n = F/Pz	-1.775 / 2905.195 =	0.001	OK
Srx = Fn(Sxx, n)	976.7, 0.001	976.7 cm³	
Mrx = Srx.py	976.7 x 265	258.825 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(16.908/258.825)^2+(0)^1$=	0.004	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x4.15/9.29 =	44.7	OK
Pcx = Area.pcx	109.63x235.73/10 =	2584.311 kN	Table 24 b
λy = Ley/ryy	100x1x2.4/5.34 =	44.9	OK
Pcy = Area.pcy	109.63x221.98/10 =	2433.559 kN	Table 24 c

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x3+.5x7+.15x11)/17 ≥0.44	0.543	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x-6+.6x-13+.1x-34)/66 ≥.8x34/66	0.407	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2.4 =	2.4 m	
λ = Le/ry	2.4 / 5.34	44.91	OK
v = Fn (x,Le,ry,λ)	10.21, 2.4, 5.34, 44.91	0.844	Table 19
$\lambda_{LT} = u.v.\lambda.\sqrt{\beta_W}$	0.85 x 0.844 x 44.91 √ 1	32.25	
pb = Fn (py,λ_{LT})	265, 32.25	265 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	976.7 x 265 ≤ 258.826 =	258.826 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.543x-16.9/258.8	0.035	
$r_c=F_c/P_{cy}$	1.1/2433.6	0.000	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.035•32.3+0•44.9)/(0.035+0)	32.410	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1.019(2•0.035+0)/(0.035+0)	34.722	
$M_{ob} = M_b(1-F_c/P_{cy})$	258.826(1-1.1/2433.6)	258.709	
$M_{xy} = M_{cx}\ (1-F_c / P_{cy})^{½}$	258.826(1-1.1/2433.6)^{½}	258.767	
$M_{ox} = M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	258.826(1-1.1/2584.3)/(1+0.5•1.1/2584.3)	258.661	
$M_{oy} = M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	95.209(1-1.1/2433.6)/(1+1.0(1.1/2433.6))	95.123	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	32.410, 34.722, 1.019, 258.767, 258.709	258.767	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	44.695, 1.019, 258.825, 258.661	258.761	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	44.914, 1.019, 95.209, 95.123	95.176	
$m_x.M_x/M_{ax}$	0.407x66/258.8	0.104	OK
$m_{LT}.M_{LT}/M_{ab}$	0.543x-16.9/258.8	0.035	OK
$m_x.M_x/M_{ax}$	0.407x66/258.8	0.027	OK
Compare with Simplied to 4.8.3.3	0.119, 0.036, 0.036	0.119	
Compare with MoreExact to 4.8.3.3	0.104, 0.036, 0.035	0.104	

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Deflection Check - Load Case 10

$\delta \leq$ Span/360	1.38 ≤ 4150 / 360	1.38 mm	OK

AXIAL WITH MOMENTS (MEMBER)
Members 308-309 and 313 (N.428-E10) @ Level 6
Between 2.4 and 4.15 m, in Load Case 1

Member Loading and Member Forces

Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6 L1 + 1.4 A1

A1 D 078.500 (kN/m³)

Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	428	0.43C	0.04	-5.25	0.00	0.02	0.00		0.00	1.38
	439	1.10C	-0.04	-31.89	0.00	-65.98	0.00		@ 2.745	@ 2.616

Classification and Properties (BS 5950: 2000)

Section (86.06 kg/m)	203x203 UC 86 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	5.1, 12.66, 265, 1.1, 65.98, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	31.891 / 448.688 =	0.071	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	265 x 976.7≤1.2 x 265 x 850.7 =	258.826 kN.m	
Pz =Ae.py	109.63x265 =	2905.195 kN	
n = F/Pz	-1.775 / 2905.195 =	0.001	OK
Srx = Fn(Sxx, n)	976.7, 0.001	976.7 cm³	
Mrx = Srx.py	976.7 x 265	258.825 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(65.976/258.825)^2+(0)^1=$	0.065	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x4.15/9.29 =	44.7	OK
Pcx = Area.pcx	109.63x235.73/10 =	2584.311 kN	Table 24 b
λy = Ley/ryy	100x1x1.75/5.34 =	32.7	OK
Pcy = Area.pcy	109.63x241.71/10 =	2649.869 kN	Table 24 c

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x25+.5x39+.15x52)/66 ≥0.44	0.668	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x-6+.6x-13+.1x-34)/66 ≥.8x34/66	0.407	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 1.75 =	1.75 m	
λ = Le/ry	1.75 / 5.34	32.75	OK
v = Fn (x,Le,ry,λ)	10.21, 1.75, 5.34, 32.75	0.901	Table 19
λ_{LT} = u.v.λ.$\sqrt{\beta_W}$	0.85 x 0.901 x 32.75 √ 1	25.11	
pb = Fn (py,λ_{LT})	265, 25.11	265 N/mm²	Table 16

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Mb = Sx.pb ≤ Mc	976.7 x 265 ≤ 258.826 =	258.826 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.668x-66/258.8	0.170	
$r_c=F_c/P_{cy}$	1.1/2649.9	0.000	
$\lambda_r=(r_b \lambda_{LT}+r_c \lambda_y)/(r_b+r_c)$	(0.17•25.1+0•32.7)/(0.17+0)	25.125	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1.019(2•0.17+0)/(0.17+0)	34.899	
$M_{ob} = M_b(1-F_c/P_{cy})$	258.826(1-1.1/2649.9)	258.718	
$M_{xy} = M_{cx}\ (1-F_c/P_{cy})^{½}$	258.826(1-1.1/2649.9)^{½}	258.772	
$M_{ox} = M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	258.826(1-1.1/2584.3)/(1+0.5•1.1/2584.3)	258.661	
$M_{oy} = M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	95.209(1-1.1/2649.9)/(1+1.0(1.1/2649.9))	95.130	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	25.125, 34.899, 1.019, 258.772, 258.718	258.772	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	44.695, 1.019, 258.825, 258.661	258.761	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	32.750, 1.019, 95.209, 95.130	95.192	
$m_x.M_x/M_{ax}$	0.407x66/258.8	0.104	OK
$m_{LT}.M_{LT}/M_{ab}$	0.668x-66/258.8	0.170	OK
$m_x.M_x/M_{ax}$	0.407x66/258.8	0.104	OK
Compare with Simplied to 4.8.3.3	0.119, 0.171, 0.171	0.171	
Compare with MoreExact to 4.8.3.3	0.104, 0.171, 0.17	0.171	

Deflection Check - Load Case 10

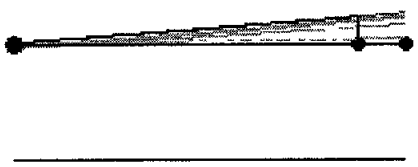
δ ≤ Span/360	1.38 ≤ 4150 / 360	1.38 mm	OK

AXIAL WITH MOMENTS (MEMBER)
Member 310 (B9-D9) @ Level 6
Between 0 and 2.4 m, in Load Case 1

Member Loading and Member Forces

Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6 L1 + 1.4 A1

A1 D 078.500 (kN/m³)



Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
310	432	1.39T	0.00	-22.66	0.00	-1.09	0.00			1.06
	443	1.39T	0.00	-25.96	0.00	-67.71	0.00			@ 1.617

Classification and Properties (BS 5950: 2000)

Section (86.06 kg/m)	203x203 UC 86 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	5.1, 12.66, 265, 0, 67.71, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	25.551 / 448.688 =	0.057	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	265 x 976.7≤1.2 x 265 x 850.7 =	258.826 kN.m	
Pz =Ae.py	109.63x265 =	2905.195 kN	
n = F/Pz	-1.395 / 2905.195 =	0.000	OK

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Srx = Fn(Sxx, n)	976.7, 0	976.7 cm³	
Mrx = Srx.py	976.7 x 265	258.825 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(58.952/258.825)^2+(0)^1=$	0.052	OK

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x15+.5x29+.15x44)/59 ≥0.44	0.597	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x-17+.6x-33+.1x-50)/68 ≥.8x50/68	0.594	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2.4 =	2.4 m	
λ = Le/ry	2.4 / 5.34	44.91	OK
v = Fn (x,Le,ry,λ)	10.21, 2.4, 5.34, 44.91	0.844	Table 19
$\lambda_{LT} = u.v.\lambda.\sqrt{\beta_W}$	0.85 x 0.844 x 44.91 √ 1	32.25	
pb = Fn (py,λ_{LT})	265, 32.25	265 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	976.7 x 265 ≤ 258.826 =	258.826 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.597x-59/258.8	0.136	
$r_c=F_c/P_{cy}$	0/2433.6	0.000	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.136•32.3+0•44.9)/(0.136+0)	32.251	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1.019(2•0.136+0)/(0.136+0)	34.941	
$M_{ob} = M_b(1-F_c/P_{cy})$	258.826(1-0/2433.6)	258.826	
$M_{xy} = M_{cx}\ (1-F_c/P_{cy})^{½}$	258.826(1-0/2433.6)^{½}	258.826	
$M_{ox} = M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	258.826(1-0/2774.1)/(1+0.5•0/2774.1)	258.826	
$M_{oy} = M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	95.209(1-0/2433.6)/(1+1.0(0/2433.6))	95.209	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	32.251, 34.941, 1.019, 258.826, 258.826	258.826	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	29.509, 1.019, 258.825, 258.826	258.826	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	44.914, 1.019, 95.209, 95.209	95.209	
$m_x.M_x/M_{ax}$	0.594x67.7/258.8	0.156	OK
$m_{LT}.M_{LT}/M_{ab}$	0.597x-59/258.8	0.136	OK
$m_x.M_x/M_{ax}$	0.594x67.7/258.8	0.135	OK
Compare with Simplied to 4.8.3.3	0.178, 0.136, 0.136	0.178	
Compare with MoreExact to 4.8.3.3	0.156, 0.136, 0.136	0.156	

Deflection Check - Load Case 10

δ ≤ Span/360	1.06 ≤ 2740 / 360	1.06 mm	OK

AXIAL WITH MOMENTS (MEMBER)
Member 310 (B9-D9) @ Level 6
Between 2.4 and 2.74 m, in Load Case 1

Member Loading and Member Forces

Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6 L1 + 1.4 A1

A1 D 078.500 (kN/m³)

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Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
310	432	1.39T	0.00	-22.66	0.00	-1.09	0.00			1.06
	443	1.39T	0.00	-25.96	0.00	-67.71	0.00			@ 1.617

Classification and Properties (BS 5950: 2000)

Section (86.06 kg/m)	203x203 UC 86 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	5.1, 12.66, 265, 0, 67.71, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	25.96 / 448.688 =	0.058	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	265 x 976.7≤1.2 x 265 x 850.7 =	258.826 kN.m	
Pz =Ae.py	109.63x265 =	2905.195 kN	
n = F/Pz	-1.395 / 2905.195 =	0.000	OK
Srx = Fn(Sxx, n)	976.7, 0	976.7 cm³	
Mrx = Srx.py	976.7 x 265	258.825 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(67.709/258.825)^2+(0)^1$=	0.068	OK

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x61+.5x63+.15x66)/68 ≥0.44	0.948	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x-17+.6x-33+.1x-50)/68 ≥.8x50/68	0.594	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 0.34 =	0.34 m	
λ = Le/ry	0.34 / 5.34	6.36	OK
v = Fn (x,Le,ry,λ)	10.21, 0.34, 5.34, 6.36	0.995	Table 19
λ_{LT} = u.v.λ.$\sqrt{\beta_W}$	0.85 x 0.995 x 6.36 √ 1	5.39	
pb = Fn (py,λ_{LT})	265, 5.39	265 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	976.7 x 265 ≤ 258.826 =	258.826 kN.m	

Simplified Approach

py.Zx	265x850.7	225.436 kN.m	
F/Pc+mx.Mx/py.Zx	0+0.594x67.7/225.4	0.178	OK
$F/Pcy+m_{LT}.M_{LT}/Mb$	0+0.948x-67.7/258.8	0.248	OK

More Exact Approach

Max=Mcx/(1+.5F/Pcx)	258.8/(1+.5x0/2774.1)	258.826 kN.m	
F/Pcx+mx.Mx/Max	0/2774.1+0.594x67.7/258.8	0.155	OK
$F/Pcy+m_{LT}.M_{LT}/Mb$	0/2905.2+0.948x-67.7/258.8	0.248	OK

Deflection Check - Load Case 10

δ ≤ Span/360	1.06 ≤ 2740 / 360	1.06 mm	OK

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AXIAL WITH MOMENTS (MEMBER)

Members 315, 320, 323 and 326 (E10-K10) @ Level 6

Between 0 and 2.4 m, in Load Case 1

Member Loading and Member Forces

Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6 L1 + 1.4 A1

A1 D 078.500 (kN/m³)

Member Forces in Load Case 1 and Maximum Deflection from Load Case 10										
Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	439	2.22C	-0.03	42.40	0.00	-71.57	0.00	16.80	0.00	0.79
	457	1.93C	0.03	-9.46	0.00	0.37	0.00	@ 4.160	@ 0.522	@ 4.160

Classification and Properties (BS 5950: 2000)

Section (86.06 kg/m)	203x203 UC 86 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	5.1, 12.66, 265, 2.69, 71.57, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	42.402 / 448.688 =	0.095	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	265 x 976.7≤1.2 x 265 x 850.7 =	258.826 kN.m	
Fvy/Pvy	0 / 1226.811 =	0	Low Shear
Mcy = py.Syy≤1.2 py.Zyy	265 x 456.2≤1.2 x 265 x 299.4 =	95.209 kN.m	
Pz = Ag.py	109.63 x 265 =	2905.195 kN	
n = F/Pz	2.688 / 2905.195 =	0.001	OK
Srx = Fn(Sxx, n)	976.7, 0.001	976.7 cm³	
Mrx = Srx.py	976.7 x 265	258.825 kN.m	
Sry = Fn(Syy, n)	456.2, 0.001	456.2 cm³	
Mry = Sry.py	456.2 x 265	95.209 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(71.565/258.825)^2+(0.001/95.209)^1$=	0.076	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x6.147/9.29 =	66.2	OK
Pcx = Area.pcx	109.63x203.135/10 =	2226.964 kN	Table 24 b
λy = Ley/ryy	100x1x2.4/5.34 =	44.9	OK
Pcy = Area.pcy	109.63x221.98/10 =	2433.559 kN	Table 24 c

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x47+.5x29+.15x11)/72 ≥0.44	0.526	Table 18
$m_y=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x0+.6x0+.1x0)/0 ≥.8x0/0	1	Table 26
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x-19+.6x8+.1x13)/72 ≥.8x19/72	0.259	Table 26
$m_{yx}=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x0+.6x0+.1x0)/0 ≥.8x0/0	1	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2.4 =	2.4 m	
λ = Le/ry	2.4 / 5.34	44.91	OK
v = Fn (x,Le,ry,λ)	10.21, 2.4, 5.34, 44.91	0.844	Table 19
λ_{LT} = u.v.λ.$\sqrt{\beta_W}$	0.85 x 0.844 x 44.91 √ 1	32.25	
pb = Fn (py,λ_{LT})	265, 32.25	265 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	976.7 x 265 ≤ 258.826 =	258.826 kN.m	

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Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.526x-71.6/258.8	0.145	
$r_c=F_c/P_{cy}$	2.7/2433.6	0.001	
$\lambda_r=(r_b \lambda_{LT}+r_c \lambda_y)/(r_b+r_c)$	(0.145•32.3+0.001•44.9)/(0.145+0.001)	32.346	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1.019(2•0.145+0.001)/(0.145+0.001)	34.809	
$M_{ob}=M_b(1-F_c/P_{cy})$	258.826(1-2.7/2433.6)	258.540	
$M_{xy}=M_{cx}(1-F_c/P_{cy})^{½}$	258.826(1-2.7/2433.6)^{½}	258.683	
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	258.826(1-2.7/2227)/(1+0.5•2.7/2227)	258.357	
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	95.209(1-2.7/2433.6)/(1+1.0(2.7/2433.6))	94.999	
$M_{ab}=fn(\lambda_r, \lambda_{ro}, \varepsilon, M_{xy}, M_{ob})$	32.346, 34.809, 1.019, 258.683, 258.540	258.683	
$M_{ax}=fn(\lambda_x, \varepsilon, M_{rx}, M_{ox})$	66.202, 1.019, 258.825, 258.357	258.499	
$M_{ay}=fn(\lambda_y, \varepsilon, M_{ry}, M_{oy})$	44.914, 1.019, 95.209, 94.999	95.127	
$m_x.M_x/M_{ax}$	0.259x71.6/258.5	0.072	OK
$m_{LT}.M_{LT}/M_{ab}$	0.526x-71.6/258.7	0.145	OK
$m_x.M_x/M_{ax}$	0.259x71.6/258.5	0.072	OK
Compare with Simplied to 4.8.3.3	0.083, 0.146, 0.147	0.147	
Compare with MoreExact to 4.8.3.3	0.073, 0.146, 0.146	0.146	

Deflection Check - Load Case 10

$\delta \le$ Span/360	0.79 ≤ 6147 / 360	0.79 mm	OK

AXIAL WITH MOMENTS (MEMBER)

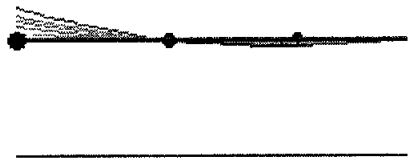
Members 315, 320, 323 and 326 (E10-K10) @ Level 6

Between 2.4 and 4.4 m, in Load Case 1

Member Loading and Member Forces

Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6 L1 + 1.4 A1

A1 D 078.500 (kN/m³)



Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
	439	2.22C	-0.03	42.40	0.00	-71.57	0.00	16.80	0.00	0.79
	457	1.93C	0.03	-9.46	0.00	0.37	0.00	@ 4.160	@ 0.522	@ 4.160

Classification and Properties (BS 5950: 2000)

Section (86.06 kg/m)	203x203 UC 86 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	5.1, 12.66, 265, 2.69, 71.57, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	7.55 / 448.688 =	0.017	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	265 x 976.7≤1.2 x 265 x 850.7 =	258.826 kN.m	
Fvy/Pvy	0 / 1226.811 =	0	Low Shear
Mcy = py.Syy≤1.2 py.Zyy	265 x 456.2≤1.2 x 265 x 299.4 =	95.209 kN.m	
Pz = Ag.py	109.63 x 265 =	2905.195 kN	

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n = F/Pz	2.688 / 2905.195 =	0.001	OK
Srx = Fn(Sxx, n)	976.7, 0.001	976.7 cm³	
Mrx = Srx.py	976.7 x 265	258.825 kN.m	
Sry = Fn(Syy, n)	456.2, 0.001	456.2 cm³	
Mry = Sry.py	456.2 x 265	95.209 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(16.842/258.825)^{2}+(0.001/95.209)^{1}$=	0.004	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x6.147/9.29 =	66.2	OK
Pcx = Area.pcx	109.63x203.135/10 =	2226.964 kN	Table 24 b
λy = Ley/ryy	100x1x2/5.34 =	37.4	OK
Pcy = Area.pcy	109.63x234.31/10 =	2568.716 kN	Table 24 c

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x6+.5x11+.15x15)/15 ≥0.44	0.768	Table 18
$m_y=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x0+.6x0+.1x0)/0 ≥.8x0/0	1	Table 26
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x-19+.6x8+.1x13)/72 ≥.8x19/72	0.259	Table 26
$m_{yx}=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x0+.6x0+.1x0)/0 ≥.8x0/0	1	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2 =	2 m	
λ = Le/ry	2 / 5.34	37.43	OK
v = Fn (x,Le,ry,λ)	10.21, 2, 5.34, 37.43	0.879	Table 19
$\lambda_{LT}= u.v.\lambda.\sqrt{\beta_W}$	0.85 x 0.879 x 37.43 √ 1	27.99	
pb = Fn (py,λ_{LT})	265, 27.99	265 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	976.7 x 265 ≤ 258.826 =	258.826 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.768x16.8/258.8	0.050	
$r_c=F_c/P_{cy}$	2.7/2568.7	0.001	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.05•28+0.001•37.4)/(0.05+0.001)	28.186	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1.019(2•0.05+0.001)/(0.05+0.001)	34.583	
$M_{ob}= M_b(1-F_c/P_{cy})$	258.826(1-2.7/2568.7)	258.555	
$M_{xy}= M_{cx}\ (1-F_c/\ P_{cy})^{½}$	258.826(1-2.7/2568.7)^{½}	258.690	
$M_{ox}= M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	258.826(1-2.7/2227)/(1+0.5•2.7/2227)	258.357	
$M_{oy}= M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	95.209(1-2.7/2568.7)/(1+1.0(2.7/2568.7))	95.010	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	28.186, 34.583, 1.019, 258.690, 258.555	258.690	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	66.202, 1.019, 258.825, 258.357	258.499	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	37.428, 1.019, 95.209, 95.010	95.152	
$m_x.M_x/M_{ax}$	0.259x71.6/258.5	0.072	OK
$m_{LT}.M_{LT}/M_{ab}$	0.768x16.8/258.7	0.050	OK
$m_x.M_x/M_{ax}$	0.259x71.6/258.5	0.017	OK
Compare with Simplied to 4.8.3.3	0.083, 0.051, 0.051	0.083	
Compare with MoreExact to 4.8.3.3	0.073, 0.051, 0.05	0.073	

Deflection Check - Load Case 10

δ ≤ Span/360	0.79 ≤ 6147 / 360	0.79 mm	OK

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REVISED STRUCTURAL CALCULATIONS FOR SUPERSTRUCTURE (PAGES 400-599)

PROPOSED OFFICE DEVELOPMENT AT 18 ORCHARD STREET NEATH

PART II

THOMAS PARRY DESIGN PARTNERSHIP
THE OLD SKETTY COACH HOUSE
GOWER ROAD
SWANSEA

STRUCTURAL ENGINEERS
SLOWIKOWSKI, BLACKSHAW AND PARTNERS

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PROJECT NO: GOA/A/1511

JULY 2007

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AXIAL WITH MOMENTS (MEMBER)
Members 334-337 (D8-K8) @ Level 6
Between 0 and 2.4 m, in Load Case 1

Member Loading and Member Forces

Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6 L1 + 1.4 A1

A1 D 078.500 (kN/m³)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
	467	3.58C	0.00	37.68	0.00	0.00	0.00	78.21	0.00	9.95
	471	3.06C	0.00	-46.58	0.00	0.00	0.00	@ 3.135	@ 5.102	@ 3.135

Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Classification and Properties (BS 5950: 2000)

Section (86.06 kg/m)	203x203 UC 86 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	5.1, 12.66, 265, 4.18, 78.21, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	13.081 / 448.688 =	0.029	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	265 x 976.7≤1.2 x 265 x 850.7 =	258.826 kN.m	
Pz = Ag.py	109.63 x 265 =	2905.195 kN	
n = F/Pz	4.181 / 2905.195 =	0.001	OK
Srx = Fn(Sxx, n)	976.7, 0.001	976.7 cm³	
Mrx = Srx.py	976.7 x 265	258.824 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(68.908/258.824)^{2}+(0)^{1}$=	0.071	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x6.27/9.29 =	67.5	OK
Pcx = Area.pcx	109.63x200.766/10 =	2200.996 kN	Table 24 b
λy = Ley/ryy	100x1x2.4/5.34 =	44.9	OK
Pcy = Area.pcy	109.63x221.98/10 =	2433.559 kN	Table 24 c

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x22+.5x44+.15x61)/69 ≥0.44	0.703	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x58+.6x78+.1x58)/78 ≥.8x78/78	0.948	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2.4 =	2.4 m	
λ = Le/ry	2.4 / 5.34	44.91	OK
v = Fn (x,Le,ry,λ)	10.21, 2.4, 5.34, 44.91	0.844	Table 19
$\lambda_{LT} = u.v.\lambda.\sqrt{\beta_W}$	0.85 x 0.844 x 44.91 √ 1	32.25	
pb = Fn (py,λ_{LT})	265, 32.25	265 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	976.7 x 265 ≤ 258.826 =	258.826 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.703x68.9/258.8	0.187	
$r_c=F_c/P_{cy}$	4.2/2433.6	0.002	

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$\lambda_r=(r_b \lambda_{LT}+r_c \lambda_y)/(r_b+r_c)$	(0.187•32.3+0.002•44.9)/(0.187+0.002)	32.366	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1.019(2•0.187+0.002)/(0.187+0.002)	34.782	
$M_{ob}=M_b(1-F_c/P_{cy})$	258.826(1-4.2/2433.6)	258.381	
$M_{xy}=M_{cx}(1-F_c/P_{cy})^{½}$	258.826(1-4.2/2433.6)^{½}	258.603	
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	258.826(1-4.2/2201)/(1+0.5•4.2/2201)	258.089	
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	95.209(1-4.2/2433.6)/(1+1.0(4.2/2433.6))	94.883	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	32.366, 34.782, 1.019, 258.603, 258.381	258.603	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	67.527, 1.019, 258.824, 258.089	258.298	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	44.914, 1.019, 95.209, 94.883	95.081	
$m_x.M_x/M_{ax}$	0.948x78.2/258.3	0.287	OK
$m_{LT}.M_{LT}/M_{ab}$	0.703x68.9/258.6	0.187	OK
$m_x.M_x/M_{ax}$	0.948x78.2/258.3	0.253	OK
Compare with Simplied to 4.8.3.3	0.331, 0.189, 0.189	0.331	
Compare with MoreExact to 4.8.3.3	0.289, 0.189, 0.188	0.289	

Deflection Check - Load Case 10

$\delta \le$ Span/360	9.95 ≤ 6270 / 360	9.95 mm	OK

AXIAL WITH MOMENTS (MEMBER)
Members 334-337 (D8-K8) @ Level 6
Between 2.4 and 4.4 m, in Load Case 1

Member Loading and Member Forces

Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6 L1 + 1.4 A1

A1 D 078.500 (kN/m³)

Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
	467	3.58C	0.00	37.68	0.00	0.00	0.00	78.21	0.00	9.95
	471	3.06C	0.00	-46.58	0.00	0.00	0.00	@ 3.135	@ 5.102	@ 3.135

Classification and Properties (BS 5950: 2000)

Section (86.06 kg/m)	203x203 UC 86 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	5.1, 12.66, 265, 4.18, 78.21, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	12.196 / 448.688 =	0.027	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	265 x 976.7≤1.2 x 265 x 850.7 =	258.826 kN.m	
Pz = Ag.py	109.63 x 265 =	2905.195 kN	
n = F/Pz	4.181 / 2905.195 =	0.001	OK
Srx = Fn(Sxx, n)	976.7, 0.001	976.7 cm³	
Mrx = Srx.py	976.7 x 265	258.824 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(78.205/258.824)^2+(0)^1$=	0.091	OK

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Compression Resistance Pc

λx = Lex/rxx	100x1x6.27/9.29 =	67.5	OK
Pcx = Area.pcx	109.63x200.766/10 =	2200.996 kN	Table 24 b
λy = Ley/ryy	100x1x2/5.34 =	37.4	OK
Pcy = Area.pcy	109.63x234.31/10 =	2568.716 kN	Table 24 c

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x75+.5x75+.15x69)/78 ≥0.44	0.957	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x58+.6x78+.1x58)/78 ≥.8x78/78	0.948	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2 =	2 m	
λ = Le/ry	2 / 5.34	37.43	OK
v = Fn (x,Le,ry,λ)	10.21, 2, 5.34, 37.43	0.879	Table 19
λ_{LT} = u.v.λ.$\sqrt{\beta_W}$	0.85 x 0.879 x 37.43 √ 1	27.99	
pb = Fn (py,λ_{LT})	265, 27.99	265 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	976.7 x 265 ≤ 258.826 =	258.826 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.957x78.2/258.8	0.289	
$r_c=F_c/P_{cy}$	4.2/2568.7	0.002	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.289•28+0.002•37.4)/(0.289+0.002)	28.045	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1.019(2•0.289+0.002)/(0.289+0.002)	34.843	
$M_{ob}=M_b(1-F_c/P_{cy})$	258.826(1-4.2/2568.7)	258.404	
$M_{xy}=M_{cx}(1-F_c/P_{cy})^{½}$	258.826(1-4.2/2568.7)^{½}	258.615	
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	258.826(1-4.2/2201)/(1+0.5•4.2/2201)	258.089	
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	95.209(1-4.2/2568.7)/(1+1.0(4.2/2568.7))	94.900	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	28.045, 34.843, 1.019, 258.615, 258.404	258.615	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	67.527, 1.019, 258.824, 258.089	258.298	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	37.428, 1.019, 95.209, 94.900	95.121	
$m_x.M_x/M_{ax}$	0.948x78.2/258.3	0.287	OK
$m_{LT}.M_{LT}/M_{ab}$	0.957x78.2/258.6	0.289	OK
$m_x.M_x/M_{ax}$	0.948x78.2/258.3	0.287	OK
Compare with Simplied to 4.8.3.3	0.331, 0.291, 0.291	0.331	
Compare with MoreExact to 4.8.3.3	0.289, 0.291, 0.29	0.291	

Deflection Check - Load Case 10

δ ≤ Span/360	9.95 ≤ 6270 / 360	9.95 mm	OK

AXIAL WITH MOMENTS (MEMBER)
Members 339 and 341 (A4-D4) @ Level 6
Between 0 and 2.4 m, in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
L1 + 1.4 A1

  A1 D     078.500            ( kN/m³)
```

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Member Forces in Load Case 1 and Maximum Deflection from Load Case 10										
Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	474	1.37C	0.09	8.85	0.00	0.00	0.00	8.55		0.39
	476	1.36C	-0.09	-4.72	0.00	0.00	0.00	@ 1.040		@ 1.805

Classification and Properties (BS 5950: 2000)

Section (86.06 kg/m)	203x203 UC 86 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	5.1, 12.66, 265, 1.37, 8.55, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	7.592 / 448.688 =	0.017	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	265 x 976.7≤1.2 x 265 x 850.7 =	258.826 kN.m	
Pz = Ag.py	109.63 x 265 =	2905.195 kN	
n = F/Pz	1.372 / 2905.195 =	0.000	OK
Srx = Fn(Sxx, n)	976.7, 0	976.7 cm³	
Mrx = Srx.py	976.7 x 265	258.825 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(8.547/258.825)^{2}+(0)^{1}$=	0.001	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x3.875/9.29 =	41.7	OK
Pcx = Area.pcx	109.63x239.399/10 =	2624.530 kN	Table 24 b
λy = Ley/ryy	100x1x2.4/5.34 =	44.9	OK
Pcy = Area.pcy	109.63x221.98/10 =	2433.559 kN	Table 24 c

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x5+.5x8+.15x7)/9 ≥0.44	0.903	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x8+.6x7+.1x4)/9 ≥.8x9/9	0.824	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2.4 =	2.4 m	
λ = Le/ry	2.4 / 5.34	44.91	OK
v = Fn (x,Le,ry,λ)	10.21, 2.4, 5.34, 44.91	0.844	Table 19
λ_{LT} = u.v.λ.$\sqrt{\beta_W}$	0.85 x 0.844 x 44.91 √ 1	32.25	
pb = Fn (py,λ_{LT})	265, 32.25	265 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	976.7 x 265 ≤ 258.826 =	258.826 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.903x8.5/258.8	0.030	
$r_c=F_c/P_{cy}$	1.4/2433.6	0.001	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.03•32.3+0.001•44.9)/(0.03+0.001)	32.486	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1.019(2•0.03+0.001)/(0.03+0.001)	34.617	
$M_{ob}=M_b(1-F_c/P_{cy})$	258.826(1-1.4/2433.6)	258.680	
$M_{xy}=M_{cx}(1-F_c/P_{cy})^{½}$	258.826(1-1.4/2433.6)^{½}	258.753	
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	258.826(1-1.4/2624.5)/(1+0.5•1.4/2624.5)	258.623	
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	95.209(1-1.4/2433.6)/(1+1.0(1.4/2433.6))	95.102	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	32.486, 34.617, 1.019, 258.753, 258.680	258.753	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	41.733, 1.019, 258.825, 258.623	258.755	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	44.914, 1.019, 95.209, 95.102	95.167	
$m_x.M_x/M_{ax}$	0.824x8.5/258.8	0.027	OK
$m_{LT}.M_{LT}/M_{ab}$	0.903x8.5/258.8	0.030	OK
$m_x.M_x/M_{ax}$	0.824x8.5/258.8	0.027	OK
Compare with Simplied to 4.8.3.3	0.032, 0.03, 0.03	0.032	
Compare with MoreExact to 4.8.3.3	0.028, 0.03, 0.03	0.03	

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Deflection Check - Load Case 10

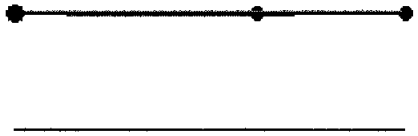
$\delta \leq$ Span/360	0.39 ≤ 3875 / 360	0.39 mm	OK

AXIAL WITH MOMENTS (MEMBER)
Members 339 and 341 (A4-D4) @ Level 6
Between 2.4 and 3.875 m, in Load Case 1

Member Loading and Member Forces

Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6 L1 + 1.4 A1

A1 D 078.500 (kN/m³)



Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
	474	1.37C	0.09	8.85	0.00	0.00	0.00	8.55		0.39
	476	1.36C	-0.09	-4.72	0.00	0.00	0.00	@ 1.040		@ 1.805

Classification and Properties (BS 5950: 2000)

Section (86.06 kg/m)	203x203 UC 86 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	5.1, 12.66, 265, 1.37, 8.55, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	2.946 / 448.688 =	0.007	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	265 x 976.7≤1.2 x 265 x 850.7 =	258.826 kN.m	
Pz = Ag.py	109.63 x 265 =	2905.195 kN	
n = F/Pz	1.372 / 2905.195 =	0.000	OK
Srx = Fn(Sxx, n)	976.7, 0	976.7 cm³	
Mrx = Srx.py	976.7 x 265	258.825 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(5.654/258.825)^2+(0)^1=$	0	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x3.875/9.29 =	41.7	OK
Pcx = Area.pcx	109.63x239.399/10 =	2624.530 kN	Table 24 b
λy = Ley/ryy	100x1x1.475/5.34 =	27.6	OK
Pcy = Area.pcy	109.63x249.65/10 =	2736.920 kN	Table 24 c

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x4+.5x3+.15x2)/6 ≥0.44	0.642	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x8+.6x7+.1x4)/9 ≥.8x9/9	0.824	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 1.475 =	1.475 m	
λ = Le/ry	1.475 / 5.34	27.6	OK
v = Fn (x,Le,ry,λ)	10.21, 1.475, 5.34, 27.6	0.925	Table 19
$\lambda_{LT} = u.v.\lambda.\sqrt{\beta_W}$	0.85 x 0.925 x 27.6 √ 1	21.72	
pb = Fn (py,λ_{LT})	265, 21.72	265 N/mm²	Table 16

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Mb = Sx.pb ≤ Mc	976.7 x 265 ≤ 258.826 =	258.826 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.642x5.7/258.8	0.014	
$r_c=F_c/P_{cy}$	1.4/2736.9	0.001	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.014•21.7+0.001•27.6)/(0.014+0.001)	21.919	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1.019(2•0.014+0.001)/(0.014+0.001)	34.339	
$M_{ob}=M_b(1-F_c/P_{cy})$	258.826(1-1.4/2736.9)	258.696	
$M_{xy}=M_{cx}(1-F_c/P_{cy})^{½}$	258.826(1-1.4/2736.9)^{½}	258.761	
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	258.826(1-1.4/2624.5)/(1+0.5•1.4/2624.5)	258.623	
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	95.209(1-1.4/2736.9)/(1+1.0(1.4/2736.9))	95.114	
$M_{ab}=fn(\lambda_r, \lambda_{ro}, \varepsilon, M_{xy}, M_{ob})$	21.919, 34.339, 1.019, 258.761, 258.696	258.761	
$M_{ax}=fn(\lambda_x, \varepsilon, M_{rx}, M_{ox})$	41.733, 1.019, 258.825, 258.623	258.755	
$M_{ay}=fn(\lambda_y, \varepsilon, M_{ry}, M_{oy})$	27.603, 1.019, 95.209, 95.114	95.195	
$m_x.M_x/M_{ax}$	0.824x8.5/258.8	0.027	OK
$m_{LT}.M_{LT}/M_{ab}$	0.642x5.7/258.8	0.014	OK
$m_x.M_x/M_{ax}$	0.824x8.5/258.8	0.018	OK
Compare with Simplied to 4.8.3.3	0.032, 0.015, 0.015	0.032	
Compare with MoreExact to 4.8.3.3	0.028, 0.015, 0.014	0.028	

Deflection Check - Load Case 10

δ ≤ Span/360	0.39 ≤ 3875 / 360	0.39 mm	OK

AXIAL WITH MOMENTS (MEMBER)

Members 342, 344-345 and 347-348 (D4-P4) @ Level 6

Between 0 and 2.4 m, in Load Case 1

Member Loading and Member Forces

Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6 L1 + 1.4 A1

A1 D 078.500 (kN/m³)

Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
	476	4.08C	-0.13	37.57	0.00	-29.08	0.00	59.57		9.11
	482	5.66C	0.14	-38.78	0.00	0.00	0.00	@ 3.935		@ 3.464

Classification and Properties (BS 5950: 2000)

Section (86.06 kg/m)	203x203 UC 86 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	5.1, 12.66, 265, 5.66, 59.55, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	19.099 / 448.688 =	0.043	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	265 x 976.7≤1.2 x 265 x 850.7 =	258.826 kN.m	
Pz = Ag.py	109.63 x 265 =	2905.195 kN	
n = F/Pz	5.661 / 2905.195 =	0.002	OK

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Srx = Fn(Sxx, n)	976.7, 0.002	976.69 cm^3	
Mrx = Srx.py	976.69 x 265	258.823 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(45.009/258.823)^2+(0)^1=$	0.03	OK
Compression Resistance Pc			
λx = Lex/rxx	100x1x6.739/9.29 =	72.6	OK
Pcx = Area.pcx	109.63x191.413/10 =	2098.459 kN	Table 24 b
λy = Ley/ryy	100x1x2.4/5.34 =	44.9	OK
Pcy = Area.pcy	109.63x221.98/10 =	2433.559 kN	Table 24 c
Equivalent Uniform Moment Factors mLT, mx, my and myx			
$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x7+.5x15+.15x32)/45 ≥0.44	0.494	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x30+.6x58+.1x55)/60 ≥.8x60/60	0.93	Table 26
Lateral Buckling Check Mb			
Le = 1.00 L	1 x 2.4 =	2.4 m	
λ = Le/ry	2.4 / 5.34	44.91	OK
v = Fn (x,Le,ry,λ)	10.21, 2.4, 5.34, 44.91	0.844	Table 19
λ_{LT} = u.v.λ.$\sqrt{\beta_W}$	0.85 x 0.844 x 44.91 √ 1	32.25	
pb = Fn (py,λ_{LT})	265, 32.25	265 N/mm^2	Table 16
Mb = Sx.pb ≤ Mc	976.7 x 265 ≤ 258.826 =	258.826 kN.m	
Combined Axial Compression and Bending to Annex I			
$r_b=m_{LT}.M_{LT}/M_b$	0.494x45/258.8	0.086	
$r_c=F_c/P_{cy}$	5.7/2433.6	0.002	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.086•32.3+0.002•44.9)/(0.086+0.002)	32.585	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1.019(2•0.086+0.002)/(0.086+0.002)	34.481	
$M_{ob}=M_b(1-F_c/P_{cy})$	258.826(1-5.7/2433.6)	258.223	
$M_{xy}=M_{cx}(1-F_c/P_{cy})^{½}$	258.826(1-5.7/2433.6)^{½}	258.524	
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	258.826(1-5.7/2098.5)/(1+0.5•5.7/2098.5)	257.780	
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	95.209(1-5.7/2433.6)/(1+1.0(5.7/2433.6))	94.767	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	32.585, 34.481, 1.019, 258.524, 258.223	258.524	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	72.578, 1.019, 258.823, 257.780	258.001	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	44.914, 1.019, 95.209, 94.767	95.036	
$m_x.M_x/M_{ax}$	0.93x59.6/258	0.215	OK
$m_{LT}.M_{LT}/M_{ab}$	0.494x45/258.5	0.086	OK
$m_x.M_x/M_{ax}$	0.93x59.6/258	0.162	OK
Compare with Simplied to 4.8.3.3	0.248, 0.088, 0.089	0.248	
Compare with MoreExact to 4.8.3.3	0.217, 0.088, 0.086	0.217	
Deflection Check - Load Case 10			
δ ≤ Span/360	9.11 ≤ 6739 / 360	9.11 mm	OK

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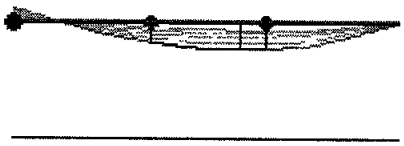
AXIAL WITH MOMENTS (MEMBER)

Members 342, 344-345 and 347-348 (D4-P4) @ Level 6 Between 2.4 and 4.4 m, in Load Case 1

Member Loading and Member Forces

Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6 L1 + 1.4 A1

A1 D 078.500 (kN/m³)



Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
	476	4.08C	-0.13	37.57	0.00	-29.08	0.00	59.57		9.11
	482	5.66C	0.14	-38.78	0.00	0.00	0.00	@ 3.935		@ 3.464

Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Classification and Properties (BS 5950: 2000)

Section (86.06 kg/m)	203x203 UC 86 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	5.1, 12.66, 265, 5.66, 59.55, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	0.026 / 448.688 =	0	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	265 x 976.7≤1.2 x 265 x 850.7 =	258.826 kN.m	
Pz = Ag.py	109.63 x 265 =	2905.195 kN	
n = F/Pz	5.661 / 2905.195 =	0.002	OK
Srx = Fn(Sxx, n)	976.7, 0.002	976.69 cm³	
Mrx = Srx.py	976.69 x 265	258.823 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(59.555/258.823)^2+(0)^1=$	0.053	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x6.739/9.29 =	72.6	OK
Pcx = Area.pcx	109.63x191.413/10 =	2098.459 kN	Table 24 b
λy = Ley/ryy	100x1x2/5.34 =	37.4	OK
Pcy = Area.pcy	109.63x234.31/10 =	2568.716 kN	Table 24 c

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x54+.5x59+.15x60)/60 ≥0.44	0.976	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x30+.6x58+.1x55)/60 ≥.8x60/60	0.93	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2 =	2 m	
λ = Le/ry	2 / 5.34	37.43	OK
v = Fn (x,Le,ry,λ)	10.21, 2, 5.34, 37.43	0.879	Table 19
$\lambda_{LT} = u.v.\lambda.\sqrt{\beta_W}$	0.85 x 0.879 x 37.43 √ 1	27.99	
pb = Fn (py,λ_{LT})	265, 27.99	265 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	976.7 x 265 ≤ 258.826 =	258.826 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.976x59.6/258.8	0.225	
$r_c=F_c/P_{cy}$	5.7/2568.7	0.002	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.225•28+0.002•37.4)/(0.225+0.002)	28.084	

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$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1.019(2•0.225+0.002)/(0.225+0.002)	34.771	
$M_{ob}=M_b(1-F_c/P_{cy})$	258.826(1-5.7/2568.7)	258.255	
$M_{xy}=M_{cx}\ (1-F_c/P_{cy})^{½}$	258.826(1-5.7/2568.7)^{½}	258.540	
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	258.826(1-5.7/2098.5)/(1+0.5•5.7/2098.5)	257.780	
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	95.209(1-5.7/2568.7)/(1+1.0(5.7/2568.7))	94.790	
$M_{ab}=fn(\lambda_r, \lambda_{ro}, \varepsilon, M_{xy}, M_{ob})$	28.084, 34.771, 1.019, 258.540, 258.255	258.540	
$M_{ax}=fn(\lambda_x, \varepsilon, M_{rx}, M_{ox})$	72.578, 1.019, 258.823, 257.780	258.001	
$M_{ay}=fn(\lambda_y, \varepsilon, M_{ry}, M_{oy})$	37.428, 1.019, 95.209, 94.790	95.090	
$m_x.M_x/M_{ax}$	0.93x59.6/258	0.215	OK
$m_{LT}.M_{LT}/M_{ab}$	0.976x59.6/258.5	0.225	OK
$m_x.M_x/M_{ax}$	0.93x59.6/258	0.215	OK
Compare with Simplied to 4.8.3.3	0.248, 0.227, 0.227	0.248	
Compare with MoreExact to 4.8.3.3	0.217, 0.227, 0.226	0.227	

Deflection Check - Load Case 10

$\delta \le$ Span/360	9.11 ≤ 6739 / 360	9.11 mm	OK

AXIAL WITH MOMENTS (MEMBER)

Member 343 (D4-H5) @ Level 6 in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
 L1 + 1.4 A1

   D1 PTRY -000.930 0.000 0.748 -001.002
   L1 PTRY -000.558 0.000 0.748 -000.601
   D1 UDLY -000.188              ( kN/m )
   L1 UDLY -000.113              ( kN/m )
   A1 D     078.500              ( kN/m³)
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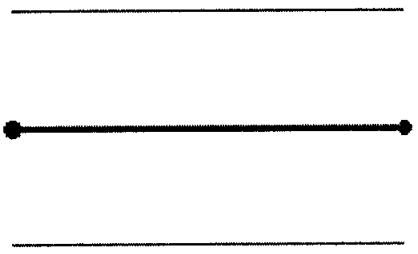

Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
343	476	5.96C	-1.50	-0.03	0.00	6.51	0.00			0.01
	479	5.96C	1.50	-2.97	0.00	5.40	0.00			@ 0.362

Classification and Properties (BS 5950: 2000)

Section (86.06 kg/m)	203x203 UC 86 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	5.1, 12.66, 265, 5.96, 6.51, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	2.969 / 448.688 =	0.007	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	265 x 976.7≤1.2 x 265 x 850.7 =	258.826 kN.m	
Pz = Ag.py	109.63 x 265 =	2905.195 kN	
n = F/Pz	5.962 / 2905.195 =	0.002	OK
Srx = Fn(Sxx, n)	976.7, 0.002	976.69 cm³	
Mrx = Srx.py	976.69 x 265	258.823 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(5.394/258.823)^2+(0)^1=$	0.002	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x0.748/9.29 =	8.1	OK
Pcx = Area.pcx	109.63x265/10 =	2905.195 kN	Table 24 b
λy = Ley/ryy	100x1x0.748/5.34 =	14	OK

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Pcy = Area.pcy	109.63x265/10 =	2905.195 kN	Table 24 c

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x6+.5x6+.15x6)/7 ≥0.44	0.963	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x6+.6x6+.1x6)/7 ≥.8x6/7	0.963	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 0.748 =	0.748 m	
λ = Le/ry	0.748 / 5.34	13.99	OK
v = Fn (x,Le,ry,λ)	10.21, 0.748, 5.34, 13.99	0.978	Table 19
$\lambda_{LT} = u.v.\lambda.\sqrt{\beta_W}$	0.85 x 0.978 x 13.99 √ 1	11.64	
pb = Fn (py,λ_{LT})	265, 11.64	265 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	976.7 x 265 ≤ 258.826 =	258.826 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.963x6.5/258.8	0.024	
$r_c=F_c/P_{cy}$	6/2905.2	0.002	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.024•11.6+0.002•14)/(0.024+0.002)	11.822	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1.019(2•0.024+0.002)/(0.024+0.002)	33.574	
$M_{ob} = M_b(1-F_c/P_{cy})$	258.826(1-6/2905.2)	258.294	
$M_{xy} = M_{cx}(1-F_c/P_{cy})^{½}$	258.826(1-6/2905.2)^{½}	258.560	
$M_{ox} = M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	258.826(1-6/2905.2)/(1+0.5•6/2905.2)	258.030	
$M_{oy} = M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	95.209(1-6/2905.2)/(1+1.0(6/2905.2))	94.819	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	11.822, 33.574, 1.019, 258.560, 258.294	258.560	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	8.054, 1.019, 258.823, 258.030	258.823	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	13.995, 1.019, 95.209, 94.819	95.209	
$m_x.M_x/M_{ax}$	0.963x6.5/258.8	0.024	OK
$m_{LT}.M_{LT}/M_{ab}$	0.963x6.5/258.6	0.024	OK
$m_x.M_x/M_{ax}$	0.963x6.5/258.8	0.024	OK
Compare with Simplied to 4.8.3.3	0.03, 0.026, 0.026	0.03	
Compare with MoreExact to 4.8.3.3	0.026, 0.026, 0.024	0.026	

Deflection Check - Load Case 10

δ ≤ Span/360	0.01 ≤ 748 / 360	0.01 mm	OK

AXIAL WITH MOMENTS (MEMBER)
Members 346 and 352 (H5-M5) @ Level 6
Between 0 and 2.4 m, in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
L1 + 1.4 A1

  D1 PTRY -001.357 0.000 5.140 -002.913
  L1 PTRY -000.814 0.000 5.140 -001.748
  A1 D     078.500              ( kN/m³)
```

Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	

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Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
	479	6.65C	-0.09	20.51	0.00	0.00	0.00	39.71		6.41
	496	6.65C	0.09	-24.23	0.00	0.00	0.00	@ 3.603		@ 3.444

Classification and Properties (BS 5950: 2000)

Section (86.06 kg/m)	203x203 UC 86 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	5.1, 12.66, 265, 6.65, 39.72, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	7.871 / 448.688 =	0.018	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	265 x 976.7≤1.2 x 265 x 850.7 =	258.826 kN.m	
Pz = Ag.py	109.63 x 265 =	2905.195 kN	
n = F/Pz	6.65 / 2905.195 =	0.002	OK
Srx = Fn(Sxx, n)	976.7, 0.002	976.69 cm³	
Mrx = Srx.py	976.69 x 265	258.822 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(34.877/258.822)^2+(0)^1=$	0.018	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x6.853/9.29 =	73.8	OK
Pcx = Area.pcx	109.63x189.083/10 =	2072.914 kN	Table 24 b
λy = Ley/ryy	100x1x2.4/5.34 =	44.9	OK
Pcy = Area.pcy	109.63x221.98/10 =	2433.559 kN	Table 24 c

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x11+.5x21+.15x29)/35 ≥0.44	0.679	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(1x28+.6x40+.1x31)/40 ≥.8x40/40	0.947	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2.4 =	2.4 m	
λ = Le/ry	2.4 / 5.34	44.91	OK
v = Fn (x,Le,ry,λ)	10.21, 2.4, 5.34, 44.91	0.844	Table 19
λ_{LT} = u.v.λ.√βw	0.85 x 0.844 x 44.91 √ 1	32.25	
pb = Fn (py,λ_{LT})	265, 32.25	265 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	976.7 x 265 ≤ 258.826 =	258.826 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.679x34.9/258.8	0.091	
$r_c=F_c/P_{cy}$	6.7/2433.6	0.003	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.091•32.3+0.003•44.9)/(0.091+0.003)	32.618	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1.019(2•0.091+0.003)/(0.091+0.003)	34.434	
$M_{ob}=M_b(1-F_c/P_{cy})$	258.826(1-6.7/2433.6)	258.118	
$M_{xy}=M_{cx}(1-F_c/P_{cy})^{½}$	258.826(1-6.7/2433.6)^½	258.472	
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	258.826(1-6.7/2072.9)/(1+0.5•6.7/2072.9)	257.582	
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	95.209(1-6.7/2433.6)/(1+1.0(6.7/2433.6))	94.690	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	32.618, 34.434, 1.019, 258.472, 258.118	258.472	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	73.801, 1.019, 258.822, 257.582	257.823	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	44.914, 1.019, 95.209, 94.690	95.005	
$m_x.M_x/M_{ax}$	0.947x39.7/257.8	0.146	OK
$m_{LT}.M_{LT}/M_{ab}$	0.679x34.9/258.5	0.092	OK
$m_x.M_x/M_{ax}$	0.947x39.7/257.8	0.128	OK
Compare with Simplied to 4.8.3.3	0.17, 0.094, 0.095	0.17	
Compare with MoreExact to 4.8.3.3	0.149, 0.094, 0.092	0.149	

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Deflection Check - Load Case 10

$\delta \leq$ Span/360	6.41 ≤ 6853 / 360	6.41 mm	OK

AXIAL WITH MOMENTS (MEMBER)

Member 349 (M6-N6) @ Level 6 in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
L1 + 1.4 A1

   D1 PTRY -001.258 0.000 5.085 -001.249
   L1 PTRY -000.755 0.000 5.085 -000.749
   A1 D     078.500              ( kN/m³)
```

Member Forces in Load Case 1 and Maximum Deflection from Load Case 10										
Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
349	483	8.85C	0.00	8.60	0.00	0.00	0.00	10.92		3.16
	484	8.85C	0.00	-8.58	0.00	0.00	0.00	@ 2.516		@ 2.516

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 8.85, 10.92, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	0.005 / 218.381 =	0	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Fvy/Pvy	0 / 381.776 =	0	Low Shear
Mcy = py.Syy≤1.2 py.Zyy	275 x 88.2≤1.2 x 275 x 57.5 =	18.975 kN.m	
Pz = Ag.py	38.21 x 275 =	1050.775 kN	
n = F/Pz	8.851 / 1050.775 =	0.008	OK
Srx = Fn(Sxx, n)	314.4, 0.008	314.36 cm³	
Mrx = Srx.py	314.36 x 275	86.449 kN.m	
Sry = Fn(Syy, n)	88.2, 0.008	88.2 cm³	
Mry = Sry.py	88.2 x 275	18.975 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(10.918/86.449)^{2}+(0.001/18.975)^{1}$=	0.016	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x5.085/8.71 =	58.4	OK
Pcx = Area.pcx	38.21x241.411/10 =	922.432 kN	Table 24 a
λy = Ley/ryy	100x1x5.085/3.18 =	160.1	OK
Pcy = Area.pcy	38.21x66.38/10 =	253.631 kN	Table 24 b

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x8+.5x11+.15x8)/11 ≥0.44	0.925	Table 18
$m_y=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x0+.6x0+.1x0)/0 ≥.8x0/0	1	Table 26
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x8+.6x11+.1x8)/11 ≥.8x11/11	0.95	Table 26
$m_{yx}=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x0+.6x0+.1x0)/0 ≥.8x0/0	1	Table 26

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Lateral Buckling Check Mb

Le = 1.00 L	1 x 5.085 =	5.085 m	
λ = Le/ry	5.085 / 3.18	160.09	OK
v = Fn (x,Le,ry,λ)	21.437, 5.085, 3.18, 160.09	0.717	Table 19
λ_{LT} = u.v.λ.$\sqrt{\beta_W}$	0.882 x 0.717 x 160.09 $\sqrt{}$ 1	101.24	
pb = Fn (py,λ_{LT})	275, 101.24	122.79 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 122.79 ≤ 86.46 =	38.606 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.925x10.9/38.6	0.262	
$r_c=F_c/P_{cy}$	8.9/253.6	0.035	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.262•101.2+0.035•160.1)/(0.262+0.035)	108.166	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.262+0.035)/(0.262+0.035)	32.281	
$M_{ob}=M_b(1-F_c/P_{cy})$	38.606(1-8.9/253.6)	37.259	
$M_{xy}=M_{cx}(1-F_c/P_{cy})^{½}$	86.460(1-8.9/253.6)^{½}	84.938	
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-8.9/922.4)/(1+0.5•8.9/922.4)	85.221	
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-8.9/253.6)/(1+1.0(8.9/253.6))	17.695	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	108.166, 32.281, 1.000, 84.938, 37.259	37.259	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	58.407, 1.000, 86.449, 85.221	85.711	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	160.091, 1.000, 18.975, 17.695	17.695	
$m_x.M_x/M_{ax}$	0.95x10.9/85.7	0.121	OK
$m_{LT}.M_{LT}/M_{ab}$	0.925x10.9/37.3	0.271	OK
$m_x.M_x/M_{ax}$	0.95x10.9/85.7	0.121	OK
Compare with Simplied to 4.8.3.3	0.17, 0.297, 0.297	0.297	
Compare with MoreExact to 4.8.3.3	0.13, 0.297, 0.119	0.297	

Deflection Check - Load Case 10

δ ≤ Span/360	3.16 ≤ 5085 / 360	3.16 mm	OK

AXIAL WITH MOMENTS (MEMBER)

Member 350 (N6-Q6) @ Level 6 in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
L1 + 1.4 A1

   D1 PTRY -001.249 0.000 4.643 -001.240
   L1 PTRY -000.749 0.000 4.643 -000.744
   A1 D     078.500              ( kN/m³)
```

Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
350	484	8.03C	0.00	7.80	0.00	0.00	0.00	9.05		2.18
	487	8.03C	0.00	-7.78	0.00	0.00	0.00	@ 2.298		@ 2.298

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 8.03, 9.05, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

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Local Capacity Check

Fvx/Pvx	0.002 / 218.381 =	0	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Fvy/Pvy	0 / 381.776 =	0	Low Shear
Mcy = py.Syy≤1.2 py.Zyy	275 x 88.2≤1.2 x 275 x 57.5 =	18.975 kN.m	
Pz = Ag.py	38.21 x 275 =	1050.775 kN	
n = F/Pz	8.026 / 1050.775 =	0.008	OK
Srx = Fn(Sxx, n)	314.4, 0.008	314.37 cm³	
Mrx = Srx.py	314.37 x 275	86.451 kN.m	
Sry = Fn(Syy, n)	88.2, 0.008	88.2 cm³	
Mry = Sry.py	88.2 x 275	18.975 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(9.045/86.451)^2+(0.001/18.975)^1$=	0.011	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x4.643/8.71 =	53.3	OK
Pcx = Area.pcx	38.21x247.533/10 =	945.823 kN	Table 24 a
λy = Ley/ryy	100x1x4.643/3.18 =	146.2	OK
Pcy = Area.pcy	38.21x77.82/10 =	297.333 kN	Table 24 b

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x7+.5x9+.15x7)/9 ≥0.44	0.925	Table 18
$m_y=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x0+.6x0+.1x0)/0 ≥.8x0/0	1	Table 26
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x7+.6x9+.1x7)/9 ≥.8x9/9	0.95	Table 26
$m_{yx}=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x0+.6x0+.1x0)/0 ≥.8x0/0	1	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 4.643 =	4.643 m	
λ = Le/ry	4.643 / 3.18	146.18	OK
v = Fn (x,Le,ry,λ)	21.437, 4.643, 3.18, 146.18	0.741	Table 19
λ_{LT} = u.v.λ.√βw	0.882 x 0.741 x 146.18 √ 1	95.51	
pb = Fn (py,λ_{LT})	275, 95.51	132.92 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 132.92 ≤ 86.46 =	41.790 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.925x9/41.8	0.200	
$r_c=F_c/P_{cy}$	8/297.3	0.027	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.2•95.5+0.027•146.2)/(0.2+0.027)	101.527	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.2+0.027)/(0.2+0.027)	32.262	
$M_{ob}=M_b(1-F_c/P_{cy})$	41.790(1-8/297.3)	40.662	
$M_{xy}=M_{cx}\ (1-F_c/P_{cy})^{½}$	86.460(1-8/297.3)^{½}	85.285	
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-8/945.8)/(1+0.5•8/945.8)	85.364	
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-8/297.3)/(1+1.0(8/297.3))	17.977	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	101.527, 32.262, 1.000, 85.285, 40.662	40.662	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	53.331, 1.000, 86.451, 85.364	85.878	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	146.176, 1.000, 18.975, 17.977	17.977	
$m_x.M_x/M_{ax}$	0.95x9/85.9	0.100	OK
$m_{LT}.M_{LT}/M_{ab}$	0.925x9/40.7	0.206	OK
$m_x.M_x/M_{ax}$	0.95x9/85.9	0.100	OK
Compare with Simplied to 4.8.3.3	0.139, 0.227, 0.227	0.227	
Compare with MoreExact to 4.8.3.3	0.108, 0.227, 0.098	0.227	

Deflection Check - Load Case 10

δ ≤ Span/360	2.18 ≤ 4643 / 360	2.18 mm	OK

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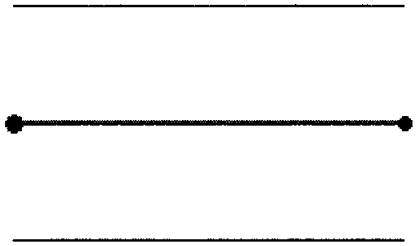
AXIAL WITH MOMENTS (MEMBER)

Member 351 (A2-H2) @ Level 6 in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
 L1 + 1.4 A1

   D1 PTRY -001.911 0.000 1.025 -001.156
   L1 PTRY -001.147 0.000 1.025 -000.694
   A1 D     078.500             ( kN/m³)
```



Member Forces in Load Case 1 and Maximum Deflection from Load Case 10										
Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
351	491	0.67C	0.00	2.22	0.00	0.00	0.00	0.53		0.01
	498	0.67C	0.00	-1.92	0.00	0.00	0.00	@ 0.497		@ 0.507

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 0.67, 0.53, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	0.082 / 218.381 =	0	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Pz = Ag.py	38.21 x 275 =	1050.775 kN	
n = F/Pz	0.671 / 1050.775 =	0.001	OK
Srx = Fn(Sxx, n)	314.4, 0.001	314.4 cm³	
Mrx = Srx.py	314.4 x 275	86.46 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(0.528/86.46)^2+(0)^1$=	0	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x1.025/8.71 =	11.8	OK
Pcx = Area.pcx	38.21x275/10 =	1050.775 kN	Table 24 a
λy = Ley/ryy	100x1x1.025/3.18 =	32.3	OK
Pcy = Area.pcy	38.21x259.18/10 =	990.320 kN	Table 24 b

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x0+.5x1+.15x0)/1 ≥0.44	0.923	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x0+.6x1+.1x0)/1 ≥.8x1/1	0.947	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 1.025 =	1.025 m	
λ = Le/ry	1.025 / 3.18	32.27	OK
v = Fn (x,Le,ry,λ)	21.437, 1.025, 3.18, 32.27	0.974	Table 19
$\lambda_{LT} = u.v.\lambda.\sqrt{\beta_W}$	0.882 x 0.974 x 32.27 √ 1	27.72	
pb = Fn (py,λ_{LT})	275, 27.72	275 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 275 ≤ 86.46 =	86.460 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.923x0.5/86.5	0.006

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$r_c=F_c/P_{cy}$	0.7/990.3	0.001	
$\lambda_r=(r_b \lambda_{LT}+r_c \lambda_y)/(r_b+r_c)$	(0.006•27.7+0.001•32.3)/(0.006+0.001)	28.206	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.006+0.001)/(0.006+0.001)	32.457	
$M_{ob}=M_b(1-F_c/P_{cy})$	86.460(1-0.7/990.3)	86.401	
$M_{xy}=M_{cx}(1-F_c/P_{cy})^{½}$	86.460(1-0.7/990.3)^{½}	86.431	
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-0.7/1050.8)/(1+0.5•0.7/1050.8)	86.377	
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-0.7/990.3)/(1+1.0(0.7/990.3))	18.949	
$M_{ab}=fn(\lambda_r, \lambda_{ro}, \varepsilon, M_{xy}, M_{ob})$	28.206, 32.457, 1.000, 86.431, 86.401	86.431	
$M_{ax}=fn(\lambda_x, \varepsilon, M_{rx}, M_{ox})$	11.773, 1.000, 86.460, 86.377	86.460	
$M_{ay}=fn(\lambda_y, \varepsilon, M_{ry}, M_{oy})$	32.270, 1.000, 18.975, 18.949	18.969	
$m_x.M_x/M_{ax}$	0.947x0.5/86.5	0.006	OK
$m_{LT}.M_{LT}/M_{ab}$	0.923x0.5/86.4	0.006	OK
$m_x.M_x/M_{ax}$	0.947x0.5/86.5	0.006	OK
Compare with Simplied to 4.8.3.3	0.007, 0.006, 0.006	0.007	
Compare with MoreExact to 4.8.3.3	0.006, 0.006, 0.006	0.006	

Deflection Check - Load Case 10

$\delta \le$ Span/360	0.01 ≤ 1025 / 360	0.01 mm	OK

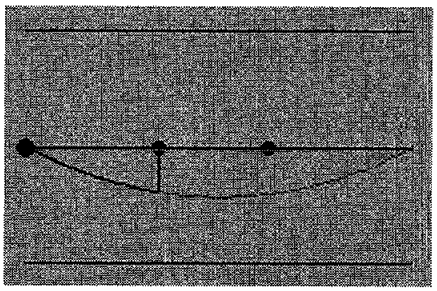
AXIAL WITH MOMENTS (MEMBER)

Member 353 (N.495-N.500) @ Level 6
Between 0 and 2.4 m, in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
L1 + 1.4 A1

   D1 PTRY -002.338 0.000 7.024 -002.384
   L1 PTRY -001.404 0.000 7.024 -001.430
   A1 D     078.500              ( kN/m³)
```



Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
353	495	1.77C	0.00	20.99	0.00	0.00	0.00	36.96		20.26
	500	1.77C	0.00	-21.11	0.00	0.00	0.00	@ 3.512		@ 3.512

Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 1.77, 36.96, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	6.685 / 218.381 =	0.031	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Pz = Ag.py	38.21 x 275 =	1050.775 kN	
n = F/Pz	1.77 / 1050.775 =	0.002	OK
Srx = Fn(Sxx, n)	314.4, 0.002	314.4 cm³	

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Mrx = Srx.py	314.4 x 275	86.46 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(33.216/86.46)^2+(0)^1=$	0.148	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x7.025/8.71 =	80.7	OK
Pcx = Area.pcx	38.21x201.852/10 =	771.277 kN	Table 24 a
λy = Ley/ryy	100x1x2.4/3.18 =	75.6	OK
Pcy = Area.pcy	38.21x190.65/10 =	728.476 kN	Table 24 b

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x12+.5x21+.15x28)/33 ≥0.44	0.694	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x28+.6x37+.1x28)/37 ≥.8x37/37	0.95	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2.4 =	2.4 m	
λ = Le/ry	2.4 / 3.18	75.56	OK
v = Fn (x,Le,ry,λ)	21.437, 2.4, 3.18, 75.56	0.886	Table 19
$\lambda_{LT} = u.v.\lambda.\sqrt{\beta_W}$	0.882 x 0.886 x 75.56 √ 1	59.08	
pb = Fn (py,λ_{LT})	275, 59.08	215.52 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 215.52 ≤ 86.46 =	67.759 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.694x33.2/67.8	0.340	
$r_c=F_c/P_{cy}$	1.8/728.5	0.002	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.34•59.1+0.002•75.6)/(0.34+0.002)	59.195	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.34+0.002)/(0.34+0.002)	34.178	
$M_{ob} = M_b(1-F_c/P_{cy})$	67.759(1-1.8/728.5)	67.595	
$M_{xy} = M_{cx}(1-F_c/P_{cy})^{½}$	86.460(1-1.8/728.5)^½	86.355	
$M_{ox} = M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-1.8/771.3)/(1+0.5•1.8/771.3)	86.163	
$M_{oy} = M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-1.8/728.5)/(1+1.0(1.8/728.5))	18.883	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	59.195, 34.178, 1.000, 86.355, 67.595	77.317	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	80.680, 1.000, 86.460, 86.163	86.185	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	75.559, 1.000, 18.975, 18.883	18.897	
$m_x.M_x/M_{ax}$	0.95x37/86.2	0.408	OK
$m_{LT}.M_{LT}/M_{ab}$	0.694x33.2/77.3	0.298	OK
$m_x.M_x/M_{ax}$	0.95x37/86.2	0.366	OK
Compare with Simplied to 4.8.3.3	0.458, 0.342, 0.342	0.458	
Compare with MoreExact to 4.8.3.3	0.409, 0.342, 0.267	0.409	

Deflection Check - Load Case 10

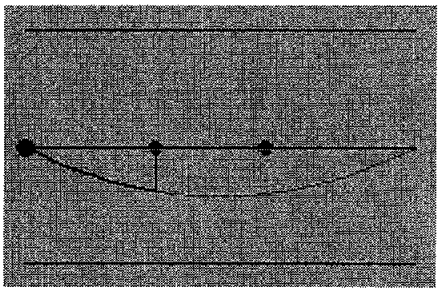
δ ≤ Span/360	20.26 ≤ 7025 / 360	20.26 mm	Warning

AXIAL WITH MOMENTS (MEMBER)
Member 354 (N.497-N.503) @ Level 6
Between 0 and 2.4 m, in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
L1 + 1.4 A1

  D1 PTRY -002.338 0.000 7.164 -002.139
  L1 PTRY -001.404 0.000 7.164 -001.284
  A1 D     078.500             ( kN/m³)
```



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Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
354	497	1.22C	0.00	20.71	0.00	0.00	0.00	36.59		20.87
	503	1.22C	0.00	-20.15	0.00	0.00	0.00	@ 3.545		@ 3.545

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 1.22, 36.59, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	6.647 / 218.381 =	0.03	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Pz = Ag.py	38.21 x 275 =	1050.775 kN	
n = F/Pz	1.216 / 1050.775 =	0.001	OK
Srx = Fn(Sxx, n)	314.4, 0.001	314.4 cm³	
Mrx = Srx.py	314.4 x 275	86.46 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(32.751/86.46)^2+(0)^1$=	0.143	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x7.164/8.71 =	82.3	OK
Pcx = Area.pcx	38.21x198.269/10 =	757.584 kN	Table 24 a
λy = Ley/ryy	100x1x2.4/3.18 =	75.6	OK
Pcy = Area.pcy	38.21x190.65/10 =	728.476 kN	Table 24 b

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x11+.5x21+.15x28)/33 ≥0.44	0.693	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x28+.6x37+.1x27)/37 ≥.8x37/37	0.95	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2.4 =	2.4 m	
λ = Le/ry	2.4 / 3.18	75.56	OK
v = Fn (x,Le,ry,λ)	21.437, 2.4, 3.18, 75.56	0.886	Table 19
$\lambda_{LT} = u.v.\lambda.\sqrt{\beta_W}$	0.882 x 0.886 x 75.56 √ 1	59.08	
pb = Fn (py,λ_{LT})	275, 59.08	215.52 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 215.52 ≤ 86.46 =	67.759 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.693x32.8/67.8	0.335	
$r_c=F_c/P_{cy}$	1.2/728.5	0.002	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.335•59.1+0.002•75.6)/(0.335+0.002)	59.160	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.335+0.002)/(0.335+0.002)	34.215	
$M_{ob} = M_b(1-F_c/P_{cy})$	67.759(1-1.2/728.5)	67.646	
$M_{xy} = M_{cx}(1-F_c/P_{cy})^{½}$	86.460(1-1.2/728.5)^{½}	86.388	
$M_{ox} = M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-1.2/757.6)/(1+0.5•1.2/757.6)	86.252	
$M_{oy} = M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-1.2/728.5)/(1+1.0(1.2/728.5))	18.912	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	59.160, 34.215, 1.000, 86.388, 67.646	77.362	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	82.281, 1.000, 86.460, 86.252	86.263	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	75.559, 1.000, 18.975, 18.912	18.921	
$m_x.M_x/M_{ax}$	0.95x36.6/86.3	0.403	OK
$m_{LT}.M_{LT}/M_{ab}$	0.693x32.8/77.4	0.294	OK
$m_x.M_x/M_{ax}$	0.95x36.6/86.3	0.361	OK
Compare with Simplied to 4.8.3.3	0.453, 0.337, 0.337	0.453	
Compare with MoreExact to 4.8.3.3	0.404, 0.337, 0.263	0.404	

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Deflection Check - Load Case 10

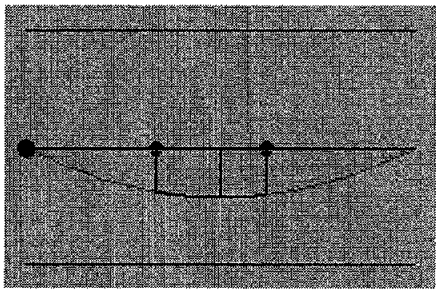
δ ≤ Span/360	20.87 ≤ 7164 / 360	20.87 mm	Warning

AXIAL WITH MOMENTS (MEMBER)
Member 354 (N.497-N.503) @ Level 6
Between 2.4 and 4.4 m, in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
 L1 + 1.4 A1

   D1 PTRY -002.338 0.000 7.164 -002.139
   L1 PTRY -001.404 0.000 7.164 -001.284
   A1 D     078.500              ( kN/m³)
```



Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
354	497	1.22C	0.00	20.71	0.00	0.00	0.00	36.59		20.87
	503	1.22C	0.00	-20.15	0.00	0.00	0.00	@ 3.545		@ 3.545

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 1.22, 36.59, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	0.019 / 218.381 =	0	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Pz = Ag.py	38.21 x 275 =	1050.775 kN	
n = F/Pz	1.216 / 1050.775 =	0.001	OK
Srx = Fn(Sxx, n)	314.4, 0.001	314.4 cm³	
Mrx = Srx.py	314.4 x 275	86.46 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(36.59/86.46)^2+(0)^1$=	0.179	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x7.164/8.71 =	82.3	OK
Pcx = Area.pcx	38.21x198.269/10 =	757.584 kN	Table 24 a
λy = Ley/ryy	100x1x2/3.18 =	63	OK
Pcy = Area.pcy	38.21x215.29/10 =	822.626 kN	Table 24 b

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x35+.5x37+.15x36)/37 ≥0.44	0.993	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x28+.6x37+.1x27)/37 ≥.8x37/37	0.95	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2 =	2 m	
λ = Le/ry	2 / 3.18	62.97	OK
v = Fn (x,Le,ry,λ)	21.437, 2, 3.18, 62.97	0.914	Table 19
λ_{LT} = u.v.λ.$\sqrt{\beta_W}$	0.882 x 0.914 x 62.97 √ 1	50.79	
pb = Fn (py,λ_{LT})	275, 50.79	236.05 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 236.05 ≤ 86.46 =	74.214 kN.m	

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Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.993x36.6/74.2	0.489	
$r_c=F_c/P_{cy}$	1.2/822.6	0.001	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.489•50.8+0.001•63)/(0.489+0.001)	50.825	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.489+0.001)/(0.489+0.001)	34.248	
$M_{ob}=M_b(1-F_c/P_{cy})$	74.214(1-1.2/822.6)	74.104	
$M_{xy}=M_{cx}(1-F_c/P_{cy})^{½}$	86.460(1-1.2/822.6)^{½}	86.396	
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-1.2/757.6)/(1+0.5•1.2/757.6)	86.252	
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-1.2/822.6)/(1+1.0(1.2/822.6))	18.919	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	50.825, 34.248, 1.000, 86.396, 74.104	82.487	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	82.281, 1.000, 86.460, 86.252	86.263	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	62.966, 1.000, 18.975, 18.919	18.938	
$m_x.M_x/M_{ax}$	0.95x36.6/86.3	0.403	OK
$m_{LT}.M_{LT}/M_{ab}$	0.993x36.6/82.5	0.440	OK
$m_x.M_x/M_{ax}$	0.95x36.6/86.3	0.403	OK
Compare with Simplied to 4.8.3.3	0.453, 0.491, 0.491	0.491	
Compare with MoreExact to 4.8.3.3	0.404, 0.491, 0.421	0.491	

Deflection Check - Load Case 10

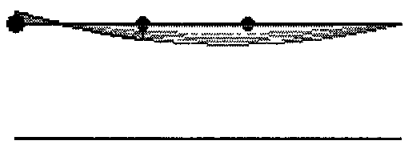
$\delta \le$ Span/360	20.87 ≤ 7164 / 360	20.87 mm	Warning

AXIAL WITH MOMENTS (MEMBER)
Member 355 (H2-M2) @ Level 6
Between 0 and 2.4 m, in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
L1 + 1.4 A1

  D1 PTRY -001.168 0.000 7.311 -001.071
  L1 PTRY -000.701 0.000 7.311 -000.642
  A1 D     078.500             ( kN/m³)
```



Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
355	498	0.62C	0.00	12.49	0.00	-8.49	0.00	16.40		9.42
	505	0.62C	0.00	-9.89	0.00	0.00	0.00	@ 3.995		@ 3.768

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 0.62, 16.4, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	4.959 / 218.381 =	0.023	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	

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Pz = Ag.py	38.21 x 275 =	1050.775 kN	
n = F/Pz	0.621 / 1050.775 =	0.001	OK
Srx = Fn(Sxx, n)	314.4, 0.001	314.4 cm^3	
Mrx = Srx.py	314.4 x 275	86.46 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(12.411/86.46)^2+(0)^1$=	0.021	OK
Compression Resistance Pc			
λx = Lex/rxx	100x1x7.311/8.71 =	84	OK
Pcx = Area.pcx	38.21x194.431/10 =	742.920 kN	Table 24 a
λy = Ley/ryy	100x1x2.4/3.18 =	75.6	OK
Pcy = Area.pcy	38.21x190.65/10 =	728.476 kN	Table 24 b
Equivalent Uniform Moment Factors mLT, mx, my and myx			
$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x2+.5x4+.15x9)/12 ≥0.44	0.496	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x9+.6x16+.1x13)/16 ≥.8x16/16	0.928	Table 26
Lateral Buckling Check Mb			
Le = 1.00 L	1 x 2.4 =	2.4 m	
λ = Le/ry	2.4 / 3.18	75.56	OK
v = Fn (x,Le,ry,λ)	21.437, 2.4, 3.18, 75.56	0.886	Table 19
λ_{LT} = u.v.λ.$\sqrt{\beta_W}$	0.882 x 0.886 x 75.56 √ 1	59.08	
pb = Fn (py,λ_{LT})	275, 59.08	215.52 N/mm^2	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 215.52 ≤ 86.46 =	67.759 kN.m	
Combined Axial Compression and Bending to Annex I			
$r_b=m_{LT}.M_{LT}/M_b$	0.496x12.4/67.8	0.091	
$r_c=F_c/P_{cy}$	0.6/728.5	0.001	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.091•59.1+0.001•75.6)/(0.091+0.001)	59.231	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.091+0.001)/(0.091+0.001)	34.141	
$M_{ob}=M_b(1-F_c/P_{cy})$	67.759(1-0.6/728.5)	67.702	
$M_{xy}=M_{cx}(1-F_c/P_{cy})^{½}$	86.460(1-0.6/728.5)^{½}	86.423	
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-0.6/742.9)/(1+0.5•0.6/742.9)	86.352	
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-0.6/728.5)/(1+1.0(0.6/728.5))	18.943	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	59.231, 34.141, 1.000, 86.423, 67.702	77.349	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	83.967, 1.000, 86.460, 86.352	86.355	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	75.559, 1.000, 18.975, 18.943	18.948	
$m_x.M_x/M_{ax}$	0.928x16.4/86.4	0.176	OK
$m_{LT}.M_{LT}/M_{ab}$	0.496x12.4/77.3	0.080	OK
$m_x.M_x/M_{ax}$	0.928x16.4/86.4	0.133	OK
Compare with Simplied to 4.8.3.3	0.198, 0.092, 0.092	0.198	
Compare with MoreExact to 4.8.3.3	0.177, 0.092, 0.071	0.177	
Deflection Check - Load Case 10			
δ ≤ Span/360	9.42 ≤ 7311 / 360	9.42 mm	OK

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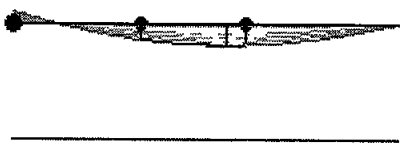
AXIAL WITH MOMENTS (MEMBER)
Member 355 (H2-M2) @ Level 6
Between 2.4 and 4.4 m, in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
L1 + 1.4 A1

   D1 PTRY -001.168 0.000 7.311 -001.071
   L1 PTRY -000.701 0.000 7.311 -000.642
   A1 D     078.500              ( kN/m³)
```



Member Forces in Load Case 1 and Maximum Deflection from Load Case 10										
Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
355	498	0.62C	0.00	12.49	0.00	-8.49	0.00	16.40		9.42
	505	0.62C	0.00	-9.89	0.00	0.00	0.00	@ 3.995		@ 3.768

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 0.62, 16.4, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	0.009 / 218.381 =	0	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Pz = Ag.py	38.21 x 275 =	1050.775 kN	
n = F/Pz	0.621 / 1050.775 =	0.001	OK
Srx = Fn(Sxx, n)	314.4, 0.001	314.4 cm³	
Mrx = Srx.py	314.4 x 275	86.46 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(16.402/86.46)^2+(0)^1$=	0.036	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x7.311/8.71 =	84	OK
Pcx = Area.pcx	38.21x194.431/10 =	742.920 kN	Table 24 a
λy = Ley/ryy	100x1x2/3.18 =	63	OK
Pcy = Area.pcy	38.21x215.29/10 =	822.626 kN	Table 24 b

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x15+.5x16+.15x16)/16 ≥0.44	0.965	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x9+.6x16+.1x13)/16 ≥.8x16/16	0.928	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2 =	2 m	
λ = Le/ry	2 / 3.18	62.97	OK
v = Fn (x,Le,ry,λ)	21.437, 2, 3.18, 62.97	0.914	Table 19
λ_{LT} = u.v.λ.$\sqrt{\beta_W}$	0.882 x 0.914 x 62.97 √ 1	50.79	
pb = Fn (py,λ_{LT})	275, 50.79	236.05 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 236.05 ≤ 86.46 =	74.214 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.965x16.4/74.2	0.213

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$r_c=F_c/P_{cy}$	0.6/822.6	0.001	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.213•50.8+0.001•63)/(0.213+0.001)	50.832	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.213+0.001)/(0.213+0.001)	34.240	
$M_{ob}=M_b(1-F_c/P_{cy})$	74.214(1-0.6/822.6)	74.158	
$M_{xy}=M_{cx}(1-F_c/P_{cy})^{½}$	86.460(1-0.6/822.6)^{½}	86.427	
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-0.6/742.9)/(1+0.5•0.6/742.9)	86.352	
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-0.6/822.6)/(1+1.0(0.6/822.6))	18.946	
$M_{ab}=fn(\lambda_r, \lambda_{ro}, \varepsilon, M_{xy}, M_{ob})$	50.832, 34.240, 1.000, 86.427, 74.158	82.501	
$M_{ax}=fn(\lambda_x, \varepsilon, M_{rx}, M_{ox})$	83.967, 1.000, 86.460, 86.352	86.355	
$M_{ay}=fn(\lambda_y, \varepsilon, M_{ry}, M_{oy})$	62.966, 1.000, 18.975, 18.946	18.956	
$m_x.M_x/M_{ax}$	0.928x16.4/86.4	0.176	OK
$m_{LT}.M_{LT}/M_{ab}$	0.965x16.4/82.5	0.192	OK
$m_x.M_x/M_{ax}$	0.928x16.4/86.4	0.176	OK
Compare with Simplied to 4.8.3.3	0.198, 0.214, 0.214	0.214	
Compare with MoreExact to 4.8.3.3	0.177, 0.214, 0.183	0.214	

Deflection Check - Load Case 10

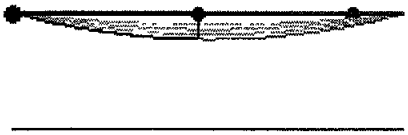
$\delta \le$ Span/360	9.42 ≤ 7311 / 360	9.42 mm	OK

AXIAL WITH MOMENTS (MEMBER)
Member 356 (N.499-N3) @ Level 6
Between 0 and 2.4 m, in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
L1 + 1.4 A1

  D1 UDLY -001.071              ( kN/m )
  L1 UDLY -000.643              ( kN/m )
  D1 PTRY -001.258 0.000 5.096 -001.249
  L1 PTRY -000.755 0.000 5.096 -000.750
  A1 D     078.500              ( kN/m³)
```



Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
356	499	5.88C	0.01	15.06	0.00	0.00	0.00	19.18		5.53
	501	5.88C	-0.01	-15.04	0.00	0.00	0.00	@ 2.548		@ 2.548

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 5.88, 19.18, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	0.872 / 218.381 =	0.004	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Fvy/Pvy	0 / 381.776 =	0	Low Shear
Mcy = py.Syy≤1.2 py.Zyy	275 x 88.2≤1.2 x 275 x 57.5 =	18.975 kN.m	
Pz = Ag.py	38.21 x 275 =	1050.775 kN	

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n = F/Pz	5.877 / 1050.775 =	0.006	OK
Srx = Fn(Sxx, n)	314.4, 0.006	314.38 cm³	
Mrx = Srx.py	314.38 x 275	86.455 kN.m	
Sry = Fn(Syy, n)	88.2, 0.006	88.2 cm³	
Mry = Sry.py	88.2 x 275	18.975 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(19.112/86.455)^2+(0.001/18.975)^1$=	0.049	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x5.097/8.71 =	58.5	OK
Pcx = Area.pcx	38.21x241.242/10 =	921.784 kN	Table 24 a
λy = Ley/ryy	100x1x2.4/3.18 =	75.6	OK
Pcy = Area.pcy	38.21x190.65/10 =	728.476 kN	Table 24 b

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x8+.5x14+.15x18)/19 ≥0.44	0.761	Table 18
$m_y=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x0+.6x0+.1x0)/0 ≥.8x0/0	1	Table 26
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x14+.6x19+.1x14)/19 ≥.8x19/19	0.95	Table 26
$m_{yx}=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x0+.6x0+.1x0)/0 ≥.8x0/0	1	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2.4 =	2.4 m	
λ = Le/ry	2.4 / 3.18	75.56	OK
v = Fn (x,Le,ry,λ)	21.437, 2.4, 3.18, 75.56	0.886	Table 19
$\lambda_{LT} = u.v.\lambda.\sqrt{\beta_W}$	0.882 x 0.886 x 75.56 √ 1	59.08	
pb = Fn (py,λ_{LT})	275, 59.08	215.52 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 215.52 ≤ 86.46 =	67.759 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.761x19.1/67.8	0.215	
$r_c=F_c/P_{cy}$	5.9/728.5	0.008	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.215•59.1+0.008•75.6)/(0.215+0.008)	59.675	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.215+0.008)/(0.215+0.008)	33.679	
$M_{ob} = M_b(1-F_c/P_{cy})$	67.759(1-5.9/728.5)	67.213	
$M_{xy} = M_{cx}\ (1-F_c/\ P_{cy})^{½}$	86.460(1-5.9/728.5)^{½}	86.111	
$M_{ox} = M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-5.9/921.8)/(1+0.5•5.9/921.8)	85.636	
$M_{oy} = M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-5.9/728.5)/(1+1.0(5.9/728.5))	18.671	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	59.675, 33.679, 1.000, 86.111, 67.213	76.858	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	58.537, 1.000, 86.455, 85.636	85.961	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	75.559, 1.000, 18.975, 18.671	18.717	
$m_x.M_x/M_{ax}$	0.95x19.2/86	0.212	OK
$m_{LT}.M_{LT}/M_{ab}$	0.761x19.1/76.9	0.189	OK
$m_x.M_x/M_{ax}$	0.95x19.2/86	0.211	OK
Compare with Simplied to 4.8.3.3	0.245, 0.223, 0.223	0.245	
Compare with MoreExact to 4.8.3.3	0.218, 0.223, 0.17	0.223	

Deflection Check - Load Case 10

δ ≤ Span/360	5.53 ≤ 5097 / 360	5.53 mm	OK

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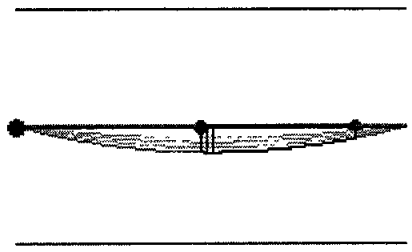
AXIAL WITH MOMENTS (MEMBER)
Member 356 (N.499-N3) @ Level 6
Between 2.4 and 4.4 m, in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
L1 + 1.4 A1

  D1 UDLY -001.071              ( kN/m )
  L1 UDLY -000.643              ( kN/m )
  D1 PTRY -001.258 0.000 5.096 -001.249
  L1 PTRY -000.755 0.000 5.096 -000.750
  A1 D     078.500              ( kN/m³)
```



Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
356	499	5.88C	0.01	15.06	0.00	0.00	0.00	19.18		5.53
	501	5.88C	-0.01	-15.04	0.00	0.00	0.00	@ 2.548		@ 2.548

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 5.88, 19.18, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	0.037 / 218.381 =	0	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Fvy/Pvy	0 / 381.776 =	0	Low Shear
Mcy = py.Syy≤1.2 py.Zyy	275 x 88.2≤1.2 x 275 x 57.5 =	18.975 kN.m	
Pz = Ag.py	38.21 x 275 =	1050.775 kN	
n = F/Pz	5.877 / 1050.775 =	0.006	OK
Srx = Fn(Sxx, n)	314.4, 0.006	314.38 cm³	
Mrx = Srx.py	314.38 x 275	86.455 kN.m	
Sry = Fn(Syy, n)	88.2, 0.006	88.2 cm³	
Mry = Sry.py	88.2 x 275	18.975 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(19.177/86.455)^{2}+(0.001/18.975)^{1}$=	0.049	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x5.097/8.71 =	58.5	OK
Pcx = Area.pcx	38.21x241.242/10 =	921.784 kN	Table 24 a
λy = Ley/ryy	100x1x2/3.18 =	63	OK
Pcy = Area.pcy	38.21x215.29/10 =	822.626 kN	Table 24 b

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x19+.5x17+.15x14)/19 ≥0.44	0.899	Table 18
$m_y=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x0+.6x0+.1x0)/0 ≥.8x0/0	1	Table 26
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x14+.6x19+.1x14)/19 ≥.8x19/19	0.95	Table 26
$m_{yx}=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x0+.6x0+.1x0)/0 ≥.8x0/0	1	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2 =	2 m	
λ = Le/ry	2 / 3.18	62.97	OK
v = Fn (x,Le,ry,λ)	21.437, 2, 3.18, 62.97	0.914	Table 19

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$\lambda_{LT} = u.v.\lambda.\sqrt{\beta_W}$	0.882 x 0.914 x 62.97 $\sqrt{1}$	50.79	
pb = Fn (py,λ_{LT})	275, 50.79	236.05 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 236.05 ≤ 86.46 =	74.214 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.899x19.2/74.2	0.232	
$r_c=F_c/P_{cy}$	5.9/822.6	0.007	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.232•50.8+0.007•63)/(0.232+0.007)	51.152	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.232+0.007)/(0.232+0.007)	33.788	
$M_{ob} = M_b(1-F_c/P_{cy})$	74.214(1-5.9/822.6)	73.684	
$M_{xy} = M_{cx}(1-F_c/P_{cy})^{½}$	86.460(1-5.9/822.6)^{½}	86.151	
$M_{ox} = M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-5.9/921.8)/(1+0.5•5.9/921.8)	85.636	
$M_{oy} = M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-5.9/822.6)/(1+1.0(5.9/822.6))	18.706	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	51.152, 33.788, 1.000, 86.151, 73.684	82.191	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	58.537, 1.000, 86.455, 85.636	85.961	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	62.966, 1.000, 18.975, 18.706	18.795	
$m_x.M_x/M_{ax}$	0.95x19.2/86	0.212	OK
$m_{LT}.M_{LT}/M_{ab}$	0.899x19.2/82.2	0.210	OK
$m_x.M_x/M_{ax}$	0.95x19.2/86	0.212	OK
Compare with Simplied to 4.8.3.3	0.244, 0.239, 0.239	0.244	
Compare with MoreExact to 4.8.3.3	0.218, 0.239, 0.201	0.239	

Deflection Check - Load Case 10

δ ≤ Span/360	5.53 ≤ 5097 / 360	5.53 mm	OK

AXIAL WITH MOMENTS (MEMBER)
Member 358 (N3-Q3) @ Level 6
Between 0 and 2.4 m, in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
 L1 + 1.4 A1

   D1 UDLY -001.071              ( kN/m )
   L1 UDLY -000.642              ( kN/m )
   D1 PTRY -001.249 0.000 4.644 -001.240
   L1 PTRY -000.750 0.000 4.644 -000.744
   A1 D     078.500              ( kN/m³)
```

Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
358	501	5.58C	0.00	13.67	0.00	0.00	0.00	15.86		3.80
	502	5.58C	0.00	-13.65	0.00	0.00	0.00	@ 2.298		@ 2.298

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 5.58, 15.86, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	0.082 / 218.381 =	0	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Fvy/Pvy	0 / 381.776 =	0	Low Shear

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Mcy = py.Syy≤1.2 py.Zyy	275 x 88.2≤1.2 x 275 x 57.5 =	18.975 kN.m	
Pz = Ag.py	38.21 x 275 =	1050.775 kN	
n = F/Pz	5.578 / 1050.775 =	0.005	OK
Srx = Fn(Sxx, n)	314.4, 0.005	314.38 cm³	
Mrx = Srx.py	314.38 x 275	86.456 kN.m	
Sry = Fn(Syy, n)	88.2, 0.005	88.2 cm³	
Mry = Sry.py	88.2 x 275	18.975 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(15.862/86.456)^{2}+(0.001/18.975)^{1}$=	0.034	OK
Compression Resistance Pc			
λx = Lex/rxx	100x1x4.644/8.71 =	53.3	OK
Pcx = Area.pcx	38.21x247.519/10 =	945.771 kN	Table 24 a
λy = Ley/ryy	100x1x2.4/3.18 =	75.6	OK
Pcy = Area.pcy	38.21x190.65/10 =	728.476 kN	Table 24 b
Equivalent Uniform Moment Factors mLT, mx, my and myx			
$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x7+.5x12+.15x15)/16 ≥0.44	0.793	Table 18
$m_y=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x0+.6x0+.1x0)/0 ≥.8x0/0	1	Table 26
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x12+.6x16+.1x12)/16 ≥.8x16/16	0.95	Table 26
$m_{yx}=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x0+.6x0+.1x0)/0 ≥.8x0/0	1	Table 26
Lateral Buckling Check Mb			
Le = 1.00 L	1 x 2.4 =	2.4 m	
λ = Le/ry	2.4 / 3.18	75.56	OK
v = Fn (x,Le,ry,λ)	21.437, 2.4, 3.18, 75.56	0.886	Table 19
$\lambda_{LT}= u.v.\lambda.\sqrt{\beta_W}$	0.882 x 0.886 x 75.56 √ 1	59.08	
pb = Fn (py,λ_{LT})	275, 59.08	215.52 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 215.52 ≤ 86.46 =	67.759 kN.m	
Combined Axial Compression and Bending to Annex I			
$r_b=m_{LT}.M_{LT}/M_b$	0.793x15.8/67.8	0.185	
$r_c=F_c/P_{cy}$	5.6/728.5	0.008	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.185•59.1+0.008•75.6)/(0.185+0.008)	59.732	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.185+0.008)/(0.185+0.008)	33.620	
$M_{ob}= M_b(1-F_c/P_{cy})$	67.759(1-5.6/728.5)	67.241	
$M_{xy}= M_{cx}\ (1-F_c/P_{cy})^{½}$	86.460(1-5.6/728.5)^{½}	86.128	
$M_{ox}= M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-5.6/945.8)/(1+0.5•5.6/945.8)	85.697	
$M_{oy}= M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-5.6/728.5)/(1+1.0(5.6/728.5))	18.687	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	59.732, 33.620, 1.000, 86.128, 67.241	76.840	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	53.343, 1.000, 86.456, 85.697	86.056	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	75.559, 1.000, 18.975, 18.687	18.730	
$m_x.M_x/M_{ax}$	0.95x15.9/86.1	0.175	OK
$m_{LT}.M_{LT}/M_{ab}$	0.793x15.8/76.8	0.164	OK
$m_x.M_x/M_{ax}$	0.95x15.9/86.1	0.175	OK
Compare with Simplied to 4.8.3.3	0.203, 0.193, 0.193	0.203	
Compare with MoreExact to 4.8.3.3	0.181, 0.193, 0.147	0.193	
Deflection Check - Load Case 10			
δ ≤ Span/360	3.8 ≤ 4644 / 360	3.8 mm	OK

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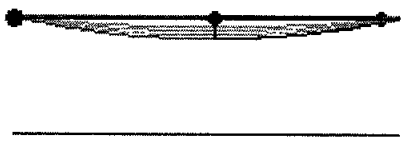
AXIAL WITH MOMENTS (MEMBER)
Member 358 (N3-Q3) @ Level 6
Between 2.4 and 4.4 m, in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
L1 + 1.4 A1

   D1 UDLY -001.071                ( kN/m )
   L1 UDLY -000.642                ( kN/m )
   D1 PTRY -001.249 0.000 4.644 -001.240
   L1 PTRY -000.750 0.000 4.644 -000.744
   A1 D     078.500                ( kN/m³)
```



Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
358	501	5.58C	0.00	13.67	0.00	0.00	0.00	15.86		3.80
	502	5.58C	0.00	-13.65	0.00	0.00	0.00	@ 2.298		@ 2.298

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 5.58, 15.86, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	0.463 / 218.381 =	0.002	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Fvy/Pvy	0 / 381.776 =	0	Low Shear
Mcy = py.Syy≤1.2 py.Zyy	275 x 88.2≤1.2 x 275 x 57.5 =	18.975 kN.m	
Pz = Ag.py	38.21 x 275 =	1050.775 kN	
n = F/Pz	5.578 / 1050.775 =	0.005	OK
Srx = Fn(Sxx, n)	314.4, 0.005	314.38 cm³	
Mrx = Srx.py	314.38 x 275	86.456 kN.m	
Sry = Fn(Syy, n)	88.2, 0.005	88.2 cm³	
Mry = Sry.py	88.2 x 275	18.975 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(15.844/86.456)^2+(0.001/18.975)^1$=	0.034	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x4.644/8.71 =	53.3	OK
Pcx = Area.pcx	38.21x247.519/10 =	945.771 kN	Table 24 a
λy = Ley/ryy	100x1x2/3.18 =	63	OK
Pcy = Area.pcy	38.21x215.29/10 =	822.626 kN	Table 24 b

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x15+.5x12+.15x9)/16 ≥0.44	0.814	Table 18
$m_y=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x0+.6x0+.1x0)/0 ≥.8x0/0	1	Table 26
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x12+.6x16+.1x12)/16 ≥.8x16/16	0.95	Table 26
$m_{yx}=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x0+.6x0+.1x0)/0 ≥.8x0/0	1	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2 =	2 m	
λ = Le/ry	2 / 3.18	62.97	OK
v = Fn (x,Le,ry,λ)	21.437, 2, 3.18, 62.97	0.914	Table 19

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$\lambda_{LT} = u.v.\lambda.\sqrt{\beta_W}$	0.882 x 0.914 x 62.97 √ 1	50.79	
pb = Fn (py,λ_{LT})	275, 50.79	236.05 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 236.05 ≤ 86.46 =	74.214 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.814x15.8/74.2	0.174	
$r_c=F_c/P_{cy}$	5.6/822.6	0.007	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.174•50.8+0.007•63)/(0.174+0.007)	51.246	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.174+0.007)/(0.174+0.007)	33.656	
$M_{ob} = M_b(1-F_c/P_{cy})$	74.214(1-5.6/822.6)	73.711	
$M_{xy} = M_{cx}(1-F_c/P_{cy})^{½}$	86.460(1-5.6/822.6)^{½}	86.166	
$M_{ox} = M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-5.6/945.8)/(1+0.5•5.6/945.8)	85.697	
$M_{oy} = M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-5.6/822.6)/(1+1.0(5.6/822.6))	18.719	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	51.246, 33.656, 1.000, 86.166, 73.711	82.156	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	53.343, 1.000, 86.456, 85.697	86.056	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	62.966, 1.000, 18.975, 18.719	18.804	
$m_x.M_x/M_{ax}$	0.95x15.9/86.1	0.175	OK
$m_{LT}.M_{LT}/M_{ab}$	0.814x15.8/82.2	0.157	OK
$m_x.M_x/M_{ax}$	0.95x15.9/86.1	0.175	OK
Compare with Simplied to 4.8.3.3	0.202, 0.181, 0.181	0.202	
Compare with MoreExact to 4.8.3.3	0.181, 0.181, 0.151	0.181	

Deflection Check - Load Case 10

δ ≤ Span/360	3.8 ≤ 4644 / 360	3.8 mm	OK

AXIAL WITH MOMENTS (MEMBER)
Member 359 (N.503-N.506) @ Level 6

Between 0 and 2.4 m, in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
L1 + 1.4 A1

  D1 UDLY -002.142            ( kN/m )
  L1 UDLY -001.285            ( kN/m )
  A1 D     078.500            ( kN/m³)
```

Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
359	503	1.41C	0.00	14.01	0.00	0.00	0.00	17.93		5.22
	506	1.41C	0.00	-14.01	0.00	0.00	0.00	@ 2.559		@ 2.559

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 1.41, 17.92, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

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Local Capacity Check

Fvx/Pvx	0.869 / 218.381 =	0.004	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Pz = Ag.py	38.21 x 275 =	1050.775 kN	
n = F/Pz	1.409 / 1050.775 =	0.001	OK
Srx = Fn(Sxx, n)	314.4, 0.001	314.4 cm³	
Mrx = Srx.py	314.4 x 275	86.46 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(17.85/86.46)^2+(0)^1=$	0.043	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x5.118/8.71 =	58.8	OK
Pcx = Area.pcx	38.21x240.919/10 =	920.551 kN	Table 24 a
λy = Ley/ryy	100x1x2.4/3.18 =	75.6	OK
Pcy = Area.pcy	38.21x190.65/10 =	728.476 kN	Table 24 b

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x7+.5x13+.15x16)/18 ≥0.44	0.76	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x13+.6x18+.1x13)/18 ≥.8x18/18	0.95	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2.4 =	2.4 m	
λ = Le/ry	2.4 / 3.18	75.56	OK
v = Fn (x,Le,ry,λ)	21.437, 2.4, 3.18, 75.56	0.886	Table 19
λ_{LT} = u.v.λ.$\sqrt{\beta_W}$	0.882 x 0.886 x 75.56 √ 1	59.08	
pb = Fn (py,λ_{LT})	275, 59.08	215.52 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 215.52 ≤ 86.46 =	67.759 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.76x17.9/67.8	0.200	
$r_c=F_c/P_{cy}$	1.4/728.5	0.002	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.2•59.1+0.002•75.6)/(0.2+0.002)	59.236	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.2+0.002)/(0.2+0.002)	34.136	
$M_{ob}=M_b(1-F_c/P_{cy})$	67.759(1-1.4/728.5)	67.628	
$M_{xy}=M_{cx}(1-F_c/P_{cy})^{½}$	86.460(1-1.4/728.5)^{½}	86.376	
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-1.4/920.6)/(1+0.5•1.4/920.6)	86.262	
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-1.4/728.5)/(1+1.0(1.4/728.5))	18.902	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	59.236, 34.136, 1.000, 86.376, 67.628	77.311	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	58.783, 1.000, 86.460, 86.262	86.340	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	75.559, 1.000, 18.975, 18.902	18.913	
$m_x.M_x/M_{ax}$	0.95x17.9/86.3	0.197	OK
$m_{LT}.M_{LT}/M_{ab}$	0.76x17.9/77.3	0.175	OK
$m_x.M_x/M_{ax}$	0.95x17.9/86.3	0.196	OK
Compare with Simplied to 4.8.3.3	0.223, 0.202, 0.202	0.223	
Compare with MoreExact to 4.8.3.3	0.199, 0.202, 0.157	0.202	

Deflection Check - Load Case 10

δ ≤ Span/360	5.22 ≤ 5118 / 360	5.22 mm	OK

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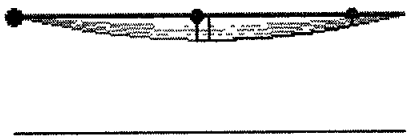
AXIAL WITH MOMENTS (MEMBER)
Member 359 (N.503-N.506) @ Level 6
Between 2.4 and 4.4 m, in Load Case 1

Member Loading and Member Forces

Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6 L1 + 1.4 A1

D1 UDLY -002.142 (kN/m)
L1 UDLY -001.285 (kN/m)
A1 D 078.500 (kN/m³)



Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
359	503	1.41C	0.00	14.01	0.00	0.00	0.00	17.93		5.22
	506	1.41C	0.00	-14.01	0.00	0.00	0.00	@ 2.559		@ 2.559

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 1.41, 17.92, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	0.027 / 218.381 =	0	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Pz = Ag.py	38.21 x 275 =	1050.775 kN	
n = F/Pz	1.409 / 1050.775 =	0.001	OK
Srx = Fn(Sxx, n)	314.4, 0.001	314.4 cm³	
Mrx = Srx.py	314.4 x 275	86.46 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(17.919/86.46)^2+(0)^1$=	0.043	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x5.118/8.71 =	58.8	OK
Pcx = Area.pcx	38.21x240.919/10 =	920.551 kN	Table 24 a
λy = Ley/ryy	100x1x2/3.18 =	63	OK
Pcy = Area.pcy	38.21x215.29/10 =	822.626 kN	Table 24 b

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x18+.5x16+.15x13)/18 ≥0.44	0.902	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x13+.6x18+.1x13)/18 ≥.8x18/18	0.95	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2 =	2 m	
λ = Le/ry	2 / 3.18	62.97	OK
v = Fn (x,Le,ry,λ)	21.437, 2, 3.18, 62.97	0.914	Table 19
λ_{LT} = u.v.λ.√βw	0.882 x 0.914 x 62.97 √ 1	50.79	
pb = Fn (py,λ_{LT})	275, 50.79	236.05 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 236.05 ≤ 86.46 =	74.214 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.902x17.9/74.2	0.218	
$r_c=F_c/P_{cy}$	1.4/822.6	0.002	

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$\lambda_r=(r_b \lambda_{LT}+r_c \lambda_y)/(r_b+r_c)$	(0.218•50.8+0.002•63)/(0.218+0.002)	50.884	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.218+0.002)/(0.218+0.002)	34.166	
$M_{ob}=M_b(1-F_c/P_{cy})$	74.214(1-1.4/822.6)	74.087	
$M_{xy}=M_{cx}(1-F_c/P_{cy})^{½}$	86.460(1-1.4/822.6)^{½}	86.386	
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-1.4/920.6)/(1+0.5•1.4/920.6)	86.262	
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-1.4/822.6)/(1+1.0(1.4/822.6))	18.910	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	50.884, 34.166, 1.000, 86.386, 74.087	82.454	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	58.783, 1.000, 86.460, 86.262	86.340	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	62.966, 1.000, 18.975, 18.910	18.932	
$m_x.M_x/M_{ax}$	0.95x17.9/86.3	0.197	OK
$m_{LT}.M_{LT}/M_{ab}$	0.902x17.9/82.5	0.196	OK
$m_x.M_x/M_{ax}$	0.95x17.9/86.3	0.197	OK
Compare with Simplied to 4.8.3.3	0.223, 0.22, 0.22	0.223	
Compare with MoreExact to 4.8.3.3	0.199, 0.22, 0.187	0.22	

Deflection Check - Load Case 10

$\delta \le$ Span/360	5.22 ≤ 5118 / 360	5.22 mm	OK

AXIAL WITH MOMENTS (MEMBER)
Member 360 (N.504-N.507) @ Level 6
Between 0 and 2.4 m, in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
L1 + 1.4 A1

   D1 UDLY -002.142          ( kN/m )
   L1 UDLY -001.285          ( kN/m )
   A1 D     078.500          ( kN/m³)
```

Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1	Node End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
360	504		3.57C	0.00	12.71	0.00	0.00	0.00	14.76		3.54
	507		3.57C	0.00	-12.71	0.00	0.00	0.00	@ 2.322		@ 2.322

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 3.57, 14.76, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	0.078 / 218.381 =	0	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Fvy/Pvy	0 / 381.776 =	0	Low Shear
Mcy = py.Syy≤1.2 py.Zyy	275 x 88.2≤1.2 x 275 x 57.5 =	18.975 kN.m	
Pz = Ag.py	38.21 x 275 =	1050.775 kN	
n = F/Pz	3.573 / 1050.775 =	0.003	OK
Srx = Fn(Sxx, n)	314.4, 0.003	314.39 cm³	
Mrx = Srx.py	314.39 x 275	86.458 kN.m	

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Sry = Fn(Syy, n)	88.2, 0.003	88.2 cm³	
Mry = Sry.py	88.2 x 275	18.975 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(14.755/86.458)^{2}+(0.001/18.975)^{1}$=	0.029	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x4.644/8.71 =	53.3	OK
Pcx = Area.pcx	38.21x247.519/10 =	945.771 kN	Table 24 a
λy = Ley/ryy	100x1x2.4/3.18 =	75.6	OK
Pcy = Area.pcy	38.21x190.65/10 =	728.476 kN	Table 24 b

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x7+.5x11+.15x14)/15 ≥0.44	0.793	Table 18
$m_y=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x0+.6x0+.1x0)/0 ≥.8x0/0	1	Table 26
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x11+.6x15+.1x11)/15 ≥.8x15/15	0.95	Table 26
$m_{yx}=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x0+.6x0+.1x0)/0 ≥.8x0/0	1	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2.4 =	2.4 m	
λ = Le/ry	2.4 / 3.18	75.56	OK
v = Fn (x,Le,ry,λ)	21.437, 2.4, 3.18, 75.56	0.886	Table 19
λ_{LT} = u.v.λ.$\sqrt{\beta_W}$	0.882 x 0.886 x 75.56 √ 1	59.08	
pb = Fn (py,λ_{LT})	275, 59.08	215.52 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 215.52 ≤ 86.46 =	67.759 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.793x14.7/67.8	0.173	
$r_c=F_c/P_{cy}$	3.6/728.5	0.005	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.173•59.1+0.005•75.6)/(0.173+0.005)	59.534	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.173+0.005)/(0.173+0.005)	33.826	
$M_{ob}=M_b(1-F_c/P_{cy})$	67.759(1-3.6/728.5)	67.427	
$M_{xy}=M_{cx}(1-F_c/P_{cy})^{½}$	86.460(1-3.6/728.5)^{½}	86.248	
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-3.6/945.8)/(1+0.5•3.6/945.8)	85.971	
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-3.6/728.5)/(1+1.0(3.6/728.5))	18.790	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	59.534, 33.826, 1.000, 86.248, 67.427	77.045	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	53.343, 1.000, 86.458, 85.971	86.201	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	75.559, 1.000, 18.975, 18.790	18.817	
$m_x.M_x/M_{ax}$	0.95x14.8/86.2	0.163	OK
$m_{LT}.M_{LT}/M_{ab}$	0.793x14.7/77	0.152	OK
$m_x.M_x/M_{ax}$	0.95x14.8/86.2	0.162	OK
Compare with Simplied to 4.8.3.3	0.187, 0.178, 0.178	0.187	
Compare with MoreExact to 4.8.3.3	0.166, 0.177, 0.136	0.177	

Deflection Check - Load Case 10

δ ≤ Span/360	3.54 ≤ 4644 / 360	3.54 mm	OK

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AXIAL WITH MOMENTS (MEMBER)
Member 360 (N.504-N.507) @ Level 6
Between 2.4 and 4.4 m, in Load Case 1

Member Loading and Member Forces

Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6 L1 + 1.4 A1

D1 UDLY -002.142 (kN/m)
L1 UDLY -001.285 (kN/m)
A1 D 078.500 (kN/m³)

Member Forces in Load Case 1 and Maximum Deflection from Load Case 10									
Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
360	504	3.57C	0.00	12.71	0.00	0.00	0.00	14.76		3.54
	507	3.57C	0.00	-12.71	0.00	0.00	0.00	@ 2.322		@ 2.322

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 3.57, 14.76, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	0.428 / 218.381 =	0.002	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Fvy/Pvy	0 / 381.776 =	0	Low Shear
Mcy = py.Syy≤1.2 py.Zyy	275 x 88.2≤1.2 x 275 x 57.5 =	18.975 kN.m	
Pz = Ag.py	38.21 x 275 =	1050.775 kN	
n = F/Pz	3.573 / 1050.775 =	0.003	OK
Srx = Fn(Sxx, n)	314.4, 0.003	314.39 cm³	
Mrx = Srx.py	314.39 x 275	86.458 kN.m	
Sry = Fn(Syy, n)	88.2, 0.003	88.2 cm³	
Mry = Sry.py	88.2 x 275	18.975 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(14.74/86.458)^2+(0.001/18.975)^1$=	0.029	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x4.644/8.71 =	53.3	OK
Pcx = Area.pcx	38.21x247.519/10 =	945.771 kN	Table 24 a
λy = Ley/ryy	100x1x2/3.18 =	63	OK
Pcy = Area.pcy	38.21x215.29/10 =	822.626 kN	Table 24 b

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x14+.5x12+.15x8)/15 ≥0.44	0.814	Table 18
$m_y=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x0+.6x0+.1x0)/0 ≥.8x0/0	1	Table 26
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x11+.6x15+.1x11)/15 ≥.8x15/15	0.95	Table 26
$m_{yx}=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x0+.6x0+.1x0)/0 ≥.8x0/0	1	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2 =	2 m	
λ = Le/ry	2 / 3.18	62.97	OK
v = Fn (x,Le,ry,λ)	21.437, 2, 3.18, 62.97	0.914	Table 19

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$\lambda_{LT} = u.v.\lambda.\sqrt{\beta_W}$	0.882 x 0.914 x 62.97 √ 1	50.79	
pb = Fn (py,λ_{LT})	275, 50.79	236.05 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 236.05 ≤ 86.46 =	74.214 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.814x14.7/74.2	0.162	
$r_c=F_c/P_{cy}$	3.6/822.6	0.004	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.162•50.8+0.004•63)/(0.162+0.004)	51.107	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.162+0.004)/(0.162+0.004)	33.852	
$M_{ob} = M_b(1-F_c/P_{cy})$	74.214(1-3.6/822.6)	73.892	
$M_{xy} = M_{cx}\ (1-F_c/\ P_{cy})^{½}$	86.460(1-3.6/822.6)^{½}	86.272	
$M_{ox} = M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-3.6/945.8)/(1+0.5•3.6/945.8)	85.971	
$M_{oy} = M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-3.6/822.6)/(1+1.0(3.6/822.6))	18.811	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	51.107, 33.852, 1.000, 86.272, 73.892	82.284	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	53.343, 1.000, 86.458, 85.971	86.201	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	62.966, 1.000, 18.975, 18.811	18.865	
$m_x.M_x/M_{ax}$	0.95x14.8/86.2	0.163	OK
$m_{LT}.M_{LT}/M_{ab}$	0.814x14.7/82.3	0.146	OK
$m_x.M_x/M_{ax}$	0.95x14.8/86.2	0.162	OK
Compare with Simplied to 4.8.3.3	0.186, 0.166, 0.166	0.186	
Compare with MoreExact to 4.8.3.3	0.166, 0.166, 0.14	0.166	

Deflection Check - Load Case 10

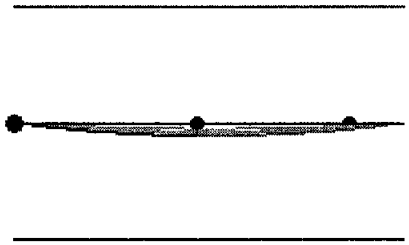
δ ≤ Span/360	3.54 ≤ 4644 / 360	3.54 mm	OK

AXIAL WITH MOMENTS (MEMBER)
Member 361 (M2-N2) @ Level 6
Between 0 and 2.4 m, in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
L1 + 1.4 A1

  D1 UDLY -001.071              ( kN/m )
  L1 UDLY -000.643              ( kN/m )
  A1 D     078.500              ( kN/m³)
```



Member Forces in Load Case 1 and Maximum Deflection from Load Case 10										
Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
361	505	0.60T	0.00	7.56	0.00	0.00	0.00	9.69		2.86
	508	0.60T	0.00	-7.56	0.00	0.00	0.00	@ 2.564		@ 2.564

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 0, 9.69, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

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Local Capacity Check

Fvx/Pvx	0.484 / 218.381 =	0.002	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Pz =Ae.py	38.21x275 =	1050.775 kN	
n = F/Pz	-0.596 / 1050.775 =	0.001	OK
Srx = Fn(Sxx, n)	314.4, 0.001	314.4 cm³	
Mrx = Srx.py	314.4 x 275	86.46 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(9.65/86.46)^2+(0)^1$=	0.012	OK

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x4+.5x7+.15x9)/10 ≥0.44	0.759	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x7+.6x10+.1x7)/10 ≥.8x10/10	0.95	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2.4 =	2.4 m	
λ = Le/ry	2.4 / 3.18	75.56	OK
v = Fn (x,Le,ry,λ)	21.437, 2.4, 3.18, 75.56	0.886	Table 19
λ_{LT} = u.v.λ.√βw	0.882 x 0.886 x 75.56 √ 1	59.08	
pb = Fn (py,λ_{LT})	275, 59.08	215.52 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 215.52 ≤ 86.46 =	67.759 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.759x9.7/67.8	0.108	
$r_c=F_c/P_{cy}$	0/728.5	0.000	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.108•59.1+0•75.6)/(0.108+0)	59.078	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.108+0)/(0.108+0)	34.300	
$M_{ob}=M_b(1-F_c/P_{cy})$	67.759(1-0/728.5)	67.759	
$M_{xy}=M_{cx}(1-F_c/P_{cy})^{½}$	86.460(1-0/728.5)^{½}	86.460	
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-0/919.9)/(1+0.5•0/919.9)	86.460	
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-0/728.5)/(1+1.0(0/728.5))	18.975	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	59.078, 34.300, 1.000, 86.460, 67.759	77.462	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	58.907, 1.000, 86.460, 86.460	86.460	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	75.559, 1.000, 18.975, 18.975	18.975	
$m_x.M_x/M_{ax}$	0.95x9.7/86.5	0.107	OK
$m_{LT}.M_{LT}/M_{ab}$	0.759x9.7/77.5	0.095	OK
$m_x.M_x/M_{ax}$	0.95x9.7/86.5	0.106	OK
Compare with Simplied to 4.8.3.3	0.119, 0.108, 0.108	0.119	
Compare with MoreExact to 4.8.3.3	0.107, 0.108, 0.085	0.108	

Deflection Check - Load Case 10

δ ≤ Span/360	2.86 ≤ 5129 / 360	2.86 mm	OK

AXIAL WITH MOMENTS (MEMBER)
Member 361 (M2-N2) @ Level 6
Between 2.4 and 4.4 m, in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
 L1 + 1.4 A1

   D1 UDLY -001.071              ( kN/m )
   L1 UDLY -000.643              ( kN/m )
   A1 D     078.500              ( kN/m³)
```

Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

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Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
361	505	0.60T	0.00	7.56	0.00	0.00	0.00	9.69		2.86
	508	0.60T	0.00	-7.56	0.00	0.00	0.00	@ 2.564		@ 2.564

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 0, 9.69, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	0.029 / 218.381 =	0	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Pz =Ae.py	38.21x275 =	1050.775 kN	
n = F/Pz	-0.596 / 1050.775 =	0.001	OK
Srx = Fn(Sxx, n)	314.4, 0.001	314.4 cm³	
Mrx = Srx.py	314.4 x 275	86.46 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(9.69/86.46)^2+(0)^1$=	0.013	OK

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x10+.5x9+.15x7)/10 ≥0.44	0.904	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x7+.6x10+.1x7)/10 ≥.8x10/10	0.95	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2 =	2 m	
λ = Le/ry	2 / 3.18	62.97	OK
v = Fn (x,Le,ry,λ)	21.437, 2, 3.18, 62.97	0.914	Table 19
λ_{LT} = u.v.λ.√βw	0.882 x 0.914 x 62.97 √ 1	50.79	
pb = Fn (py,λ_{LT})	275, 50.79	236.05 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 236.05 ≤ 86.46 =	74.214 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.904x9.7/74.2	0.118
$r_c=F_c/P_{cy}$	0/822.6	0.000
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.118•50.8+0•63)/(0.118+0)	50.789
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.118+0)/(0.118+0)	34.300
$M_{ob}=M_b(1-F_c/P_{cy})$	74.214(1-0/822.6)	74.214
$M_{xy}=M_{cx}(1-F_c/P_{cy})^{½}$	86.460(1-0/822.6)^{½}	86.460
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-0/919.9)/(1+0.5•0/919.9)	86.460
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-0/822.6)/(1+1.0(0/822.6))	18.975
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	50.789, 34.300, 1.000, 86.460, 74.214	82.539
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	58.907, 1.000, 86.460, 86.460	86.460
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	62.966, 1.000, 18.975, 18.975	18.975
$m_x.M_x/M_{ax}$	0.95x9.7/86.5	0.107 OK
$m_{LT}.M_{LT}/M_{ab}$	0.904x9.7/82.5	0.106 OK
$m_x.M_x/M_{ax}$	0.95x9.7/86.5	0.106 OK
Compare with Simplied to 4.8.3.3	0.119, 0.118, 0.118	0.119
Compare with MoreExact to 4.8.3.3	0.107, 0.118, 0.101	0.118

Deflection Check - Load Case 10

δ ≤ Span/360	2.86 ≤ 5129 / 360	2.86 mm	OK

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AXIAL WITH MOMENTS (MEMBER)
Member 362 (N.506-N.509) @ Level 6
Between 0 and 2.4 m, in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
L1 + 1.4 A1

   D1 UDLY -002.142              ( kN/m )
   L1 UDLY -001.285              ( kN/m )
   A1 D     078.500              ( kN/m³)
```

Member Forces in Load Case 1 and Maximum Deflection from Load Case 10										
Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
362	506	1.70C	0.00	12.72	0.00	0.00	0.00	14.77		3.54
	509	1.70C	0.00	-12.72	0.00	0.00	0.00	@ 2.323		@ 2.323

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 1.7, 14.76, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	0.081 / 218.381 =	0	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Pz = Ag.py	38.21 x 275 =	1050.775 kN	
n = F/Pz	1.698 / 1050.775 =	0.002	OK
Srx = Fn(Sxx, n)	314.4, 0.002	314.4 cm³	
Mrx = Srx.py	314.4 x 275	86.46 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(14.761/86.46)^2+(0)^1$=	0.029	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x4.645/8.71 =	53.4	OK
Pcx = Area.pcx	38.21x247.508/10 =	945.727 kN	Table 24 a
λy = Ley/ryy	100x1x2.4/3.18 =	75.6	OK
Pcy = Area.pcy	38.21x190.65/10 =	728.476 kN	Table 24 b

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x7+.5x11+.15x14)/15 ≥0.44	0.793	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x11+.6x15+.1x11)/15 ≥.8x15/15	0.95	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2.4 =	2.4 m	
λ = Le/ry	2.4 / 3.18	75.56	OK
v = Fn (x,Le,ry,λ)	21.437, 2.4, 3.18, 75.56	0.886	Table 19
λ_{LT} = u.v.λ.√β_W	0.882 x 0.886 x 75.56 √ 1	59.08	
pb = Fn (py,λ_{LT})	275, 59.08	215.52 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 215.52 ≤ 86.46 =	67.759 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.793x14.7/67.8	0.173

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$r_c=F_c/P_{cy}$	1.7/728.5	0.002	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.173•59.1+0.002•75.6)/(0.173+0.002)	59.298	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.173+0.002)/(0.173+0.002)	34.072	
$M_{ob}=M_b(1-F_c/P_{cy})$	67.759(1-1.7/728.5)	67.601	
$M_{xy}=M_{cx}\ (1-F_c/P_{cy})^{½}$	86.460(1-1.7/728.5)^{½}	86.359	
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-1.7/945.7)/(1+0.5•1.7/945.7)	86.227	
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-1.7/728.5)/(1+1.0(1.7/728.5))	18.887	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	59.298, 34.072, 1.000, 86.359, 67.601	77.263	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	53.353, 1.000, 86.460, 86.227	86.337	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	75.559, 1.000, 18.975, 18.887	18.900	
$m_x.M_x/M_{ax}$	0.95x14.8/86.3	0.163	OK
$m_{LT}.M_{LT}/M_{ab}$	0.793x14.7/77.3	0.151	OK
$m_x.M_x/M_{ax}$	0.95x14.8/86.3	0.162	OK
Compare with Simplied to 4.8.3.3	0.184, 0.175, 0.175	0.184	
Compare with MoreExact to 4.8.3.3	0.164, 0.175, 0.136	0.175	

Deflection Check - Load Case 10

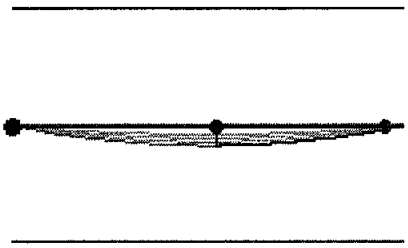
$\delta \le$ Span/360	3.54 ≤ 4645 / 360	3.54 mm	OK

AXIAL WITH MOMENTS (MEMBER)
Member 362 (N.506-N.509) @ Level 6
Between 2.4 and 4.4 m, in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
L1 + 1.4 A1

   D1 UDLY -002.142              ( kN/m )
   L1 UDLY -001.285              ( kN/m )
   A1 D     078.500              ( kN/m³)
```



Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
362	506	1.70C	0.00	12.72	0.00	0.00	0.00	14.77		3.54
	509	1.70C	0.00	-12.72	0.00	0.00	0.00	@ 2.323		@ 2.323

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 1.7, 14.76, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	0.425 / 218.381 =	0.002	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Pz = Ag.py	38.21 x 275 =	1050.775 kN	
n = F/Pz	1.698 / 1050.775 =	0.002	OK
Srx = Fn(Sxx, n)	314.4, 0.002	314.4 cm³	
Mrx = Srx.py	314.4 x 275	86.46 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(14.746/86.46)^2+(0)^1$=	0.029	OK

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Compression Resistance Pc

λx = Lex/rxx	100x1x4.645/8.71 =	53.4	OK
Pcx = Area.pcx	38.21x247.508/10 =	945.727 kN	Table 24 a
λy = Ley/ryy	100x1x2/3.18 =	63	OK
Pcy = Area.pcy	38.21x215.29/10 =	822.626 kN	Table 24 b

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x14+.5x12+.15x8)/15 ≥0.44	0.815	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x11+.6x15+.1x11)/15 ≥.8x15/15	0.95	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2 =	2 m	
λ = Le/ry	2 / 3.18	62.97	OK
v = Fn (x,Le,ry,λ)	21.437, 2, 3.18, 62.97	0.914	Table 19
$\lambda_{LT} = u.v.\lambda.\sqrt{\beta_W}$	0.882 x 0.914 x 62.97 √ 1	50.79	
pb = Fn (py,λ_{LT})	275, 50.79	236.05 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 236.05 ≤ 86.46 =	74.214 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.815x14.7/74.2	0.162	
$r_c=F_c/P_{cy}$	1.7/822.6	0.002	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.162•50.8+0.002•63)/(0.162+0.002)	50.942	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.162+0.002)/(0.162+0.002)	34.084	
$M_{ob} = M_b(1-F_c/P_{cy})$	74.214(1-1.7/822.6)	74.061	
$M_{xy} = M_{cx}\ (1-F_c / P_{cy})^{½}$	86.460(1-1.7/822.6)^{½}	86.371	
$M_{ox} = M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-1.7/945.7)/(1+0.5•1.7/945.7)	86.227	
$M_{oy} = M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-1.7/822.6)/(1+1.0(1.7/822.6))	18.897	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	50.942, 34.084, 1.000, 86.371, 74.061	82.418	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	53.353, 1.000, 86.460, 86.227	86.337	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	62.966, 1.000, 18.975, 18.897	18.923	
$m_x.M_x/M_{ax}$	0.95x14.8/86.3	0.163	OK
$m_{LT}.M_{LT}/M_{ab}$	0.815x14.7/82.4	0.146	OK
$m_x.M_x/M_{ax}$	0.95x14.8/86.3	0.162	OK
Compare with Simplied to 4.8.3.3	0.184, 0.164, 0.164	0.184	
Compare with MoreExact to 4.8.3.3	0.164, 0.164, 0.139	0.164	

Deflection Check - Load Case 10

δ ≤ Span/360	3.54 ≤ 4645 / 360	3.54 mm	OK

AXIAL WITH MOMENTS (MEMBER)
Member 363 (N2-Q2) @ Level 6
Between 0 and 2.4 m, in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
L1 + 1.4 A1

   D1 UDLY -001.071              ( kN/m )
   L1 UDLY -000.642              ( kN/m )
   A1 D     078.500              ( kN/m³)
```

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Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
363	508	0.07T	0.00	6.84	0.00	0.00	0.00	7.95		1.92
	510	0.07T	0.00	-6.84	0.00	0.00	0.00	@ 2.323		@ 2.323

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 0, 7.94, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	0.043 / 218.381 =	0	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Pz =Ae.py	38.21x275 =	1050.775 kN	
n = F/Pz	-0.072 / 1050.775 =	0.000	OK
Srx = Fn(Sxx, n)	314.4, 0	314.4 cm³	
Mrx = Srx.py	314.4 x 275	86.46 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(7.942/86.46)^2+(0)^1$=	0.008	OK

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x4+.5x6+.15x8)/8 ≥0.44	0.793	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x6+.6x8+.1x6)/8 ≥.8x8/8	0.95	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2.4 =	2.4 m	
λ = Le/ry	2.4 / 3.18	75.56	OK
v = Fn (x,Le,ry,λ)	21.437, 2.4, 3.18, 75.56	0.886	Table 19
λ_{LT} = u.v.λ.√β_W	0.882 x 0.886 x 75.56 √ 1	59.08	
pb = Fn (py,λ_{LT})	275, 59.08	215.52 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 215.52 ≤ 86.46 =	67.759 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.793x7.9/67.8	0.093	
$r_c=F_c/P_{cy}$	0/728.5	0.000	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.093•59.1+0•75.6)/(0.093+0)	59.078	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.093+0)/(0.093+0)	34.300	
$M_{ob}=M_b(1-F_c/P_{cy})$	67.759(1-0/728.5)	67.759	
$M_{xy}=M_{cx}(1-F_c/P_{cy})^{½}$	86.460(1-0/728.5)^{½}	86.460	
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-0/945.7)/(1+0.5•0/945.7)	86.460	
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-0/728.5)/(1+1.0(0/728.5))	18.975	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	59.078, 34.300, 1.000, 86.460, 67.759	77.462	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	53.353, 1.000, 86.460, 86.460	86.460	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	75.559, 1.000, 18.975, 18.975	18.975	
$m_x.M_x/M_{ax}$	0.95x7.9/86.5	0.087	OK
$m_{LT}.M_{LT}/M_{ab}$	0.793x7.9/77.5	0.081	OK
$m_x.M_x/M_{ax}$	0.95x7.9/86.5	0.087	OK
Compare with Simplied to 4.8.3.3	0.098, 0.093, 0.093	0.098	
Compare with MoreExact to 4.8.3.3	0.087, 0.093, 0.073	0.093	

Deflection Check - Load Case 10

δ ≤ Span/360	1.92 ≤ 4645 / 360	1.92 mm	OK

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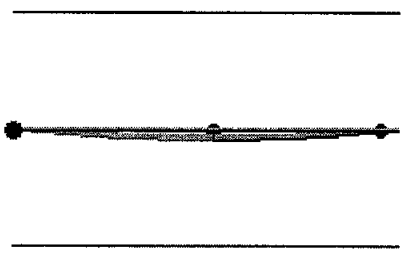
AXIAL WITH MOMENTS (MEMBER)
Member 363 (N2-Q2) @ Level 6
Between 2.4 and 4.4 m, in Load Case 1

Member Loading and Member Forces

Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6 L1 + 1.4 A1

D1 UDLY -001.071 (kN/m)
L1 UDLY -000.642 (kN/m)
A1 D 078.500 (kN/m³)



Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
363	508	0.07T	0.00	6.84	0.00	0.00	0.00	7.95		1.92
	510	0.07T	0.00	-6.84	0.00	0.00	0.00	@ 2.323		@ 2.323

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 0, 7.94, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	0.229 / 218.381 =	0.001	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Pz =Ae.py	38.21x275 =	1050.775 kN	
n = F/Pz	-0.072 / 1050.775 =	0.000	OK
Srx = Fn(Sxx, n)	314.4, 0	314.4 cm³	
Mrx = Srx.py	314.4 x 275	86.46 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(7.935/86.46)^2+(0)^1$=	0.008	OK

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x7+.5x6+.15x4)/8 ≥0.44	0.815	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x6+.6x8+.1x6)/8 ≥.8x8/8	0.95	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2 =	2 m	
λ = Le/ry	2 / 3.18	62.97	OK
v = Fn (x,Le,ry,λ)	21.437, 2, 3.18, 62.97	0.914	Table 19
$\lambda_{LT} = u.v.\lambda.\sqrt{\beta_W}$	0.882 x 0.914 x 62.97 √ 1	50.79	
pb = Fn (py,λ_{LT})	275, 50.79	236.05 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 236.05 ≤ 86.46 =	74.214 kN.m	

Simplified Approach

py.Zx	275x280.1	77.028 kN.m	
F/Pc+mx.Mx/py.Zx	0+0.95x7.9/77	0.098	OK
$F/Pcy+m_{LT}.M_{LT}/Mb$	0+0.815x7.9/74.2	0.087	OK

More Exact Approach

Max=Mcx/(1+.5F/Pcx)	86.5/(1+.5x0/945.7)	86.46 kN.m	
F/Pcx+mx.Mx/Max	0/945.7+0.95x7.9/86.5	0.087	OK
$F/Pcy+m_{LT}.M_{LT}/Mb$	0/822.6+0.815x7.9/74.2	0.087	OK

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Deflection Check - Load Case 10

$\delta \leq$ Span/360	1.92 ≤ 4645 / 360	1.92 mm	OK

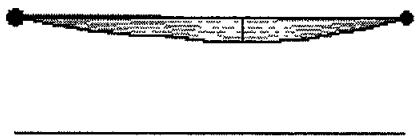
AXIAL WITH MOMENTS (MEMBER)

Members 648 and 683 (B12-B9) @ Level 6 in Load Case 1

Member Loading and Member Forces

Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6 L1 + 1.4 A1

```
D1 UDLY -001.143          ( kN/m )
L1 UDLY -000.686          ( kN/m )
A1 D     078.500          ( kN/m³)
```



Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	384	0.08T	-0.01	9.37	0.00	0.00	0.00	18.65	0.00	11.42
	432	0.42C	-0.01	-11.68	0.00	0.00	0.00	@ 4.392	@ 2.810	@ 3.947

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 0.42, 18.64, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	0.085 / 218.381 =	0	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Pz = Ag.py	38.21 x 275 =	1050.775 kN	
n = F/Pz	0.421 / 1050.775 =	0.000	OK
Srx = Fn(Sxx, n)	314.4, 0	314.4 cm³	
Mrx = Srx.py	314.4 x 275	86.46 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(18.641/86.46)^2+(0)^1$=	0.046	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x7.605/8.71 =	87.3	OK
Pcx = Area.pcx	38.21x186.601/10 =	713.004 kN	Table 24 a
λy = Ley/ryy	100x1x7.605/3.18 =	239.4	OK
Pcy = Area.pcy	38.21x31.71/10 =	121.182 kN	Table 24 b

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x12+.5x18+.15x16)/19 ≥0.44	0.905	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x12+.6x18+.1x16)/19 ≥.8x19/19	0.927	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 7.605 =	7.605 m	
λ = Le/ry	7.605 / 3.18	239.43	OK
v = Fn (x,Le,ry,λ)	21.437, 7.605, 3.18, 239.43	0.61	Table 19
λ_{LT} = u.v.λ.$\sqrt{\beta_W}$	0.882 x 0.61 x 239.43 √ 1	128.79	
pb = Fn (py,λ_{LT})	275, 128.79	85.55 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 85.55 ≤ 86.46 =	26.897 kN.m	

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Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.905x18.6/26.9	0.627	
$r_c=F_c/P_{cy}$	0.4/121.2	0.003	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.627•128.8+0.003•239.4)/(0.627+0.003)	129.399	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.627+0.003)/(0.627+0.003)	34.206	
$M_{ob}=M_b(1-F_c/P_{cy})$	26.897(1-0.4/121.2)	26.804	
$M_{xy}=M_{cx}(1-F_c/P_{cy})^{½}$	86.460(1-0.4/121.2)^{½}	86.310	
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-0.4/713)/(1+0.5•0.4/713)	86.384	
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-0.4/121.2)/(1+1.0(0.4/121.2))	18.844	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	129.399, 34.206, 1.000, 86.310, 26.804	26.804	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	87.348, 1.000, 86.460, 86.384	86.384	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	239.428, 1.000, 18.975, 18.844	18.844	
$m_x.M_x/M_{ax}$	0.927x18.6/86.4	0.200	OK
$m_{LT}.M_{LT}/M_{ab}$	0.905x18.6/26.8	0.630	OK
$m_x.M_x/M_{ax}$	0.927x18.6/86.4	0.200	OK
Compare with Simplied to 4.8.3.3	0.228, 0.631, 0.631	0.631	
Compare with MoreExact to 4.8.3.3	0.201, 0.631, 0.195	0.631	

Deflection Check - Load Case 10

$\delta \le$ Span/360	11.42 ≤ 7605 / 360	11.42 mm	OK

AXIAL WITH MOMENTS (MEMBER)
Member 651 (N.387-N.430) @ Level 6
Between 0 and 2.4 m, in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
L1 + 1.4 A1

  D1 UDLY -002.076            ( kN/m )
  L1 UDLY -001.246            ( kN/m )
  A1 D     078.500            ( kN/m³)
```

Member Forces in Load Case 1 and Maximum Deflection from Load Case 10										
Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
651	387	0.03T	-0.01	7.47	0.00	0.00	0.00	5.25		0.46
	430	0.03T	0.01	-7.47	0.00	0.00	0.00	@ 1.405		@ 1.405

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 0, 5.25, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	0.107 / 218.381 =	0	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Pz =Ae.py	38.21x275 =	1050.775 kN	
n = F/Pz	-0.029 / 1050.775 =	0.000	OK
Srx = Fn(Sxx, n)	314.4, 0	314.4 cm³	

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Mrx = Srx.py	314.4 x 275	86.46 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(5.249/86.46)^2+(0)^1=$	0.004	OK

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x4+.5x5+.15x5)/5 ≥0.44	0.928	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x4+.6x5+.1x4)/5 ≥.8x5/5	0.95	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2.4 =	2.4 m	
λ = Le/ry	2.4 / 3.18	75.56	OK
v = Fn (x,Le,ry,λ)	21.437, 2.4, 3.18, 75.56	0.886	Table 19
λ_{LT} = u.v.λ.$\sqrt{\beta_W}$	0.882 x 0.886 x 75.56 √ 1	59.08	
pb = Fn (py,λ_{LT})	275, 59.08	215.52 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 215.52 ≤ 86.46 =	67.759 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.928x5.2/67.8	0.072	
$r_c=F_c/P_{cy}$	0/728.5	0.000	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.072•59.1+0•75.6)/(0.072+0)	59.078	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.072+0)/(0.072+0)	34.300	
$M_{ob}=M_b(1-F_c/P_{cy})$	67.759(1-0/728.5)	67.759	
$M_{xy}=M_{cx}(1-F_c/P_{cy})^{½}$	86.460(1-0/728.5)^{½}	86.460	
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-0/1015.2)/(1+0.5•0/1015.2)	86.460	
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-0/728.5)/(1+1.0(0/728.5))	18.975	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	59.078, 34.300, 1.000, 86.460, 67.759	77.462	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	32.274, 1.000, 86.460, 86.460	86.460	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	75.559, 1.000, 18.975, 18.975	18.975	
$m_x.M_x/M_{ax}$	0.95x5.3/86.5	0.058	OK
$m_{LT}.M_{LT}/M_{ab}$	0.928x5.2/77.5	0.063	OK
$m_x.M_x/M_{ax}$	0.95x5.3/86.5	0.058	OK
Compare with Simplied to 4.8.3.3	0.065, 0.072, 0.072	0.072	
Compare with MoreExact to 4.8.3.3	0.058, 0.072, 0.056	0.072	

Deflection Check - Load Case 10

δ ≤ Span/360	0.46 ≤ 2810 / 360	0.46 mm	OK

AXIAL WITH MOMENTS (MEMBER)
Member 651 (N.387-N.430) @ Level 6
Between 2.4 and 2.81 m, in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
L1 + 1.4 A1

  D1 UDLY -002.076          ( kN/m )
  L1 UDLY -001.246          ( kN/m )
  A1 D     078.500          ( kN/m³)
```

Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
651	387	0.03T	-0.01	7.47	0.00	0.00	0.00	5.25		0.46
	430	0.03T	0.01	-7.47	0.00	0.00	0.00	@ 1.405		@ 1.405

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Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 0, 5.25, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	5.294 / 218.381 =	0.024	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Pz =Ae.py	38.21x275 =	1050.775 kN	
n = F/Pz	-0.029 / 1050.775 =	0.000	OK
Srx = Fn(Sxx, n)	314.4, 0	314.4 cm³	
Mrx = Srx.py	314.4 x 275	86.46 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(2.62/86.46)^2+(0)^1=$	0.001	OK

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x2+.5x1+.15x1)/3 ≥0.44	0.632	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x4+.6x5+.1x4)/5 ≥.8x5/5	0.95	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 0.41 =	0.41 m	
λ = Le/ry	0.41 / 3.18	12.91	OK
v = Fn (x,Le,ry,λ)	21.437, 0.41, 3.18, 12.91	0.996	Table 19
$\lambda_{LT} = u.v.\lambda.\sqrt{\beta_W}$	0.882 x 0.996 x 12.91 √ 1	11.34	
pb = Fn (py,λ_{LT})	275, 11.34	275 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 275 ≤ 86.46 =	86.460 kN.m	

Simplified Approach

py.Zx	275x280.1	77.028 kN.m	
F/Pc+mx.Mx/py.Zx	0+0.95x5.3/77	0.065	OK
$F/Pcy+m_{LT}.M_{LT}/Mb$	0+0.632x2.6/86.5	0.019	OK

More Exact Approach

Max=Mcx/(1+.5F/Pcx)	86.5/(1+.5x0/1015.2)	86.46 kN.m	
F/Pcx+mx.Mx/Max	0/1015.2+0.95x5.3/86.5	0.058	OK
$F/Pcy+m_{LT}.M_{LT}/Mb$	0/1050.8+0.632x2.6/86.5	0.019	OK

Deflection Check - Load Case 10

δ ≤ Span/360	0.46 ≤ 2810 / 360	0.46 mm	OK

AXIAL WITH MOMENTS (MEMBER)
Member 653 (E12-E10) @ Level 6
Between 0 and 2.4 m, in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
 L1 + 1.4 A1

   D1 UDLY -002.020            ( kN/m )
   L1 UDLY -001.212            ( kN/m )
   A1 D     078.500            ( kN/m³)
```

Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

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Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
653	390	0.00T	0.00	7.29	0.00	0.00	0.00	5.12		0.45
	439	0.00T	0.00	-7.29	0.00	0.00	0.00	@ 1.405		@ 1.405

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 0, 5.12, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	0.104 / 218.381 =	0	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Pz =Ae.py	38.21x275 =	1050.775 kN	
n = F/Pz	-0.003 / 1050.775 =	0.000	OK
Srx = Fn(Sxx, n)	314.4, 0	314.4 cm³	
Mrx = Srx.py	314.4 x 275	86.46 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(5.118/86.46)^2+(0)^1=$	0.004	OK

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x3+.5x5+.15x5)/5 ≥0.44	0.928	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x4+.6x5+.1x4)/5 ≥.8x5/5	0.95	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2.4 =	2.4 m	
λ = Le/ry	2.4 / 3.18	75.56	OK
v = Fn (x,Le,ry,λ)	21.437, 2.4, 3.18, 75.56	0.886	Table 19
$\lambda_{LT}= u.v.\lambda.\sqrt{\beta_W}$	0.882 x 0.886 x 75.56 √ 1	59.08	
pb = Fn (py,λ_{LT})	275, 59.08	215.52 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 215.52 ≤ 86.46 =	67.759 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.928x5.1/67.8	0.070	
$r_c=F_c/P_{cy}$	0/728.5	0.000	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.07•59.1+0•75.6)/(0.07+0)	59.078	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.07+0)/(0.07+0)	34.300	
$M_{ob}= M_b(1-F_c/P_{cy})$	67.759(1-0/728.5)	67.759	
$M_{xy}= M_{cx}(1-F_c/P_{cy})^{½}$	86.460(1-0/728.5)^{½}	86.460	
$M_{ox}= M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-0/1015.2)/(1+0.5•0/1015.2)	86.460	
$M_{oy}= M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-0/728.5)/(1+1.0(0/728.5))	18.975	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	59.078, 34.300, 1.000, 86.460, 67.759	77.462	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	32.274, 1.000, 86.460, 86.460	86.460	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	75.559, 1.000, 18.975, 18.975	18.975	
$m_x.M_x/M_{ax}$	0.95x5.1/86.5	0.056	OK
$m_{LT}.M_{LT}/M_{ab}$	0.928x5.1/77.5	0.061	OK
$m_x.M_x/M_{ax}$	0.95x5.1/86.5	0.056	OK
Compare with Simplied to 4.8.3.3	0.063, 0.07, 0.07	0.07	
Compare with MoreExact to 4.8.3.3	0.056, 0.07, 0.055	0.07	

Deflection Check - Load Case 10

δ ≤ Span/360	0.45 ≤ 2810 / 360	0.45 mm	OK

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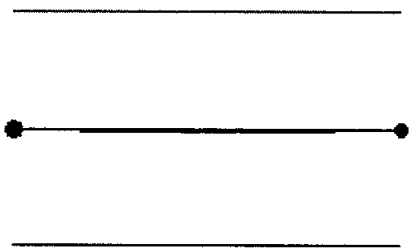
AXIAL WITH MOMENTS (MEMBER)

Member 657 (A8-A4) @ Level 6 in Load Case 1

Member Loading and Member Forces

Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6 L1 + 1.4 A1

D1 UDLY -000.520 (kN/m)
L1 UDLY -000.312 (kN/m)
A1 D 078.500 (kN/m³)



Member Forces in Load Case 1 and Maximum Deflection from Load Case 10										
Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
657	395	0.70T	0.04	2.96	0.00	0.00	0.00	2.66		0.39
	474	0.70T	-0.04	-2.96	0.00	0.00	0.00	@ 1.796		@ 1.796

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 0, 2.66, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	0.001 / 218.381 =	0	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Pz =Ae.py	38.21x275 =	1050.775 kN	
n = F/Pz	-0.701 / 1050.775 =	0.001	OK
Srx = Fn(Sxx, n)	314.4, 0.001	314.4 cm³	
Mrx = Srx.py	314.4 x 275	86.46 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(2.657/86.46)^2+(0)^1=$	0.001	OK

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x2+.5x3+.15x2)/3 ≥0.44	0.925	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x2+.6x3+.1x2)/3 ≥.8x3/3	0.95	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 3.592 =	3.592 m	
λ = Le/ry	3.592 / 3.18	113.09	OK
v = Fn (x,Le,ry,λ)	21.437, 3.592, 3.18, 113.09	0.804	Table 19
λ_{LT} = u.v.λ.√βw	0.882 x 0.804 x 113.09 √ 1	80.23	
pb = Fn (py,λ_{LT})	275, 80.23	164.32 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 164.32 ≤ 86.46 =	51.661 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.925x2.7/51.7	0.048
$r_c=F_c/P_{cy}$	0/451.6	0.000
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.048•80.2+0•113.1)/(0.048+0)	80.232
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.048+0)/(0.048+0)	34.300
$M_{ob}=M_b(1-F_c/P_{cy})$	51.661(1-0/451.6)	51.661
$M_{xy}=M_{cx}(1-F_c/P_{cy})^{½}$	86.460(1-0/451.6)^{½}	86.460
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-0/989.8)/(1+0.5•0/989.8)	86.460
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-0/451.6)/(1+1.0(0/451.6))	18.975

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M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	80.232, 34.300, 1.000, 86.460, 51.661	55.424	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	41.256, 1.000, 86.460, 86.460	86.460	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	113.087, 1.000, 18.975, 18.975	18.975	
$m_x.M_x/M_{ax}$	0.95x2.7/86.5	0.029	OK
$m_{LT}.M_{LT}/M_{ab}$	0.925x2.7/55.4	0.044	OK
$m_x.M_x/M_{ax}$	0.95x2.7/86.5	0.029	OK
Compare with Simplied to 4.8.3.3	0.033, 0.048, 0.048	0.048	
Compare with MoreExact to 4.8.3.3	0.029, 0.048, 0.028	0.048	

Deflection Check - Load Case 10

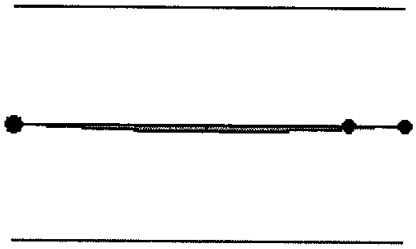
δ ≤ Span/360	0.39 ≤ 3592 / 360	0.39 mm	OK

AXIAL WITH MOMENTS (MEMBER)
Member 674 (N.417-N.452) @ Level 6
Between 0 and 2.4 m, in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
 L1 + 1.4 A1

   D1 UDLY -001.087                ( kN/m )
   L1 UDLY -000.652                ( kN/m )
   D1 PTRY -000.987 0.000 2.810 -000.994
   L1 PTRY -000.592 0.000 2.810 -000.596
   A1 D     078.500                ( kN/m³)
```



Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
674	417	0.05T	0.01	7.47	0.00	0.00	0.00	5.25		0.46
	452	0.05T	-0.01	-7.48	0.00	0.00	0.00	@ 1.419		@ 1.419

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 0, 5.25, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	0.108 / 218.381 =	0	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Pz =Ae.py	38.21x275 =	1050.775 kN	
n = F/Pz	-0.053 / 1050.775 =	0.000	OK
Srx = Fn(Sxx, n)	314.4, 0	314.4 cm³	
Mrx = Srx.py	314.4 x 275	86.46 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(5.25/86.46)^2+(0)^1$=	0.004	OK

Equivalent Uniform Moment Factors mLT, mx, my and myx

m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}	0.2+(.15x4+.5x5+.15x5)/5 ≥0.44	0.928	Table 18
m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}	0.2+(.1x4+.6x5+.1x4)/5 ≥.8x5/5	0.95	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2.4 =	2.4 m	
λ = Le/ry	2.4 / 3.18	75.56	OK
v = Fn (x,Le,ry,λ)	21.437, 2.4, 3.18, 75.56	0.886	Table 19

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$\lambda_{LT} = u.v.\lambda.\sqrt{\beta_W}$	0.882 x 0.886 x 75.56 √ 1	59.08	
pb = Fn (py,λ_{LT})	275, 59.08	215.52 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 215.52 ≤ 86.46 =	67.759 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.928x5.3/67.8	0.072	
$r_c=F_c/P_{cy}$	0/728.5	0.000	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.072•59.1+0•75.6)/(0.072+0)	59.078	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.072+0)/(0.072+0)	34.300	
$M_{ob}=M_b(1-F_c/P_{cy})$	67.759(1-0/728.5)	67.759	
$M_{xy}=M_{cx}(1-F_c/P_{cy})^{½}$	86.460(1-0/728.5)^{½}	86.460	
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-0/1015.2)/(1+0.5•0/1015.2)	86.460	
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-0/728.5)/(1+1.0(0/728.5))	18.975	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	59.078, 34.300, 1.000, 86.460, 67.759	77.462	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	32.274, 1.000, 86.460, 86.460	86.460	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	75.559, 1.000, 18.975, 18.975	18.975	
$m_x.M_x/M_{ax}$	0.95x5.3/86.5	0.058	OK
$m_{LT}.M_{LT}/M_{ab}$	0.928x5.3/77.5	0.063	OK
$m_x.M_x/M_{ax}$	0.95x5.3/86.5	0.058	OK
Compare with Simplied to 4.8.3.3	0.065, 0.072, 0.072	0.072	
Compare with MoreExact to 4.8.3.3	0.058, 0.072, 0.056	0.072	

Deflection Check - Load Case 10

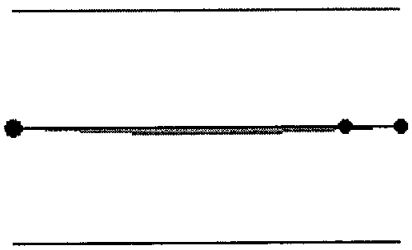
δ ≤ Span/360	0.46 ≤ 2810 / 360	0.46 mm	OK

AXIAL WITH MOMENTS (MEMBER)
Member 674 (N.417-N.452) @ Level 6
Between 2.4 and 2.81 m, in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
 L1 + 1.4 A1

   D1 UDLY -001.087              ( kN/m )
   L1 UDLY -000.652              ( kN/m )
   D1 PTRY -000.987 0.000 2.810 -000.994
   L1 PTRY -000.592 0.000 2.810 -000.596
   A1 D     078.500              ( kN/m³)
```



Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
674	417	0.05T	0.01	7.47	0.00	0.00	0.00	5.25		0.46
	452	0.05T	-0.01	-7.48	0.00	0.00	0.00	@ 1.419		@ 1.419

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 0, 5.25, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	5.295 / 218.381 =	0.024	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Pz =Ae.py	38.21x275 =	1050.775 kN	
n = F/Pz	-0.053 / 1050.775 =	0.000	OK

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Srx = Fn(Sxx, n)	314.4, 0	314.4 cm³	
Mrx = Srx.py	314.4 x 275	86.46 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(2.622/86.46)^2+(0)^1=$	0.001	OK

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x2+.5x1+.15x1)/3 ≥0.44	0.633	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x4+.6x5+.1x4)/5 ≥.8x5/5	0.95	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 0.41 =	0.41 m	
λ = Le/ry	0.41 / 3.18	12.91	OK
v = Fn (x,Le,ry,λ)	21.437, 0.41, 3.18, 12.91	0.996	Table 19
λ_{LT} = u.v.λ.√β_W	0.882 x 0.996 x 12.91 √ 1	11.34	
pb = Fn (py,λ_{LT})	275, 11.34	275 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 275 ≤ 86.46 =	86.460 kN.m	

Simplified Approach

py.Zx	275x280.1	77.028 kN.m	
F/Pc+mx.Mx/py.Zx	0+0.95x5.3/77	0.065	OK
F/Pcy+m_{LT}.M_{LT}/Mb	0+0.633x2.6/86.5	0.019	OK

More Exact Approach

Max=Mcx/(1+.5F/Pcx)	86.5/(1+.5x0/1015.2)	86.46 kN.m	
F/Pcx+mx.Mx/Max	0/1015.2+0.95x5.3/86.5	0.058	OK
F/Pcy+m_{LT}.M_{LT}/Mb	0/1050.8+0.633x2.6/86.5	0.019	OK

Deflection Check - Load Case 10

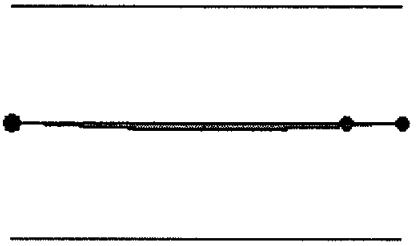
δ ≤ Span/360	0.46 ≤ 2810 / 360	0.46 mm	OK

AXIAL WITH MOMENTS (MEMBER)
Member 678 (N.421-N.455) @ Level 6
Between 0 and 2.4 m, in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
L1 + 1.4 A1

   D1 PTRY -002.163 0.000 2.810 -001.988
   L1 PTRY -001.297 0.000 2.810 -001.192
   A1 D     078.500              ( kN/m³)
```



r Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
678	421	0.17T	0.01	7.57	0.00	0.00	0.00	5.25		0.46
	455	0.17T	-0.01	-7.37	0.00	0.00	0.00	@ 1.391		@ 1.391

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 0, 5.25, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	0.059 / 218.381 =	0	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	

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Pz =Ae.py	38.21x275 =	1050.775 kN	
n = F/Pz	-0.171 / 1050.775 =	0.000	OK
Srx = Fn(Sxx, n)	314.4, 0	314.4 cm³	
Mrx = Srx.py	314.4 x 275	86.46 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(5.245/86.46)^2+(0)^1=$	0.004	OK

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x4+.5x5+.15x5)/5 ≥0.44	0.929	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x4+.6x5+.1x4)/5 ≥.8x5/5	0.95	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2.4 =	2.4 m	
λ = Le/ry	2.4 / 3.18	75.56	OK
v = Fn (x,Le,ry,λ)	21.437, 2.4, 3.18, 75.56	0.886	Table 19
λ_{LT} = u.v.λ.$\sqrt{\beta_W}$	0.882 x 0.886 x 75.56 √ 1	59.08	
pb = Fn (py,λ_{LT})	275, 59.08	215.52 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 215.52 ≤ 86.46 =	67.759 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.929x5.2/67.8	0.072	
$r_c=F_c/P_{cy}$	0/728.5	0.000	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.072•59.1+0•75.6)/(0.072+0)	59.078	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.072+0)/(0.072+0)	34.300	
$M_{ob}=M_b(1-F_c/P_{cy})$	67.759(1-0/728.5)	67.759	
$M_{xy}=M_{cx}\ (1-F_c/P_{cy})^{½}$	86.460(1-0/728.5)^{½}	86.460	
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-0/1015.2)/(1+0.5•0/1015.2)	86.460	
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-0/728.5)/(1+1.0(0/728.5))	18.975	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	59.078, 34.300, 1.000, 86.460, 67.759	77.462	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	32.275, 1.000, 86.460, 86.460	86.460	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	75.559, 1.000, 18.975, 18.975	18.975	
$m_x.M_x/M_{ax}$	0.95x5.2/86.5	0.058	OK
$m_{LT}.M_{LT}/M_{ab}$	0.929x5.2/77.5	0.063	OK
$m_x.M_x/M_{ax}$	0.95x5.2/86.5	0.058	OK
Compare with Simplied to 4.8.3.3	0.065, 0.072, 0.072	0.072	
Compare with MoreExact to 4.8.3.3	0.058, 0.072, 0.056	0.072	

Deflection Check - Load Case 10

δ ≤ Span/360	0.46 ≤ 2810 / 360	0.46 mm	OK

AXIAL WITH MOMENTS (MEMBER)

Member 681 (K12-K10) @ Level 6 in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
L1 + 1.4 A1

   D1 PTRY -001.166 0.000 2.832 -000.986
   L1 PTRY -000.700 0.000 2.832 -000.592
   A1 D     078.500             ( kN/m³)
```

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Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
681	425	0.37T	0.01	-12.02	0.00	0.00	0.00			1.49
	457	0.37T	-0.01	-3.64	0.00	-21.88	0.00			@ 1.606

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 0, 21.88, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	3.638 / 218.381 =	0.017	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Pz =Ae.py	38.21x275 =	1050.775 kN	
n = F/Pz	-0.374 / 1050.775 =	0.000	OK
Srx = Fn(Sxx, n)	314.4, 0	314.4 cm³	
Mrx = Srx.py	314.4 x 275	86.46 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(21.881/86.46)^2+(0)^1$=	0.064	OK

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x8+.5x14+.15x19)/22 ≥0.44	0.698	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x8+.6x14+.1x19)/22 ≥.8x19/22	0.702	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2.832 =	2.832 m	
λ = Le/ry	2.832 / 3.18	89.15	OK
v = Fn (x,Le,ry,λ)	21.437, 2.832, 3.18, 89.15	0.856	Table 19
$\lambda_{LT} = u.v.\lambda.\sqrt{\beta_W}$	0.882 x 0.856 x 89.15 √ 1	67.31	
pb = Fn (py,λ_{LT})	275, 67.31	195.03 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 195.03 ≤ 86.46 =	61.316 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.698x21.9/61.3	0.249	
$r_c=F_c/P_{cy}$	0/620	0.000	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.249•67.3+0•89.2)/(0.249+0)	67.308	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.249+0)/(0.249+0)	34.300	
$M_{ob} = M_b(1-F_c/P_{cy})$	61.316(1-0/620)	61.316	
$M_{xy} = M_{cx}(1-F_c/P_{cy})^{½}$	86.460(1-0/620)^{½}	86.460	
$M_{ox} = M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-0/1014.6)/(1+0.5•0/1014.6)	86.460	
$M_{oy} = M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-0/620)/(1+1.0(0/620))	18.975	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	67.308, 34.300, 1.000, 86.460, 61.316	70.345	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	32.524, 1.000, 86.460, 86.460	86.460	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	89.151, 1.000, 18.975, 18.975	18.975	
$m_x.M_x/M_{ax}$	0.702x21.9/86.5	0.178	OK
$m_{LT}.M_{LT}/M_{ab}$	0.698x21.9/70.3	0.217	OK
$m_x.M_x/M_{ax}$	0.702x21.9/86.5	0.178	OK
Compare with Simplied to 4.8.3.3	0.199, 0.249, 0.249	0.249	
Compare with MoreExact to 4.8.3.3	0.178, 0.249, 0.177	0.249	

Deflection Check - Load Case 10

δ ≤ Span/360	1.49 ≤ 2832 / 360	1.49 mm	OK

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AXIAL WITH MOMENTS (MEMBER)

Member 687 (B9-N.466) @ Level 6 in Load Case 1

Member Loading and Member Forces

Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6 L1 + 1.4 A1

D1 UDLY -001.370 (kN/m)
L1 UDLY -000.822 (kN/m)
A1 D 078.500 (kN/m³)

Member Forces in Load Case 1 and Maximum Deflection from Load Case 10										
Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
687	432	0.05T	0.00	12.25	0.00	0.00	0.00	20.53		10.31
	466	0.05T	0.00	-12.25	0.00	0.00	0.00	@ 3.353		@ 3.353

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 0, 20.52, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	0.001 / 218.381 =	0	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Pz =Ae.py	38.21x275 =	1050.775 kN	
n = F/Pz	-0.046 / 1050.775 =	0.000	OK
Srx = Fn(Sxx, n)	314.4, 0	314.4 cm³	
Mrx = Srx.py	314.4 x 275	86.46 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(20.523/86.46)^2+(0)^1$=	0.056	OK

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x15+.5x21+.15x15)/21 ≥0.44	0.925	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x15+.6x21+.1x15)/21 ≥.8x21/21	0.95	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 6.705 =	6.705 m	
λ = Le/ry	6.705 / 3.18	211.09	OK
v = Fn (x,Le,ry,λ)	21.437, 6.705, 3.18, 211.09	0.643	Table 19
λ_{LT} = u.v.λ.$\sqrt{\beta_W}$	0.882 x 0.643 x 211.09 √ 1	119.76	
pb = Fn (py,λ_{LT})	275, 119.76	95.89 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 95.89 ≤ 86.46 =	30.148 kN.m	

Simplified Approach

py.Zx	275x280.1	77.028 kN.m	
F/Pc+mx.Mx/py.Zx	0+0.95x20.5/77	0.253	OK
F/Pcy+m_{LT}.M_{LT}/Mb	0+0.925x20.5/30.1	0.630	OK

More Exact Approach

Max=Mcx/(1+.5F/Pcx)	86.5/(1+.5x0/801.6)	86.46 kN.m	
F/Pcx+mx.Mx/Max	0/801.6+0.95x20.5/86.5	0.226	OK
F/Pcy+m_{LT}.M_{LT}/Mb	0/153.4+0.925x20.5/30.1	0.630	OK

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Deflection Check - Load Case 10

$\delta \leq$ Span/360	10.31 ≤ 6705 / 360	10.31 mm	OK

AXIAL WITH MOMENTS (MEMBER)
Member 689 (N.436-D9) @ Level 6
Between 0 and 2.4 m, in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
L1 + 1.4 A1

  D1 PTRY -002.337 0.000 4.795 -002.303
  L1 PTRY -001.402 0.000 4.795 -001.382
  A1 D     078.500             ( kN/m³)
```

Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
689	436	0.08C	0.01	-14.17	0.00	0.00	0.00	-16.94		4.33
	443	0.08C	-0.01	14.10	0.00	0.00	0.00	@ 2.373		@ 2.373

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 0.08, 16.94, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	0.028 / 218.381 =	0	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Pz = Ag.py	38.21 x 275 =	1050.775 kN	
n = F/Pz	0.079 / 1050.775 =	0.000	OK
Srx = Fn(Sxx, n)	314.4, 0	314.4 cm³	
Mrx = Srx.py	314.4 x 275	86.46 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(16.941/86.46)^2+(0)^1$=	0.038	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x4.795/8.71 =	55.1	OK
Pcx = Area.pcx	38.21x245.534/10 =	938.184 kN	Table 24 a
λy = Ley/ryy	100x1x2.4/3.18 =	75.6	OK
Pcy = Area.pcy	38.21x190.65/10 =	728.476 kN	Table 24 b

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x7+.5x13+.15x16)/17 ≥0.44	0.782	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x13+.6x17+.1x13)/17 ≥.8x17/17	0.95	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2.4 =	2.4 m	
λ = Le/ry	2.4 / 3.18	75.56	OK
v = Fn (x,Le,ry,λ)	21.437, 2.4, 3.18, 75.56	0.886	Table 19
λ_{LT} = u.v.λ.$\sqrt{\beta_W}$	0.882 x 0.886 x 75.56 √ 1	59.08	
pb = Fn (py,λ_{LT})	275, 59.08	215.52 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 215.52 ≤ 86.46 =	67.759 kN.m	

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Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.782x16.9/67.8	0.195	
$r_c=F_c/P_{cy}$	0.1/728.5	0.000	
$\lambda_r=(r_b \lambda_{LT}+r_c \lambda_y)/(r_b+r_c)$	(0.195•59.1+0•75.6)/(0.195+0)	59.088	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.195+0)/(0.195+0)	34.290	
$M_{ob}=M_b(1-F_c/P_{cy})$	67.759(1-0.1/728.5)	67.752	
$M_{xy}=M_{cx}(1-F_c/P_{cy})^{½}$	86.460(1-0.1/728.5)^{½}	86.455	
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-0.1/938.2)/(1+0.5•0.1/938.2)	86.449	
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-0.1/728.5)/(1+1.0(0.1/728.5))	18.971	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	59.088, 34.290, 1.000, 86.455, 67.752	77.454	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	55.073, 1.000, 86.460, 86.449	86.454	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	75.559, 1.000, 18.975, 18.971	18.971	
$m_x.M_x/M_{ax}$	0.95x16.9/86.5	0.186	OK
$m_{LT}.M_{LT}/M_{ab}$	0.782x16.9/77.5	0.171	OK
$m_x.M_x/M_{ax}$	0.95x16.9/86.5	0.186	OK
Compare with Simplied to 4.8.3.3	0.209, 0.195, 0.195	0.209	
Compare with MoreExact to 4.8.3.3	0.186, 0.195, 0.153	0.195	

Deflection Check - Load Case 10

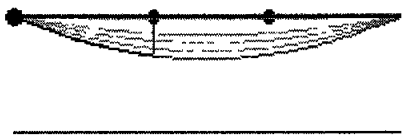
$\delta \le$ Span/360	4.33 ≤ 4795 / 360	4.33 mm	OK

AXIAL WITH MOMENTS (MEMBER)
Member 695 (D9-D8) @ Level 6
Between 0 and 2.4 m, in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
L1 + 1.4 A1

   D1 UDLY -001.370              ( kN/m )
   L1 UDLY -000.822              ( kN/m )
   D1 PTRY -000.933 0.000 6.705 -000.784
   L1 PTRY -000.560 0.000 6.705 -000.470
   A1 D     078.500              ( kN/m³)
```



Member Forces in Load Case 1 and Maximum Deflection from Load Case 10										
Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
695	443	0.02C	-0.01	19.24	0.00	0.00	0.00	31.91		15.94
	467	0.02C	0.01	-18.84	0.00	0.00	0.00	@ 3.318		@ 3.318

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 0.02, 31.91, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	5.335 / 218.381 =	0.024	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Pz = Ag.py	38.21 x 275 =	1050.775 kN	
n = F/Pz	0.021 / 1050.775 =	0.000	OK
Srx = Fn(Sxx, n)	314.4, 0	314.4 cm³	
Mrx = Srx.py	314.4 x 275	86.46 kN.m	

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$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(29.42/86.46)^2+(0)^1=$	0.116	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x6.705/8.71 =	77	OK
Pcx = Area.pcx	38.21x209.784/10 =	801.583 kN	Table 24 a
λy = Ley/ryy	100x1x2.4/3.18 =	75.6	OK
Pcy = Area.pcy	38.21x190.65/10 =	728.476 kN	Table 24 b

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x10+.5x19+.15x25)/29 ≥0.44	0.703	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x24+.6x32+.1x24)/32 ≥.8x32/32	0.95	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2.4 =	2.4 m	
λ = Le/ry	2.4 / 3.18	75.56	OK
v = Fn (x,Le,ry,λ)	21.437, 2.4, 3.18, 75.56	0.886	Table 19
λ_{LT} = u.v.λ.$\sqrt{\beta_W}$	0.882 x 0.886 x 75.56 √ 1	59.08	
pb = Fn (py,λ_{LT})	275, 59.08	215.52 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 215.52 ≤ 86.46 =	67.759 kN.m	

Simplified Approach

py.Zx	275x280.1	77.028 kN.m	
F/Pc+mx.Mx/py.Zx	0.021/728.476+0.95x31.9/77	0.394	OK
F/Pcy+m_{LT}.M_{LT}/Mb	0.021/728.476+0.703x29.4/67.8	0.305	OK

More Exact Approach

Max=Mcx/(1+.5F/Pcx)	86.5/(1+.5x0/801.6)	86.459 kN.m	
F/Pcx+mx.Mx/Max	0/801.6+0.95x31.9/86.5	0.351	OK
F/Pcy+m_{LT}.M_{LT}/Mb	0/728.5+0.703x29.4/67.8	0.305	OK

Deflection Check - Load Case 10

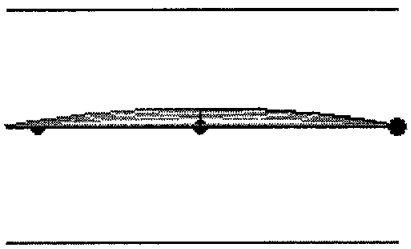
δ ≤ Span/360	15.94 ≤ 6705 / 360	15.94 mm	OK

AXIAL WITH MOMENTS (MEMBER)
Member 700 (N.449-N.460) @ Level 6
Between 0 and 2.4 m, in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
L1 + 1.4 A1

  D1 PTRY -000.963 0.000 4.795 -000.932
  L1 PTRY -000.578 0.000 4.795 -000.559
  D1 UDLY -000.825              ( kN/m )
  L1 UDLY -000.495              ( kN/m )
  A1 D     078.500              ( kN/m³)
```



Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
700	449	0.14T	0.01	-11.07	0.00	0.00	0.00	-13.23		3.39
	460	0.14T	-0.01	11.01	0.00	0.00	0.00	@ 2.373		@ 2.373

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 0, 13.24, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

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Local Capacity Check

Fvx/Pvx	0.02 / 218.381 =	0	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Pz =Ae.py	38.21x275 =	1050.775 kN	
n = F/Pz	-0.137 / 1050.775 =	0.000	OK
Srx = Fn(Sxx, n)	314.4, 0	314.4 cm³	
Mrx = Srx.py	314.4 x 275	86.46 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(13.235/86.46)^2+(0)^1$=	0.023	OK

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0 2+(.15x6+.5x10+.15x12)/13 ≥0.44	0.782	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x10+.6x13+.1x10)/13 ≥.8x13/13	0.95	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2.4 =	2.4 m	
λ = Le/ry	2.4 / 3.18	75.56	OK
v = Fn (x,Le,ry,λ)	21.437, 2.4, 3.18, 75.56	0.886	Table 19
λ_{LT} = u.v.λ.√βw	0.882 x 0.886 x 75.56 √ 1	59.08	
pb = Fn (py,λ_{LT})	275, 59.08	215.52 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 215.52 ≤ 86.46 =	67.759 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.782x13.2/67.8	0.153	
$r_c=F_c/P_{cy}$	0/728.5	0.000	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.153•59.1+0•75.6)/(0.153+0)	59.078	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.153+0)/(0.153+0)	34.300	
$M_{ob}=M_b(1-F_c/P_{cy})$	67.759(1-0/728.5)	67.759	
$M_{xy}=M_{cx}(1-F_c/P_{cy})^{½}$	86.460(1-0/728.5)^{½}	86.460	
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-0/938.2)/(1+0.5•0/938.2)	86.460	
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-0/728.5)/(1+1.0(0/728.5))	18.975	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	59.078, 34.300, 1.000, 86.460, 67.759	77.462	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	55.079, 1.000, 86.460, 86.460	86.460	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	75.559, 1.000, 18.975, 18.975	18.975	
$m_x.M_x/M_{ax}$	0.95x13.2/86.5	0.146	OK
$m_{LT}.M_{LT}/M_{ab}$	0.782x13.2/77.5	0.134	OK
$m_x.M_x/M_{ax}$	0.95x13.2/86.5	0.145	OK
Compare with Simplied to 4.8.3.3	0.163, 0.153, 0.153	0.163	
Compare with MoreExact to 4.8.3.3	0.146, 0.153, 0.12	0.153	

Deflection Check - Load Case 10

δ ≤ Span/360	3.39 ≤ 4795 / 360	3.39 mm	OK

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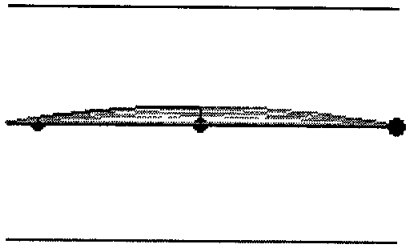
AXIAL WITH MOMENTS (MEMBER)
Member 700 (N.449-N.460) @ Level 6
Between 2.4 and 4.4 m, in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
L1 + 1.4 A1

  D1 PTRY -000.963 0.000 4.795 -000.932
  L1 PTRY -000.578 0.000 4.795 -000.559
  D1 UDLY -000.825              ( kN/m )
  L1 UDLY -000.495              ( kN/m )
  A1 D     078.500              ( kN/m³)
```



Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
700	449	0.14T	0.01	-11.07	0.00	0.00	0.00	-13.23		3.39
	460	0.14T	-0.01	11.01	0.00	0.00	0.00	@ 2.373		@ 2.373

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 0, 13.24, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	0.02 / 218.381 =	0	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Pz =Ae.py	38.21x275 =	1050.775 kN	
n = F/Pz	-0.137 / 1050.775 =	0.000	OK
Srx = Fn(Sxx, n)	314.4, 0	314.4 cm³	
Mrx = Srx.py	314.4 x 275	86.46 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(13.235/86.46)^2+(0)^1=$	0.023	OK

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x13+.5x11+.15x8)/13 ≥0.44	0.847	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x10+.6x13+.1x10)/13 ≥.8x13/13	0.95	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2 =	2 m	
λ = Le/ry	2 / 3.18	62.97	OK
v = Fn (x,Le,ry,λ)	21.437, 2, 3.18, 62.97	0.914	Table 19
$\lambda_{LT} = u.v.\lambda.\sqrt{\beta_W}$	0.882 x 0.914 x 62.97 √ 1	50.79	
pb = Fn (py,λ_{LT})	275, 50.79	236.05 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 236.05 ≤ 86.46 =	74.214 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.847x13.2/74.2	0.151
$r_c=F_c/P_{cy}$	0/822.6	0.000
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.151•50.8+0•63)/(0.151+0)	50.789
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.151+0)/(0.151+0)	34.300
$M_{ob}=M_b(1-F_c/P_{cy})$	74.214(1-0/822.6)	74.214
$M_{xy}=M_{cx}(1-F_c/P_{cy})^{½}$	86.460(1-0/822.6)^{½}	86.460
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-0/938.2)/(1+0.5•0/938.2)	86.460

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$M_{oy} = M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-0/822.6)/(1+1.0(0/822.6))	18.975	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	50.789, 34.300, 1.000, 86.460, 74.214	82.539	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	55.079, 1.000, 86.460, 86.460	86.460	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	62.966, 1.000, 18.975, 18.975	18.975	
$m_x.M_x/M_{ax}$	0.95x13.2/86.5	0.146	OK
$m_{LT}.M_{LT}/M_{ab}$	0.847x13.2/82.5	0.136	OK
$m_x.M_x/M_{ax}$	0.95x13.2/86.5	0.145	OK
Compare with Simplied to 4.8.3.3	0.163, 0.151, 0.151	0.163	
Compare with MoreExact to 4.8.3.3	0.146, 0.151, 0.13	0.151	

Deflection Check - Load Case 10

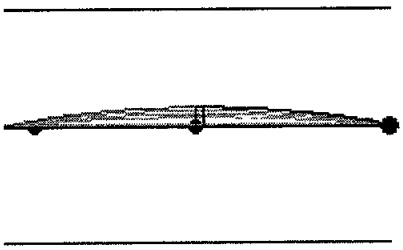
$\delta \leq$ Span/360	3.39 ≤ 4795 / 360	3.39 mm	OK

AXIAL WITH MOMENTS (MEMBER)
Member 703 (N.452-N.461) @ Level 6
Between 0 and 2.4 m, in Load Case 1

Member Loading and Member Forces

```
Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
L1 + 1.4 A1

D1 UDLY -001.818          ( kN/m )
L1 UDLY -001.091          ( kN/m )
A1 D     078.500          ( kN/m³)
```



Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
703	452	0.29T	0.00	-11.30	0.00	0.00	0.00	-13.54		3.47
	461	0.29T	0.00	11.30	0.00	0.00	0.00	@ 2.398		@ 2.398

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 0, 13.55, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	0.007 / 218.381 =	0	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Pz =Ae.py	38.21x275 =	1050.775 kN	
n = F/Pz	-0.291 / 1050.775 =	0.000	OK
Srx = Fn(Sxx, n)	314.4, 0	314.4 cm³	
Mrx = Srx.py	314.4 x 275	86.46 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(13.545/86.46)^2+(0)^1$=	0.025	OK

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x6+.5x10+.15x13)/14 ≥0.44	0.781	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x10+.6x14+.1x10)/14 ≥.8x14/14	0.95	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2.4 =	2.4 m	

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λ = Le/ry	2.4 / 3.18	75.56	OK
v = Fn (x,Le,ry,λ)	21.437, 2.4, 3.18, 75.56	0.886	Table 19
λ_{LT} = u.v.λ.$\sqrt{\beta_W}$	0.882 x 0.886 x 75.56 $\sqrt{}$ 1	59.08	
pb = Fn (py,λ_{LT})	275, 59.08	215.52 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 215.52 ≤ 86.46 =	67.759 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.781x13.5/67.8	0.156	
$r_c=F_c/P_{cy}$	0/728.5	0.000	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.156•59.1+0•75.6)/(0.156+0)	59.078	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.156+0)/(0.156+0)	34.300	
$M_{ob}=M_b(1-F_c/P_{cy})$	67.759(1-0/728.5)	67.759	
$M_{xy}=M_{cx}(1-F_c/P_{cy})^{½}$	86.460(1-0/728.5)^{½}	86.460	
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-0/938.2)/(1+0.5•0/938.2)	86.460	
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-0/728.5)/(1+1.0(0/728.5))	18.975	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	59.078, 34.300, 1.000, 86.460, 67.759	77.462	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	55.079, 1.000, 86.460, 86.460	86.460	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	75.559, 1.000, 18.975, 18.975	18.975	
$m_x.M_x/M_{ax}$	0.95x13.5/86.5	0.149	OK
$m_{LT}.M_{LT}/M_{ab}$	0.781x13.5/77.5	0.136	OK
$m_x.M_x/M_{ax}$	0.95x13.5/86.5	0.149	OK
Compare with Simplied to 4.8.3.3	0.167, 0.156, 0.156	0.167	
Compare with MoreExact to 4.8.3.3	0.149, 0.156, 0.122	0.156	

Deflection Check - Load Case 10

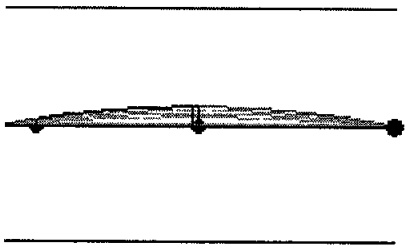
$\delta \le$ Span/360	3.47 ≤ 4795 / 360	3.47 mm	OK

AXIAL WITH MOMENTS (MEMBER)
Member 703 (N.452-N.461) @ Level 6
Between 2.4 and 4.4 m, in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
L1 + 1.4 A1

  D1 UDLY -001.818              ( kN/m )
  L1 UDLY -001.091              ( kN/m )
  A1 D     078.500              ( kN/m³)
```



Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
703	452	0.29T	0.00	-11.30	0.00	0.00	0.00	-13.54		3.47
	461	0.29T	0.00	11.30	0.00	0.00	0.00	@ 2.398		@ 2.398

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 0, 13.55, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

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Local Capacity Check

Fvx/Pvx	0.007 / 218.381 =	0	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Pz =Ae.py	38.21x275 =	1050.775 kN	
n = F/Pz	-0.291 / 1050.775 =	0.000	OK
Srx = Fn(Sxx, n)	314.4, 0	314.4 cm³	
Mrx = Srx.py	314.4 x 275	86.46 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(13.545/86.46)^2+(0)^1$=	0.025	OK

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+5M_3+.15M_4)/M_{max}$	0.2+(.15x13+.5x11+.15x8)/14 ≥0.44	0.848	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x10+.6x14+.1x10)/14 ≥.8x14/14	0.95	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2 =	2 m	
λ = Le/ry	2 / 3.18	62.97	OK
v = Fn (x,Le,ry,λ)	21.437, 2, 3.18, 62.97	0.914	Table 19
λ_{LT} = u.v.λ.√βw	0.882 x 0.914 x 62.97 √ 1	50.79	
pb = Fn (py,λ_{LT})	275, 50.79	236.05 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 236.05 ≤ 86.46 =	74.214 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.848x13.5/74.2	0.155	
$r_c=F_c/P_{cy}$	0/822.6	0.000	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.155•50.8+0•63)/(0.155+0)	50.789	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.155+0)/(0.155+0)	34.300	
$M_{ob}=M_b(1-F_c/P_{cy})$	74.214(1-0/822.6)	74.214	
$M_{xy}=M_{cx}(1-F_c/P_{cy})^{½}$	86.460(1-0/822.6)^{½}	86.460	
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-0/938.2)/(1+0.5•0/938.2)	86.460	
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-0/822.6)/(1+1.0(0/822.6))	18.975	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	50.789, 34.300, 1.000, 86.460, 74.214	82.539	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	55.079, 1.000, 86.460, 86.460	86.460	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	62.966, 1.000, 18.975, 18.975	18.975	
$m_x.M_x/M_{ax}$	0.95x13.5/86.5	0.149	OK
$m_{LT}.M_{LT}/M_{ab}$	0.848x13.5/82.5	0.139	OK
$m_x.M_x/M_{ax}$	0.95x13.5/86.5	0.149	OK
Compare with Simplied to 4.8.3.3	0.167, 0.155, 0.155	0.167	
Compare with MoreExact to 4.8.3.3	0.149, 0.155, 0.133	0.155	

Deflection Check - Load Case 10

δ ≤ Span/360	3.47 ≤ 4795 / 360	3.47 mm	OK

AXIAL WITH MOMENTS (MEMBER)
Member 705 (N.455-N.458) @ Level 6
Between 0 and 2.4 m, in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
L1 + 1.4 A1

   D1 UDLY -000.993              ( kN/m )
   L1 UDLY -000.596              ( kN/m )
   D1 PTRY -000.993 0.000 2.412 -000.879
   L1 PTRY -000.596 0.000 2.412 -000.528
   A1 D     078.500              ( kN/m³)
```

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Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
705	455	0.44T	-0.04	-7.24	0.00	0.00	0.00	-5.19		0.24
	458	0.44T	0.04	4.75	0.00	-2.87	0.00	@ 1.442		@ 1.194

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 0, 5.19, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	0.181 / 218.381 =	0.001	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Pz =Ae.py	38.21x275 =	1050.775 kN	
n = F/Pz	-0.442 / 1050.775 =	0.000	OK
Srx = Fn(Sxx, n)	314.4, 0	314.4 cm³	
Mrx = Srx.py	314.4 x 275	86.46 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(5.186/86.46)^2+(0)^1$=	0.004	OK

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x3+.5x5+.15x5)/5 ≥0.44	0.926	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x3+.6x5+.1x5)/5 ≥.8x5/5	0.944	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2.4 =	2.4 m	
λ = Le/ry	2.4 / 3.18	75.56	OK
v = Fn (x,Le,ry,λ)	21.437, 2.4, 3.18, 75.56	0.886	Table 19
$\lambda_{LT}= u.v.\lambda.\sqrt{\beta_W}$	0.882 x 0.886 x 75.56 √ 1	59.08	
pb = Fn (py,λ_{LT})	275, 59.08	215.52 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 215.52 ≤ 86.46 =	67.759 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.926x5.2/67.8	0.071	
$r_c=F_c/P_{cy}$	0/728.5	0.000	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.071•59.1+0•75.6)/(0.071+0)	59.078	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.071+0)/(0.071+0)	34.300	
$M_{ob}= M_b(1-F_c/P_{cy})$	67.759(1-0/728.5)	67.759	
$M_{xy}= M_{cx}\ (1-F_c/P_{cy})^{½}$	86.460(1-0/728.5)^{½}	86.460	
$M_{ox}= M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-0/1026.7)/(1+0.5•0/1026.7)	86.460	
$M_{oy}= M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-0/728.5)/(1+1.0(0/728.5))	18.975	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	59.078, 34.300, 1.000, 86.460, 67.759	77.462	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	27.706, 1.000, 86.460, 86.460	86.460	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	75.559, 1.000, 18.975, 18.975	18.975	
$m_x.M_x/M_{ax}$	0.944x5.2/86.5	0.057	OK
$m_{LT}.M_{LT}/M_{ab}$	0.926x5.2/77.5	0.062	OK
$m_x.M_x/M_{ax}$	0.944x5.2/86.5	0.057	OK
Compare with Simplied to 4.8.3.3	0.064, 0.071, 0.071	0.071	
Compare with MoreExact to 4.8.3.3	0.057, 0.071, 0.056	0.071	

Deflection Check - Load Case 10

δ ≤ Span/360	0.24 ≤ 2412 / 360	0.24 mm	OK

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AXIAL WITH MOMENTS (MEMBER)
Member 705 (N.455-N.458) @ Level 6
Between 2.4 and 2.412 m, in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
 L1 + 1.4 A1

   D1 UDLY -000.993              ( kN/m )
   L1 UDLY -000.596              ( kN/m )
   D1 PTRY -000.993 0.000 2.412 -000.879
   L1 PTRY -000.596 0.000 2.412 -000.528
   A1 D     078.500              ( kN/m³)
```

Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
705	455	0.44T	-0.04	-7.24	0.00	0.00	0.00	-5.19		0.24
	458	0.44T	0.04	4.75	0.00	-2.87	0.00	@ 1.442		@ 1.194

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 0, 5.19, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	4.696 / 218.381 =	0.022	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Pz =Ae.py	38.21x275 =	1050.775 kN	
n = F/Pz	-0.442 / 1050.775 =	0.000	OK
Srx = Fn(Sxx, n)	314.4, 0	314.4 cm³	
Mrx = Srx.py	314.4 x 275	86.46 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(2.934/86.46)^2+(0)^1$=	0.001	OK

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x3+.5x3+.15x3)/3 ≥0.44	0.993	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x3+.6x5+.1x5)/5 ≥.8x5/5	0.944	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 0.012 =	0.012 m	
λ = Le/ry	0.012 / 3.18	0.38	OK
v = Fn (x,Le,ry,λ)	21.437, 0.012, 3.18, 0.38	1	Table 19
λ_{LT} = u.v.λ.$\sqrt{\beta_W}$	0.882 x 1 x 0.38 √ 1	0.33	
pb = Fn (py,λ_{LT})	275, 0.33	275 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 275 ≤ 86.46 =	86.460 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.993x2.9/86.5	0.034
$r_c=F_c/P_{cy}$	0/1050.8	0.000
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.034•0.3+0•0.4)/(0.034+0)	0.333
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.034+0)/(0.034+0)	34.300
$M_{ob}=M_b(1-F_c/P_{cy})$	86.460(1-0/1050.8)	86.460
$M_{xy}=M_{cx}(1-F_c/P_{cy})^{½}$	86.460(1-0/1050.8)^{½}	86.460

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$M_{ox} = M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-0/1026.7)/(1+0.5•0/1026.7)	86.460	
$M_{oy} = M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-0/1050.8)/(1+1.0(0/1050.8))	18.975	
M_{ab}=fn(λ_T, λ_{To}, ε, M_{xy}, M_{ob})	0.333, 34.300, 1.000, 86.460, 86.460	86.460	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	27.706, 1.000, 86.460, 86.460	86.460	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	0.378, 1.000, 18.975, 18.975	18.975	
$m_x.M_x/M_{ax}$	0.944x5.2/86.5	0.057	OK
$m_{LT}.M_{LT}/M_{ab}$	0.993x2.9/86.5	0.034	OK
$m_x.M_x/M_{ax}$	0.944x5.2/86.5	0.032	OK
Compare with Simplied to 4.8.3.3	0.064, 0.034, 0.034	0.064	
Compare with MoreExact to 4.8.3.3	0.057, 0.034, 0.034	0.057	

Deflection Check - Load Case 10

δ ≤ Span/360	0.24 ≤ 2412 / 360	0.24 mm	OK

AXIAL WITH MOMENTS (MEMBER)

Member 706 (K10-N.459) @ Level 6 in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
L1 + 1.4 A1

  D1 PTRY -000.988 0.000 2.412 -000.874
  L1 PTRY -000.593 0.000 2.412 -000.524
  A1 D     078.500             ( kN/m³)
```

Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
706	457	0.66T	-0.03	5.83	0.00	-21.80	0.00			1.68
	459	0.66T	0.03	12.14	0.00	0.00	0.00			@ 1.044

Classification and Properties (BS 5950: 2000)

Section (30.03 kg/m)	152x152 UC 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	8.13, 19.02, 275, 0, 21.8, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	5.826 / 169.026 =	0.034	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 247.7≤1.2 x 275 x 221.9 =	68.118 kN.m	
Pz =Ae.py	38.26x275 =	1052.15 kN	
n = F/Pz	-0.661 / 1052.15 =	0.001	OK
Srx = Fn(Sxx, n)	247.7, 0.001	247.7 cm³	
Mrx = Srx.py	247.7 x 275	68.117 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(21.802/68.117)^2+(0)^1$=	0.102	OK

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x18+.5x13+.15x7)/22 ≥0.44	0.664	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x18+.6x13+.1x7)/22 ≥.8x18/22	0.665	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2.412 =	2.412 m	
λ = Le/ry	2.412 / 3.83	62.97	OK
v = Fn (x,Le,ry,λ)	15.946, 2.412, 3.83, 62.97	0.866	Table 19

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$\lambda_{LT} = u.v.\lambda.\sqrt{\beta_W}$	0.849 x 0.866 x 62.97 √ 1	46.29	
pb = Fn (py,λ_{LT})	275, 46.29	246.97 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	247.7 x 246.97 ≤ 68.118 =	61.173 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.664x21.8/61.2	0.236	
$r_c=F_c/P_{cy}$	0/747.2	0.000	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.236•46.3+0•63)/(0.236+0)	46.286	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.236+0)/(0.236+0)	34.300	
$M_{ob} = M_b(1-F_c/P_{cy})$	61.173(1-0/747.2)	61.173	
$M_{xy} = M_{cx}\ (1-F_c/\ P_{cy})^{½}$	68.118(1-0/747.2)^{½}	68.118	
$M_{ox} = M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	68.118(1-0/976.7)/(1+0.5•0/976.7)	68.118	
$M_{oy} = M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	24.222(1-0/747.2)/(1+1.0(0/747.2))	24.222	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	46.286, 34.300, 1.000, 68.118, 61.173	66.501	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	35.679, 1.000, 68.117, 68.118	68.118	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	62.967, 1.000, 24.222, 24.222	24.222	
$m_x.M_x/M_{ax}$	0.665x21.8/68.1	0.213	OK
$m_{LT}.M_{LT}/M_{ab}$	0.664x21.8/66.5	0.218	OK
$m_x.M_x/M_{ax}$	0.665x21.8/68.1	0.213	OK
Compare with Simplied to 4.8.3.3	0.238, 0.236, 0.236	0.238	
Compare with MoreExact to 4.8.3.3	0.213, 0.236, 0.212	0.236	

Deflection Check - Load Case 10

δ ≤ Span/360	1.68 ≤ 2412 / 360	1.68 mm	OK

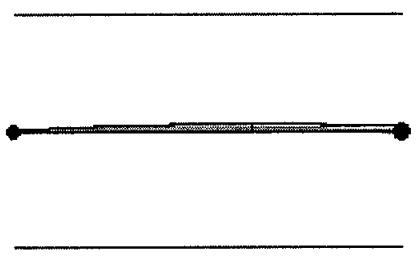
AXIAL WITH MOMENTS (MEMBER)

Member 707 (N.458-N.462) @ Level 6 in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
 L1 + 1.4 A1

   D1 UDLY -000.993                ( kN/m )
   L1 UDLY -000.596                ( kN/m )
   D1 PTRY -000.879 0.000 2.383 -000.764
   L1 PTRY -000.528 0.000 2.383 -000.459
   A1 D     078.500                ( kN/m³)
```



Member Forces in Load Case 1 and Maximum Deflection from Load Case 4										
Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
707	458	0.42T	0.03	-4.46	0.00	-2.86	0.00	-4.93		0.21
	462	0.42T	-0.03	6.75	0.00	0.00	0.00	@ 0.934		@ 1.130

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 0, 4.93, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	0.07 / 218.381 =	0	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Pz =Ae.py	38.21x275 =	1050.775 kN	

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$n = F/Pz$	-0.42 / 1050.775 =	0.000	OK
$Srx = Fn(Sxx, n)$	314.4, 0	314.4 cm³	
$Mrx = Srx.py$	314.4 x 275	86.46 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(4.927/86.46)^2+(0)^1=$	0.003	OK

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x5+.5x5+.15x3)/5 ≥0.44	0.923	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x5+.6x5+.1x3)/5 ≥.8x5/5	0.94	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2.383 =	2.383 m	
$\lambda = Le/ry$	2.383 / 3.18	75.02	OK
$v = Fn(x,Le,ry,\lambda)$	21.437, 2.383, 3.18, 75.02	0.887	Table 19
$\lambda_{LT} = u.v.\lambda.\sqrt{\beta_W}$	0.882 x 0.887 x 75.02 √ 1	58.74	
$pb = Fn(py,\lambda_{LT})$	275, 58.74	216.37 N/mm²	Table 16
$Mb = Sx.pb \leq Mc$	314.4 x 216.37 ≤ 86.46 =	68.025 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.923x4.9/68	0.067	
$r_c=F_c/P_{cy}$	0/732.7	0.000	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.067•58.7+0•75)/(0.067+0)	58.740	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.067+0)/(0.067+0)	34.300	
$M_{ob} = M_b(1-F_c/P_{cy})$	68.025(1-0/732.7)	68.025	
$M_{xy} = M_{cx}(1-F_c/P_{cy})^{½}$	86.460(1-0/732.7)^½	86.460	
$M_{ox} = M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-0/1027.5)/(1+0.5•0/1027.5)	86.460	
$M_{oy} = M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-0/732.7)/(1+1.0(0/732.7))	18.975	
$M_{ab}=fn(\lambda_r, \lambda_{ro}, \varepsilon, M_{xy}, M_{ob})$	58.740, 34.300, 1.000, 86.460, 68.025	77.712	
$M_{ax}=fn(\lambda_x, \varepsilon, M_{rx}, M_{ox})$	27.373, 1.000, 86.460, 86.460	86.460	
$M_{ay}=fn(\lambda_y, \varepsilon, M_{ry}, M_{oy})$	75.024, 1.000, 18.975, 18.975	18.975	
$m_x.M_x/M_{ax}$	0.94x4.9/86.5	0.054	OK
$m_{LT}.M_{LT}/M_{ab}$	0.923x4.9/77.7	0.059	OK
$m_x.M_x/M_{ax}$	0.94x4.9/86.5	0.054	OK
Compare with Simplied to 4.8.3.3	0.06, 0.067, 0.067	0.067	
Compare with MoreExact to 4.8.3.3	0.054, 0.067, 0.053	0.067	

Deflection Check - Load Case 4

$\delta \leq$ Span/360	0.21 ≤ 2383 / 360	0.21 mm	OK

AXIAL WITH MOMENTS (MEMBER)

Member 708 (N.459-K9) @ Level 6 in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
 L1 + 1.4 A1

   D1 PTRY -000.873 0.000 2.411 -000.760
   L1 PTRY -000.524 0.000 2.411 -000.456
   A1 D     078.500              ( kN/m³)
```

Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
708	459	0.37T	0.02	-17.60	0.00	0.00	0.00			1.48

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Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
	463	0.37T	-0.02	-11.94	0.00	-35.49	0.00			@ 1.367

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 0, 35.49, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	11.946 / 218.381 =	0.055	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Pz =Ae.py	38.21x275 =	1050.775 kN	
n = F/Pz	-0.372 / 1050.775 =	0.000	OK
Srx = Fn(Sxx, n)	314.4, 0	314.4 cm³	
Mrx = Srx.py	314.4 x 275	86.46 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(35.494/86.46)^2+(0)^1$=	0.169	OK

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x10+.5x19+.15x28)/35 ≥0.44	0.635	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x10+.6x19+.1x28)/35 ≥.8x28/35	0.636	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2.411 =	2.411 m	
λ = Le/ry	2.411 / 3.18	75.91	OK
v = Fn (x,Le,ry,λ)	21.437, 2.411, 3.18, 75.91	0.885	Table 19
λ_{LT} = u.v.λ.$\sqrt{\beta_W}$	0.882 x 0.885 x 75.91 √ 1	59.3	
pb = Fn (py,λ_{LT})	275, 59.3	214.97 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 214.97 ≤ 86.46 =	67.588 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.635x35.5/67.6	0.333	
$r_c=F_c/P_{cy}$	0/725.7	0.000	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.333•59.3+0•75.9)/(0.333+0)	59.297	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.333+0)/(0.333+0)	34.300	
$M_{ob}=M_b(1-F_c/P_{cy})$	67.588(1-0/725.7)	67.588	
$M_{xy}=M_{cx}(1-F_c/P_{cy})^{½}$	86.460(1-0/725.7)^{½}	86.460	
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-0/1026.7)/(1+0.5•0/1026.7)	86.460	
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-0/725.7)/(1+1.0(0/725.7))	18.975	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	59.297, 34.300, 1.000, 86.460, 67.588	77.300	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	27.696, 1.000, 86.460, 86.460	86.460	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	75.906, 1.000, 18.975, 18.975	18.975	
$m_x.M_x/M_{ax}$	0.636x35.5/86.5	0.261	OK
$m_{LT}.M_{LT}/M_{ab}$	0.635x35.5/77.3	0.292	OK
$m_x.M_x/M_{ax}$	0.636x35.5/86.5	0.261	OK
Compare with Simplied to 4.8.3.3	0.293, 0.333, 0.333	0.333	
Compare with MoreExact to 4.8.3.3	0.261, 0.333, 0.261	0.333	

Deflection Check - Load Case 10

δ ≤ Span/360	1.48 ≤ 2411 / 360	1.48 mm	OK

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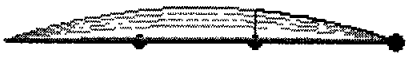
AXIAL WITH MOMENTS (MEMBER)
Member 709 (N.460-N.468) @ Level 6
Between 0 and 2.4 m, in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
L1 + 1.4 A1

   D1 PTRY -001.757 0.000 6.711 -001.566
   L1 PTRY -001.054 0.000 6.711 -000.940
   A1 D     078.500              ( kN/m³)
```



Member Forces in Load Case 1 and Maximum Deflection from Load Case 10										
Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
709	460	0.05C	0.00	-14.82	0.00	0.00	0.00	-24.44		12.27
	468	0.05C	0.00	14.31	0.00	0.00	0.00	@ 3.356		@ 3.356

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 0.05, 24.44, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	4.054 / 218.381 =	0.019	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Pz = Ag.py	38.21 x 275 =	1050.775 kN	
n = F/Pz	0.053 / 1050.775 =	0.000	OK
Srx = Fn(Sxx, n)	314.4, 0	314.4 cm³	
Mrx = Srx.py	314.4 x 275	86.46 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(22.567/86.46)^2+(0)^1$=	0.068	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x6.712/8.71 =	77.1	OK
Pcx = Area.pcx	38.21x209.625/10 =	800.977 kN	Table 24 a
λy = Ley/ryy	100x1x2.4/3.18 =	75.6	OK
Pcy = Area.pcy	38.21x190.65/10 =	728.476 kN	Table 24 b

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x8+.5x15+.15x19)/23 ≥0.44	0.704	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x18+.6x24+.1x18)/24 ≥.8x24/24	0.95	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2.4 =	2.4 m	
λ = Le/ry	2.4 / 3.18	75.56	OK
v = Fn (x,Le,ry,λ)	21.437, 2.4, 3.18, 75.56	0.886	Table 19
λ_{LT} = u.v.λ.$\sqrt{\beta_W}$	0.882 x 0.886 x 75.56 √ 1	59.08	
pb = Fn (py,λ_{LT})	275, 59.08	215.52 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 215.52 ≤ 86.46 =	67.759 kN.m	

Simplified Approach

py.Zx	275x280.1	77.028 kN.m	
F/Pc+mx.Mx/py.Zx	0.053/728.476+0.95x24.4/77	0.302	OK
$F/Pcy+m_{LT}.M_{LT}/Mb$	0.053/728.476+0.704x22.6/67.8	0.234	OK

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More Exact Approach

Max=Mcx/(1+.5F/Pcx)	86.5/(1+.5x0.1/801)	86.457 kN.m	
F/Pcx+mx.Mx/Max	0.1/801+0.95x24.4/86.5	0.269	OK
F/Pcy+m_{LT}.M_{LT}/Mb	0.1/728.5+0.704x22.6/67.8	0.234	OK

Deflection Check - Load Case 10

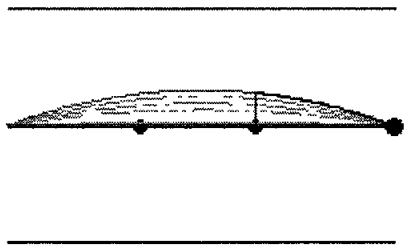
δ ≤ Span/360	12.27 ≤ 6712 / 360	12.27 mm	OK

AXIAL WITH MOMENTS (MEMBER)
Member 710 (N.461-N.469) @ Level 6
Between 0 and 2.4 m, in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
L1 + 1.4 A1

  D1 PTRY -000.824 0.000 6.716 -000.782
  L1 PTRY -000.495 0.000 6.716 -000.469
  D1 UDLY -000.992              ( kN/m )
  L1 UDLY -000.595              ( kN/m )
  A1 D     078.500              ( kN/m³)
```



Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
710	461	0.11C	-0.01	-15.69	0.00	0.00	0.00	-26.25		13.18
	469	0.11C	0.01	15.58	0.00	0.00	0.00	@ 3.323		@ 3.323

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 0.11, 26.25, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	4.439 / 218.381 =	0.02	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Pz = Ag.py	38.21 x 275 =	1050.775 kN	
n = F/Pz	0.114 / 1050.775 =	0.000	OK
Srx = Fn(Sxx, n)	314.4, 0	314.4 cm³	
Mrx = Srx.py	314.4 x 275	86.46 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(24.131/86.46)^{2}+(0)^{1}$=	0.078	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x6.716/8.71 =	77.1	OK
Pcx = Area.pcx	38.21x209.523/10 =	800.586 kN	Table 24 a
λy = Ley/ryy	100x1x2.4/3.18 =	75.6	OK
Pcy = Area.pcy	38.21x190.65/10 =	728.476 kN	Table 24 b

Equivalent Uniform Moment Factors mLT, mx, my and myx

m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}	0.2+(.15x9+.5x15+.15x21)/24 ≥0.44	0.701	Table 18
m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}	0.2+(.1x20+.6x26+.1x20)/26 ≥.8x26/26	0.95	Table 26

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Lateral Buckling Check Mb

Le = 1.00 L	1 x 2.4 =	2.4 m	
λ = Le/ry	2.4 / 3.18	75.56	OK
v = Fn (x,Le,ry,λ)	21.437, 2.4, 3.18, 75.56	0.886	Table 19
λ_{LT} = u.v.λ.$\sqrt{\beta_W}$	0.882 x 0.886 x 75.56 $\sqrt{}$ 1	59.08	
pb = Fn (py,λ_{LT})	275, 59.08	215.52 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 215.52 ≤ 86.46 =	67.759 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.701x24.1/67.8	0.250	
$r_c=F_c/P_{cy}$	0.1/728.5	0.000	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.25•59.1+0•75.6)/(0.25+0)	59.089	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.25+0)/(0.25+0)	34.289	
$M_{ob}=M_b(1-F_c/P_{cy})$	67.759(1-0.1/728.5)	67.749	
$M_{xy}=M_{cx}(1-F_c/P_{cy})^{½}$	86.460(1-0.1/728.5)^{½}	86.453	
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-0.1/800.6)/(1+0.5•0.1/800.6)	86.441	
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-0.1/728.5)/(1+1.0(0.1/728.5))	18.969	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	59.089, 34.289, 1.000, 86.453, 67.749	77.452	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	77.135, 1.000, 86.460, 86.441	86.444	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	75.559, 1.000, 18.975, 18.969	18.970	
$m_x.M_x/M_{ax}$	0.95x26.2/86.4	0.289	OK
$m_{LT}.M_{LT}/M_{ab}$	0.701x24.1/77.5	0.219	OK
$m_x.M_x/M_{ax}$	0.95x26.2/86.4	0.265	OK
Compare with Simplied to 4.8.3.3	0.324, 0.25, 0.25	0.324	
Compare with MoreExact to 4.8.3.3	0.289, 0.25, 0.196	0.289	

Deflection Check - Load Case 10

δ ≤ Span/360	13.18 ≤ 6716 / 360	13.18 mm	OK

AXIAL WITH MOMENTS (MEMBER)

Member 711 (N.462-N.464) @ Level 6 in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
 L1 + 1.4 A1

   D1 UDLY -000.992                ( kN/m )
   L1 UDLY -000.595                ( kN/m )
   D1 PTRY -000.763 0.000 2.240 -000.700
   L1 PTRY -000.458 0.000 2.240 -000.420
   A1 D     078.500                ( kN/m³)
```

Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
711	462	0.13C	-0.02	-10.90	0.00	0.00	0.00			0.53
	464	0.13C	0.02	-0.85	0.00	-13.10	0.00			@ 1.247

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 0.13, 13.1, 0	(Axial: Non-Slender)	Plastic

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Auto Design Load Cases	1-2, 6-7 and 9		
Local Capacity Check			
Fvx/Pvx	0.855 / 218.381 =	0.004	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Pz = Ag.py	38.21 x 275 =	1050.775 kN	
n = F/Pz	0.131 / 1050.775 =	0.000	OK
Srx = Fn(Sxx, n)	314.4, 0	314.4 cm³	
Mrx = Srx.py	314.4 x 275	86.46 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(13.101/86.46)^2+(0)^1=$	0.023	OK
Compression Resistance Pc			
λx = Lex/rxx	100x1x2.24/8.71 =	25.7	OK
Pcx = Area.pcx	38.21x269.927/10 =	1031.390 kN	Table 24 a
λy = Ley/ryy	100x1x2.24/3.18 =	70.5	OK
Pcy = Area.pcy	38.21x200.9/10 =	767.657 kN	Table 24 b
Equivalent Uniform Moment Factors mLT, mx, my and myx			
$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x5+.5x9+.15x12)/13 ≥0.44	0.756	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x5+.6x9+.1x12)/13 ≥.8x12/13	0.761	Table 26
Lateral Buckling Check Mb			
Le = 1.00 L	1 x 2.24 =	2.24 m	
λ = Le/ry	2.24 / 3.18	70.51	OK
v = Fn (x,Le,ry,λ)	21.437, 2.24, 3.18, 70.51	0.898	Table 19
$\lambda_{LT} = u.v.\lambda.\sqrt{\beta_W}$	0.882 x 0.898 x 70.51 √ 1	55.83	
$pb = Fn (py,\lambda_{LT})$	275, 55.83	223.6 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 223.6 ≤ 86.46 =	70.300 kN.m	
Combined Axial Compression and Bending to Annex I			
$r_b=m_{LT}.M_{LT}/M_b$	0.756x13.1/70.3	0.141	
$r_c=F_c/P_{cy}$	0.1/767.7	0.000	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.141•55.8+0•70.5)/(0.141+0)	55.852	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.141+0)/(0.141+0)	34.279	
$M_{ob} = M_b(1-F_c/P_{cy})$	70.300(1-0.1/767.7)	70.288	
$M_{xy} = M_{cx}\ (1-F_c/P_{cy})^{½}$	86.460(1-0.1/767.7)^½	86.453	
$M_{ox} = M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-0.1/1031.4)/(1+0.5•0.1/1031.4)	86.444	
$M_{oy} = M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-0.1/767.7)/(1+1.0(0.1/767.7))	18.969	
$M_{ab}=fn(\lambda_r, \lambda_{ro}, \varepsilon, M_{xy}, M_{ob})$	55.852, 34.279, 1.000, 86.453, 70.288	79.689	
$M_{ax}=fn(\lambda_x, \varepsilon, M_{rx}, M_{ox})$	25.723, 1.000, 86.460, 86.444	86.458	
$M_{ay}=fn(\lambda_y, \varepsilon, M_{ry}, M_{oy})$	70.509, 1.000, 18.975, 18.969	18.970	
$m_x.M_x/M_{ax}$	0.761x13.1/86.5	0.115	OK
$m_{LT}.M_{LT}/M_{ab}$	0.756x13.1/79.7	0.124	OK
$m_x.M_x/M_{ax}$	0.761x13.1/86.5	0.115	OK
Compare with Simplied to 4.8.3.3	0.13, 0.141, 0.141	0.141	
Compare with MoreExact to 4.8.3.3	0.116, 0.141, 0.115	0.141	
Deflection Check - Load Case 10			
δ ≤ Span/360	0.53 ≤ 2240 / 360	0.53 mm	OK

AXIAL WITH MOMENTS (MEMBER)

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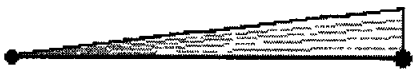
Member 712 (K9-N.465) @ Level 6 in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
L1 + 1.4 A1

   D1 PTRY -000.760 0.000 2.240 -000.696
   L1 PTRY -000.456 0.000 2.240 -000.418
   A1 D     078.500              ( kN/m³)
```



Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
712	463	1.81T	-0.01	13.41	0.00	-35.47	0.00			1.26
	465	1.81T	0.01	18.20	0.00	0.00	0.00			@ 0.947

Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 0, 35.47, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	13.409 / 218.381 =	0.061	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Pz =Ae.py	38.21x275 =	1050.775 kN	
n = F/Pz	-1.808 / 1050.775 =	0.002	OK
Srx = Fn(Sxx, n)	314.4, 0.002	314.4 cm³	
Mrx = Srx.py	314.4 x 275	86.46 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(35.47/86.46)^2+(0)^1$=	0.168	OK

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x28+.5x19+.15x10)/35 ≥0.44	0.628	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x28+.6x19+.1x10)/35 ≥.8x28/35	0.628	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2.24 =	2.24 m	
λ = Le/ry	2.24 / 3.18	70.52	OK
v = Fn (x,Le,ry,λ)	21.437, 2.24, 3.18, 70.52	0.898	Table 19
λ_{LT} = u.v.λ.√β_W	0.882 x 0.898 x 70.52 √ 1	55.84	
pb = Fn (py,λ_{LT})	275, 55.84	223.58 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 223.58 ≤ 86.46 =	70.294 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.628x35.5/70.3	0.317
$r_c=F_c/P_{cy}$	0/767.6	0.000
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.317•55.8+0•70.5)/(0.317+0)	55.842
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.317+0)/(0.317+0)	34.300
$M_{ob}=M_b(1-F_c/P_{cy})$	70.294(1-0/767.6)	70.294
$M_{xy}=M_{cx}(1-F_c/P_{cy})^{½}$	86.460(1-0/767.6)^{½}	86.460
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-0/1031.4)/(1+0.5•0/1031.4)	86.460
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-0/767.6)/(1+1.0(0/767.6))	18.975
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	55.842, 34.300, 1.000, 86.460, 70.294	79.698
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	25.731, 1.000, 86.460, 86.460	86.460

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M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	70.522, 1.000, 18.975, 18.975	18.975	
$m_x.M_x/M_{ax}$	0.628x35.5/86.5	0.258	OK
$m_{LT}.M_{LT}/M_{ab}$	0.628x35.5/79.7	0.279	OK
$m_x.M_x/M_{ax}$	0.628x35.5/86.5	0.258	OK
Compare with Simplied to 4.8.3.3	0.289, 0.317, 0.317	0.317	
Compare with MoreExact to 4.8.3.3	0.258, 0.317, 0.257	0.317	

Deflection Check - Load Case 10

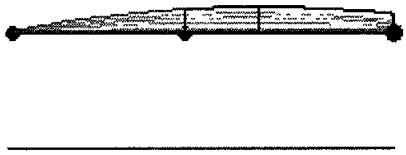
$\delta \leq$ Span/360	1.26 ≤ 2240 / 360	1.26 mm	OK

AXIAL WITH MOMENTS (MEMBER)
Member 713 (N.464-N.470) @ Level 6
Between 0 and 2.4 m, in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
L1 + 1.4 A1

  D1 UDLY -000.992                ( kN/m )
  L1 UDLY -000.595                ( kN/m )
  D1 PTRY -000.700 0.000 4.476 -000.573
  L1 PTRY -000.420 0.000 4.476 -000.344
  A1 D     078.500                ( kN/m³)
```



Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
713	464	0.24C	0.00	-6.73	0.00	-13.09	0.00	-18.26		3.86
	470	0.24C	0.00	12.35	0.00	0.00	0.00	@ 1.523		@ 2.123

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 0.24, 18.25, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	0.115 / 218.381 =	0.001	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Pz = Ag.py	38.21 x 275 =	1050.775 kN	
n = F/Pz	0.244 / 1050.775 =	0.000	OK
Srx = Fn(Sxx, n)	314.4, 0	314.4 cm³	
Mrx = Srx.py	314.4 x 275	86.46 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(18.252/86.46)^2+(0)^1$=	0.045	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x4.476/8.71 =	51.4	OK
Pcx = Area.pcx	38.21x249.622/10 =	953.804 kN	Table 24 a
λy = Ley/ryy	100x1x2.4/3.18 =	75.6	OK
Pcy = Area.pcy	38.21x190.65/10 =	728.476 kN	Table 24 b

Equivalent Uniform Moment Factors mLT, mx, my and myx

m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}	0.2+(.15x16+.5x18+.15x18)/18 ≥0.44	0.976	Table 18
m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}	0.2+(.1x18+.6x17+.1x11)/18 ≥.8x18/18	0.925	Table 26

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Lateral Buckling Check Mb

Le = 1.00 L	1 x 2.4 =	2.4 m	
λ = Le/ry	2.4 / 3.18	75.56	OK
v = Fn (x,Le,ry,λ)	21.437, 2.4, 3.18, 75.56	0.886	Table 19
λ_{LT} = u.v.λ.$\sqrt{\beta_W}$	0.882 x 0.886 x 75.56 $\sqrt{}$ 1	59.08	
pb = Fn (py,λ_{LT})	275, 59.08	215.52 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 215.52 ≤ 86.46 =	67.759 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.976x18.3/67.8	0.263	
$r_c=F_c/P_{cy}$	0.2/728.5	0.000	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.263•59.1+0•75.6)/(0.263+0)	59.099	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.263+0)/(0.263+0)	34.278	
$M_{ob}=M_b(1-F_c/P_{cy})$	67.759(1-0.2/728.5)	67.737	
$M_{xy}=M_{cx}(1-F_c/P_{cy})^{½}$	86.460(1-0.2/728.5)^{½}	86.445	
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-0.2/953.8)/(1+0.5•0.2/953.8)	86.427	
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-0.2/728.5)/(1+1.0(0.2/728.5))	18.962	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	59.099, 34.278, 1.000, 86.445, 67.737	77.440	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	51.412, 1.000, 86.460, 86.427	86.443	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	75.559, 1.000, 18.975, 18.962	18.964	
$m_x.M_x/M_{ax}$	0.925x18.3/86.4	0.196	OK
$m_{LT}.M_{LT}/M_{ab}$	0.976x18.3/77.4	0.230	OK
$m_x.M_x/M_{ax}$	0.925x18.3/86.4	0.195	OK
Compare with Simplied to 4.8.3.3	0.22, 0.263, 0.263	0.263	
Compare with MoreExact to 4.8.3.3	0.196, 0.263, 0.206	0.263	

Deflection Check - Load Case 10

δ ≤ Span/360	3.86 ≤ 4476 / 360	3.86 mm	OK

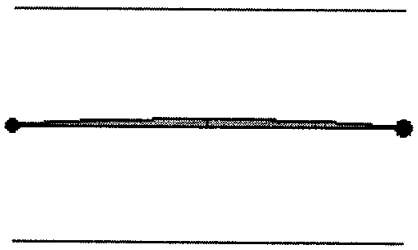
AXIAL WITH MOMENTS (MEMBER)

Member 714 (N.465-K8) @ Level 6 in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
L1 + 1.4 A1

  D1 PTRY -000.696 0.000 4.508 -000.570
  L1 PTRY -000.418 0.000 4.508 -000.342
  A1 D     078.500             ( kN/m³)
```



Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
714	465	1.30C	0.01	-4.43	0.00	0.00	0.00	-4.86		1.12
	471	1.30C	-0.01	4.20	0.00	0.00	0.00	@ 2.231		@ 2.231

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 1.3, 4.86, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

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Local Capacity Check

Fvx/Pvx	0.056 / 218.381 =	0	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Pz = Ag.py	38.21 x 275 =	1050.775 kN	
n = F/Pz	1.302 / 1050.775 =	0.001	OK
Srx = Fn(Sxx, n)	314.4, 0.001	314.4 cm³	
Mrx = Srx.py	314.4 x 275	86.46 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(4.86/86.46)^2+(0)^1$=	0.003	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x4.508/8.71 =	51.8	OK
Pcx = Area.pcx	38.21x249.235/10 =	952.327 kN	Table 24 a
λy = Ley/ryy	100x1x4.508/3.18 =	141.9	OK
Pcy = Area.pcy	38.21x81.86/10 =	312.792 kN	Table 24 b

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x4+.5x5+.15x4)/5 ≥0.44	0.925	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x4+.6x5+.1x4)/5 ≥.8x5/5	0.95	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 4.508 =	4.508 m	
λ = Le/ry	4.508 / 3.18	141.92	OK
v = Fn (x,Le,ry,λ)	21.437, 4.508, 3.18, 141.92	0.748	Table 19
λ_{LT} = u.v.λ.$\sqrt{\beta_W}$	0.882 x 0.748 x 141.92 √ 1	93.68	
pb = Fn (py,λ_{LT})	275, 93.68	136.34 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 136.34 ≤ 86.46 =	42.865 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.925x4.9/42.9	0.105	
$r_c=F_c/P_{cy}$	1.3/312.8	0.004	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.105•93.7+0.004•141.9)/(0.105+0.004)	95.521	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.105+0.004)/(0.105+0.004)	33.645	
$M_{ob}=M_b(1-F_c/P_{cy})$	42.865(1-1.3/312.8)	42.687	
$M_{xy}=M_{cx}(1-F_c/P_{cy})^{½}$	86.460(1-1.3/312.8)^{½}	86.280	
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-1.3/952.3)/(1+0.5•1.3/952.3)	86.283	
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-1.3/312.8)/(1+1.0(1.3/312.8))	18.818	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	95.521, 33.645, 1.000, 86.280, 42.687	42.687	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	51.775, 1.000, 86.460, 86.283	86.371	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	141.920, 1.000, 18.975, 18.818	18.818	
$m_x.M_x/M_{ax}$	0.95x4.9/86.4	0.054	OK
$m_{LT}.M_{LT}/M_{ab}$	0.925x4.9/42.7	0.105	OK
$m_x.M_x/M_{ax}$	0.95x4.9/86.4	0.053	OK
Compare with Simplied to 4.8.3.3	0.064, 0.109, 0.109	0.109	
Compare with MoreExact to 4.8.3.3	0.055, 0.109, 0.052	0.109	

Deflection Check - Load Case 10

δ ≤ Span/360	1.12 ≤ 4508 / 360	1.12 mm	OK

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AXIAL WITH MOMENTS (MEMBER)
Member 715 (N.466-N.475) @ Level 6
Between 0 and 2.4 m, in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
L1 + 1.4 A1

   D1 UDLY -000.520                ( kN/m )
   L1 UDLY -000.312                ( kN/m )
   D1 PTRY -001.370 0.000 3.592 -001.418
   L1 PTRY -000.822 0.000 3.592 -000.851
   A1 D     078.500                ( kN/m³)
```

Member Forces in Load Case 1 and Maximum Deflection from Load Case 10										
Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
715	466	0.57T	0.00	8.83	0.00	0.00	0.00	7.96		1.14
	475	0.57T	0.00	-8.90	0.00	0.00	0.00	@ 1.815		@ 1.815

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 0, 7.96, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	0.231 / 218.381 =	0.001	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Pz =Ae.py	38.21x275 =	1050.775 kN	
n = F/Pz	-0.574 / 1050.775 =	0.001	OK
Srx = Fn(Sxx, n)	314.4, 0.001	314.4 cm³	
Mrx = Srx.py	314.4 x 275	86.46 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(7.956/86.46)^2+(0)^1$=	0.008	OK

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x4+.5x7+.15x8)/8 ≥0.44	0.877	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x6+.6x8+.1x6)/8 ≥.8x8/8	0.95	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2.4 =	2.4 m	
λ = Le/ry	2.4 / 3.18	75.56	OK
v = Fn (x,Le,ry,λ)	21.437, 2.4, 3.18, 75.56	0.886	Table 19
$\lambda_{LT} = u.v.\lambda.\sqrt{\beta_W}$	0.882 x 0.886 x 75.56 √ 1	59.08	
pb = Fn (py,λ_{LT})	275, 59.08	215.52 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 215.52 ≤ 86.46 =	67.759 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.877x8/67.8	0.103
$r_c=F_c/P_{cy}$	0/728.5	0.000
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.103•59.1+0•75.6)/(0.103+0)	59.078
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.103+0)/(0.103+0)	34.300
$M_{ob} = M_b(1-F_c/P_{cy})$	67.759(1-0/728.5)	67.759
$M_{xy} = M_{cx}(1-F_c/P_{cy})^{½}$	86.460(1-0/728.5)^{½}	86.460
$M_{ox} = M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-0/989.8)/(1+0.5•0/989.8)	86.460
$M_{oy} = M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-0/728.5)/(1+1.0(0/728.5))	18.975

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M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	59.078, 34.300, 1.000, 86.460, 67.759	77.462	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	41.256, 1.000, 86.460, 86.460	86.460	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	75.559, 1.000, 18.975, 18.975	18.975	
$m_x.M_x/M_{ax}$	0.95x8/86.5	0.088	OK
$m_{LT}.M_{LT}/M_{ab}$	0.877x8/77.5	0.090	OK
$m_x.M_x/M_{ax}$	0.95x8/86.5	0.087	OK
Compare with Simplied to 4.8.3.3	0.098, 0.103, 0.103	0.103	
Compare with MoreExact to 4.8.3.3	0.088, 0.103, 0.081	0.103	

Deflection Check - Load Case 10

δ ≤ Span/360	1.14 ≤ 3592 / 360	1.14 mm	OK

AXIAL WITH MOMENTS (MEMBER)
Member 715 (N.466-N.475) @ Level 6
Between 2.4 and 3.592 m, in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
L1 + 1.4 A1

  D1 UDLY -000.520                ( kN/m )
  L1 UDLY -000.312                ( kN/m )
  D1 PTRY -001.370 0.000 3.592 -001.418
  L1 PTRY -000.822 0.000 3.592 -000.851
  A1 D     078.500                ( kN/m³)
```

Member Forces in Load Case 1 and Maximum Deflection from Load Case 10										
Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
715	466	0.57T	0.00	8.83	0.00	0.00	0.00	7.96		1.14
	475	0.57T	0.00	-8.90	0.00	0.00	0.00	@ 1.815		@ 1.815

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 0, 7.96, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	2.971 / 218.381 =	0.014	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Pz =Ae.py	38.21x275 =	1050.775 kN	
n = F/Pz	-0.574 / 1050.775 =	0.001	OK
Srx = Fn(Sxx, n)	314.4, 0.001	314.4 cm³	
Mrx = Srx.py	314.4 x 275	86.46 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(7.072/86.46)^2+(0)^1$=	0.007	OK

Equivalent Uniform Moment Factors mLT, mx, my and myx

m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}	0.2+(.15x6+.5x4+.15x2)/7 ≥0.44	0.691	Table 18
m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}	0.2+(.1x6+.6x8+.1x6)/8 ≥.8x8/8	0.95	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 1.192 =	1.192 m	
λ = Le/ry	1.192 / 3.18	37.53	OK

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v = Fn (x,Le,ry,λ)	21.437, 1.192, 3.18, 37.53	0.965	Table 19
λ_{LT} = u.v.λ.√β_W	0.882 x 0.965 x 37.53 √ 1	31.95	
pb = Fn (py,λ_{LT})	275, 31.95	275 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 275 ≤ 86.46 =	86.460 kN.m	

Simplified Approach

py.Zx	275x280.1	77.028 kN.m	
F/Pc+mx.Mx/py.Zx	0+0.95x8/77	0.098	OK
F/Pcy+m_{LT}.M_{LT}/Mb	0+0.691x7.1/86.5	0.057	OK

More Exact Approach

Max=Mcx/(1+.5F/Pcx)	86.5/(1+.5x0/989.8)	86.46 kN.m	
F/Pcx+mx.Mx/Max	0/989.8+0.95x8/86.5	0.087	OK
F/Pcy+m_{LT}.M_{LT}/Mb	0/967.1+0.691x7.1/86.5	0.057	OK

Deflection Check - Load Case 10

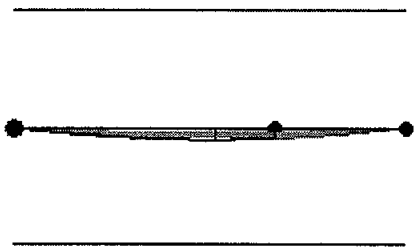
δ ≤ Span/360	1.14 ≤ 3592 / 360	1.14 mm	OK

AXIAL WITH MOMENTS (MEMBER)
Member 716 (D8-D4) @ Level 6
Between 0 and 2.4 m, in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
 L1 + 1.4 A1

   D1 PTRY -001.370 0.000 3.593 -001.417
   L1 PTRY -000.822 0.000 3.593 -000.850
   D1 UDLY -000.784              ( kN/m )
   L1 UDLY -000.470              ( kN/m )
   A1 D     078.500              ( kN/m³)
```



Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
716	467	0.13T	0.02	9.95	0.00	0.00	0.00	8.97		1.29
	476	0.13T	-0.02	-10.02	0.00	0.00	0.00	@ 1.815		@ 1.815

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 0, 8.97, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	0.261 / 218.381 =	0.001	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Pz =Ae.py	38.21x275 =	1050.775 kN	
n = F/Pz	-0.133 / 1050.775 =	0.000	OK
Srx = Fn(Sxx, n)	314.4, 0	314.4 cm³	
Mrx = Srx.py	314.4 x 275	86.46 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(8.961/86.46)^2+(0)^1$=	0.011	OK

Equivalent Uniform Moment Factors mLT, mx, my and myx

m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}	0.2+(.15x5+.5x8+.15x9)/9 ≥0.44	0.878	Table 18
m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}	0.2+(.1x7+.6x9+.1x7)/9 ≥.8x9/9	0.95	Table 26

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Lateral Buckling Check Mb

Le = 1.00 L	1 x 2.4 =	2.4 m	
λ = Le/ry	2.4 / 3.18	75.56	OK
v = Fn (x,Le,ry,λ)	21.437, 2.4, 3.18, 75.56	0.886	Table 19
λ_{LT} = u.v.λ.$\sqrt{\beta_W}$	0.882 x 0.886 x 75.56 $\sqrt{}$ 1	59.08	
pb = Fn (py,λ_{LT})	275, 59.08	215.52 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 215.52 ≤ 86.46 =	67.759 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.878x9/67.8	0.116	
$r_c=F_c/P_{cy}$	0/728.5	0.000	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.116•59.1+0•75.6)/(0.116+0)	59.078	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.116+0)/(0.116+0)	34.300	
$M_{ob}=M_b(1-F_c/P_{cy})$	67.759(1-0/728.5)	67.759	
$M_{xy}=M_{cx}(1-F_c/P_{cy})^{½}$	86.460(1-0/728.5)^{½}	86.460	
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-0/989.7)/(1+0.5•0/989.7)	86.460	
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-0/728.5)/(1+1.0(0/728.5))	18.975	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	59.078, 34.300, 1.000, 86.460, 67.759	77.462	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	41.271, 1.000, 86.460, 86.460	86.460	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	75.559, 1.000, 18.975, 18.975	18.975	
$m_x.M_x/M_{ax}$	0.95x9/86.5	0.099	OK
$m_{LT}.M_{LT}/M_{ab}$	0.878x9/77.5	0.102	OK
$m_x.M_x/M_{ax}$	0.95x9/86.5	0.098	OK
Compare with Simplied to 4.8.3.3	0.111, 0.116, 0.116	0.116	
Compare with MoreExact to 4.8.3.3	0.099, 0.116, 0.091	0.116	

Deflection Check - Load Case 10

δ ≤ Span/360	1.29 ≤ 3593 / 360	1.29 mm	OK

AXIAL WITH MOMENTS (MEMBER)
Member 717 (N.468-N.478) @ Level 6
Between 0 and 2.4 m, in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
L1 + 1.4 A1

  D1 UDLY -001.567            ( kN/m )
  L1 UDLY -000.940            ( kN/m )
  A1 D     078.500            ( kN/m³)
```

Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
717	468	0.16C	0.00	7.40	0.00	0.00	0.00	6.65		0.96
	478	0.16C	0.00	-7.40	0.00	0.00	0.00	@ 1.797		@ 1.797

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Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 0.16, 6.64, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	0.176 / 218.381 =	0.001	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Pz = Ag.py	38.21 x 275 =	1050.775 kN	
n = F/Pz	0.163 / 1050.775 =	0.000	OK
Srx = Fn(Sxx, n)	314.4, 0	314.4 cm³	
Mrx = Srx.py	314.4 x 275	86.46 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(6.638/86.46)^2+(0)^1$=	0.006	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x3.593/8.71 =	41.3	OK
Pcx = Area.pcx	38.21x259.023/10 =	989.728 kN	Table 24 a
λy = Ley/ryy	100x1x2.4/3.18 =	75.6	OK
Pcy = Area.pcy	38.21x190.65/10 =	728.476 kN	Table 24 b

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x4+.5x6+.15x7)/7 ≥0.44	0.878	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x5+.6x7+.1x5)/7 ≥.8x7/7	0.95	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2.4 =	2.4 m	
λ = Le/ry	2.4 / 3.18	75.56	OK
v = Fn (x,Le,ry,λ)	21.437, 2.4, 3.18, 75.56	0.886	Table 19
λ_{LT} = u.v.λ.√βw	0.882 x 0.886 x 75.56 √ 1	59.08	
pb = Fn (py,λ_{LT})	275, 59.08	215.52 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 215.52 ≤ 86.46 =	67.759 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.878x6.6/67.8	0.086	
$r_c=F_c/P_{cy}$	0.2/728.5	0.000	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.086•59.1+0•75.6)/(0.086+0)	59.121	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.086+0)/(0.086+0)	34.256	
$M_{ob}=M_b(1-F_c/P_{cy})$	67.759(1-0.2/728.5)	67.744	
$M_{xy}=M_{cx}(1-F_c/P_{cy})^{½}$	86.460(1-0.2/728.5)^{½}	86.450	
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-0.2/989.7)/(1+0.5•0.2/989.7)	86.439	
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-0.2/728.5)/(1+1.0(0.2/728.5))	18.967	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	59.121, 34.256, 1.000, 86.450, 67.744	77.431	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	41.271, 1.000, 86.460, 86.439	86.453	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	75.559, 1.000, 18.975, 18.967	18.968	
$m_x.M_x/M_{ax}$	0.95x6.6/86.5	0.073	OK
$m_{LT}.M_{LT}/M_{ab}$	0.878x6.6/77.4	0.075	OK
$m_x.M_x/M_{ax}$	0.95x6.6/86.5	0.073	OK
Compare with Simplied to 4.8.3.3	0.082, 0.086, 0.086	0.086	
Compare with MoreExact to 4.8.3.3	0.073, 0.086, 0.067	0.086	

Deflection Check - Load Case 10

δ ≤ Span/360	0.96 ≤ 3593 / 360	0.96 mm	OK

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AXIAL WITH MOMENTS (MEMBER)

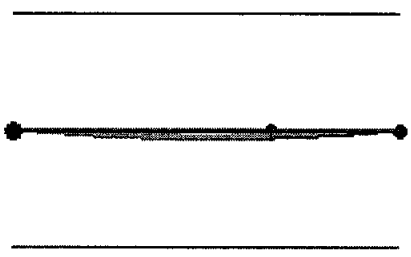
Member 717 (N.468-N.478) @ Level 6

Between 2.4 and 3.593 m, in Load Case 1

Member Loading and Member Forces

Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6 L1 + 1.4 A1

D1 UDLY -001.567 (kN/m)
L1 UDLY -000.940 (kN/m)
A1 D 078.500 (kN/m³)



Member Forces in Load Case 1 and Maximum Deflection from Load Case 10										
Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
717	468	0.16C	0.00	7.40	0.00	0.00	0.00	6.65		0.96
	478	0.16C	0.00	-7.40	0.00	0.00	0.00	@ 1.797		@ 1.797

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 0.16, 6.64, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	2.485 / 218.381 =	0.011	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Pz = Ag.py	38.21 x 275 =	1050.775 kN	
n = F/Pz	0.163 / 1050.775 =	0.000	OK
Srx = Fn(Sxx, n)	314.4, 0	314.4 cm³	
Mrx = Srx.py	314.4 x 275	86.46 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(5.893/86.46)^2+(0)^1$=	0.005	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x3.593/8.71 =	41.3	OK
Pcx = Area.pcx	38.21x259.023/10 =	989.728 kN	Table 24 a
λy = Ley/ryy	100x1x1.193/3.18 =	37.6	OK
Pcy = Area.pcy	38.21x253.06/10 =	966.928 kN	Table 24 b

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x5+.5x4+.15x2)/6 ≥0.44	0.69	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x5+.6x7+.1x5)/7 ≥.8x7/7	0.95	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 1.193 =	1.193 m	
λ = Le/ry	1.193 / 3.18	37.56	OK
v = Fn (x,Le,ry,λ)	21.437, 1.193, 3.18, 37.56	0.965	Table 19
λ_{LT} = u.v.λ.$\sqrt{\beta_W}$	0.882 x 0.965 x 37.56 √ 1	31.98	
pb = Fn (py,λ_{LT})	275, 31.98	275 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 275 ≤ 86.46 =	86.460 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.69x5.9/86.5	0.047	
$r_c=F_c/P_{cy}$	0.2/966.9	0.000	

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$\lambda_r=(r_b \lambda_{LT}+r_c \lambda_y)/(r_b+r_c)$	(0.047•32+0•37.6)/(0.047+0)	31.995	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.047+0)/(0.047+0)	34.239	
$M_{ob}=M_b(1-F_c/P_{cy})$	86.460(1-0.2/966.9)	86.445	
$M_{xy}=M_{cx}\ (1-F_c/P_{cy})^{½}$	86.460(1-0.2/966.9)^{½}	86.453	
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-0.2/989.7)/(1+0.5•0.2/989.7)	86.439	
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-0.2/966.9)/(1+1.0(0.2/966.9))	18.969	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	31.995, 34.239, 1.000, 86.453, 86.445	86.453	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	41.271, 1.000, 86.460, 86.439	86.453	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	37.559, 1.000, 18.975, 18.969	18.973	
$m_x.M_x/M_{ax}$	0.95x6.6/86.5	0.073	OK
$m_{LT}.M_{LT}/M_{ab}$	0.69x5.9/86.5	0.047	OK
$m_x.M_x/M_{ax}$	0.95x6.6/86.5	0.065	OK
Compare with Simplied to 4.8.3.3	0.082, 0.047, 0.047	0.082	
Compare with MoreExact to 4.8.3.3	0.073, 0.047, 0.047	0.073	

Deflection Check - Load Case 10

$\delta \le$ Span/360	0.96 ≤ 3593 / 360	0.96 mm	OK

AXIAL WITH MOMENTS (MEMBER)
Member 718 (N.469-N.480) @ Level 6
Between 0 and 2.4 m, in Load Case 1

Member Loading and Member Forces

Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6 L1 + 1.4 A1

D1 UDLY -001.776 (kN/m)
L1 UDLY -001.066 (kN/m)
A1 D 078.500 (kN/m³)

Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
718	469	0.48C	0.00	8.29	0.00	0.00	0.00	7.44		1.07
	480	0.48C	0.00	-8.29	0.00	0.00	0.00	@ 1.797		@ 1.797

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 0.48, 7.44, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	0.197 / 218.381 =	0.001	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Pz = Ag.py	38.21 x 275 =	1050.775 kN	
n = F/Pz	0.477 / 1050.775 =	0.000	OK
Srx = Fn(Sxx, n)	314.4, 0	314.4 cm³	
Mrx = Srx.py	314.4 x 275	86.46 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(7.435/86.46)^2+(0)^1$=	0.007	OK

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Compression Resistance Pc

λx = Lex/rxx	100x1x3.593/8.71 =	41.3	OK
Pcx = Area.pcx	38.21x259.023/10 =	989.727 kN	Table 24 a
λy = Ley/ryy	100x1x2.4/3.18 =	75.6	OK
Pcy = Area.pcy	38.21x190.65/10 =	728.476 kN	Table 24 b

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x4+.5x7+.15x7)/7 ≥0.44	0.878	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x6+.6x7+.1x6)/7 ≥.8x7/7	0.95	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2.4 =	2.4 m	
λ = Le/ry	2.4 / 3.18	75.56	OK
v = Fn (x,Le,ry,λ)	21.437, 2.4, 3.18, 75.56	0.886	Table 19
λ_{LT} = u.v.λ.$\sqrt{\beta_W}$	0.882 x 0.886 x 75.56 √ 1	59.08	
pb = Fn (py,λ_{LT})	275, 59.08	215.52 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 215.52 ≤ 86.46 =	67.759 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.878x7.4/67.8	0.096	
$r_c=F_c/P_{cy}$	0.5/728.5	0.001	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.096•59.1+0.001•75.6)/(0.096+0.001)	59.190	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.096+0.001)/(0.096+0.001)	34.184	
$M_{ob}=M_b(1-F_c/P_{cy})$	67.759(1-0.5/728.5)	67.715	
$M_{xy}=M_{cx}(1-F_c/P_{cy})^{½}$	86.460(1-0.5/728.5)^{½}	86.432	
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-0.5/989.7)/(1+0.5•0.5/989.7)	86.398	
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-0.5/728.5)/(1+1.0(0.5/728.5))	18.950	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	59.190, 34.184, 1.000, 86.432, 67.715	77.379	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	41.271, 1.000, 86.460, 86.398	86.438	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	75.559, 1.000, 18.975, 18.950	18.954	
$m_x.M_x/M_{ax}$	0.95x7.4/86.4	0.082	OK
$m_{LT}.M_{LT}/M_{ab}$	0.878x7.4/77.4	0.084	OK
$m_x.M_x/M_{ax}$	0.95x7.4/86.4	0.082	OK
Compare with Simplied to 4.8.3.3	0.092, 0.097, 0.097	0.097	
Compare with MoreExact to 4.8.3.3	0.082, 0.097, 0.076	0.097	

Deflection Check - Load Case 10

δ ≤ Span/360	1.07 ≤ 3593 / 360	1.07 mm	OK

AXIAL WITH MOMENTS (MEMBER)

Member 718 (N.469-N.480) @ Level 6

Between 2.4 and 3.593 m, in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
L1 + 1.4 A1

   D1 UDLY -001.776              ( kN/m )
   L1 UDLY -001.066              ( kN/m )
   A1 D     078.500              ( kN/m³)
```

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Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
718	469	0.48C	0.00	8.29	0.00	0.00	0.00	7.44		1.07
	480	0.48C	0.00	-8.29	0.00	0.00	0.00	@ 1.797		@ 1.797

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 0.48, 7.44, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	2.783 / 218.381 =	0.013	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Pz = Ag.py	38.21 x 275 =	1050.775 kN	
n = F/Pz	0.477 / 1050.775 =	0.000	OK
Srx = Fn(Sxx, n)	314.4, 0	314.4 cm³	
Mrx = Srx.py	314.4 x 275	86.46 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(6.601/86.46)^2+(0)^1$=	0.006	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x3.593/8.71 =	41.3	OK
Pcx = Area.pcx	38.21x259.023/10 =	989.727 kN	Table 24 a
λy = Ley/ryy	100x1x1.193/3.18 =	37.6	OK
Pcy = Area.pcy	38.21x253.06/10 =	966.928 kN	Table 24 b

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x6+.5x4+.15x2)/7 ≥0.44	0.69	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x6+.6x7+.1x6)/7 ≥.8x7/7	0.95	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 1.193 =	1.193 m	
λ = Le/ry	1.193 / 3.18	37.56	OK
v = Fn (x,Le,ry,λ)	21.437, 1.193, 3.18, 37.56	0.965	Table 19
λ_{LT} = u.v.λ.√βw	0.882 x 0.965 x 37.56 √ 1	31.98	
pb = Fn (py,λ_{LT})	275, 31.98	275 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 275 ≤ 86.46 =	86.460 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.69x6.6/86.5	0.053	
$r_c=F_c/P_{cy}$	0.5/966.9	0.000	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.053•32+0•37.6)/(0.053+0)	32.027	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.053+0)/(0.053+0)	34.141	
$M_{ob}=M_b(1-F_c/P_{cy})$	86.460(1-0.5/966.9)	86.417	
$M_{xy}=M_{cx}(1-F_c/P_{cy})^{½}$	86.460(1-0.5/966.9)^{½}	86.439	
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-0.5/989.7)/(1+0.5•0.5/989.7)	86.398	
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-0.5/966.9)/(1+1.0(0.5/966.9))	18.956	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	32.027, 34.141, 1.000, 86.439, 86.417	86.439	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	41.271, 1.000, 86.460, 86.398	86.438	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	37.559, 1.000, 18.975, 18.956	18.969	
$m_x.M_x/M_{ax}$	0.95x7.4/86.4	0.082	OK
$m_{LT}.M_{LT}/M_{ab}$	0.69x6.6/86.4	0.053	OK
$m_x.M_x/M_{ax}$	0.95x7.4/86.4	0.073	OK
Compare with Simplied to 4.8.3.3	0.092, 0.053, 0.053	0.092	
Compare with MoreExact to 4.8.3.3	0.082, 0.053, 0.053	0.082	

Deflection Check - Load Case 10

δ ≤ Span/360	1.07 ≤ 3593 / 360	1.07 mm	OK

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AXIAL WITH MOMENTS (MEMBER)
Members 719 and 721 (N.470-N.481) @ Level 6
Between 0 and 2.4 m, in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
 L1 + 1.4 A1

   D1 UDLY -000.993              ( kN/m )
   L1 UDLY -000.596              ( kN/m )
   D1 PTRY -000.574 0.000 1.803 -000.421
   L1 PTRY -000.344 0.000 1.803 -000.252
   A1 D     078.500              ( kN/m³)
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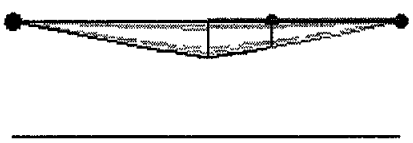

Member Forces in Load Case 1 and Maximum Deflection from Load Case 3

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	470	1.00C	0.04	18.78	0.00	0.00	0.00	27.74		4.83
	481	0.79C	0.03	-19.40	0.00	0.00	0.00	@ 1.803		@ 1.802

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 1, 27.73, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	11.86 / 218.381 =	0.054	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Pz = Ag.py	38.21 x 275 =	1050.775 kN	
n = F/Pz	1 / 1050.775 =	0.001	OK
Srx = Fn(Sxx, n)	314.4, 0.001	314.4 cm³	
Mrx = Srx.py	314.4 x 275	86.46 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(27.733/86.46)^2+(0)^1$=	0.103	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x3.593/8.71 =	41.3	OK
Pcx = Area.pcx	38.21x259.023/10 =	989.727 kN	Table 24 a
λy = Ley/ryy	100x1x2.4/3.18 =	75.6	OK
Pcy = Area.pcy	38.21x190.65/10 =	728.476 kN	Table 24 b

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x11+.5x20+.15x27)/28 ≥0.44	0.759	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x15+.6x27+.1x16)/28 ≥.8x28/28	0.902	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2.4 =	2.4 m	
λ = Le/ry	2.4 / 3.18	75.56	OK
v = Fn (x,Le,ry,λ)	21.437, 2.4, 3.18, 75.56	0.886	Table 19
λ_{LT} = u.v.λ.$\sqrt{\beta_W}$	0.882 x 0.886 x 75.56 √ 1	59.08	
pb = Fn (py,λ_{LT})	275, 59.08	215.52 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 215.52 ≤ 86.46 =	67.759 kN.m	

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Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.759x27.7/67.8	0.311	
$r_c=F_c/P_{cy}$	1/728.5	0.001	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.311•59.1+0.001•75.6)/(0.311+0.001)	59.151	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.311+0.001)/(0.311+0.001)	34.225	
$M_{ob}=M_b(1-F_c/P_{cy})$	67.759(1-1/728.5)	67.666	
$M_{xy}=M_{cx}(1-F_c/P_{cy})^{½}$	86.460(1-1/728.5)^{½}	86.401	
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-1/989.7)/(1+0.5•1/989.7)	86.329	
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-1/728.5)/(1+1.0(1/728.5))	18.923	
$M_{ab}=fn(\lambda_r, \lambda_{ro}, \varepsilon, M_{xy}, M_{ob})$	59.151, 34.225, 1.000, 86.401, 67.666	77.377	
$M_{ax}=fn(\lambda_x, \varepsilon, M_{rx}, M_{ox})$	41.271, 1.000, 86.460, 86.329	86.414	
$M_{ay}=fn(\lambda_y, \varepsilon, M_{ry}, M_{oy})$	75.559, 1.000, 18.975, 18.923	18.931	
$m_x.M_x/M_{ax}$	0.902x27.7/86.4	0.290	OK
$m_{LT}.M_{LT}/M_{ab}$	0.759x27.7/77.4	0.272	OK
$m_x.M_x/M_{ax}$	0.902x27.7/86.4	0.289	OK
Compare with Simplied to 4.8.3.3	0.326, 0.312, 0.312	0.326	
Compare with MoreExact to 4.8.3.3	0.291, 0.312, 0.244	0.312	

Deflection Check - Load Case 3

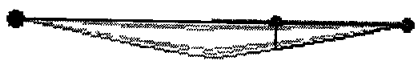
$\delta \le$ Span/360	4.83 ≤ 3593 / 360	4.83 mm	OK

AXIAL WITH MOMENTS (MEMBER)
Members 719 and 721 (N.470-N.481) @ Level 6
Between 2.4 and 3.593 m, in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
L1 + 1.4 A1

  D1 UDLY -000.993                ( kN/m )
  L1 UDLY -000.596                ( kN/m )
  D1 PTRY -000.574 0.000 1.803 -000.421
  L1 PTRY -000.344 0.000 1.803 -000.252
  A1 D     078.500                ( kN/m³)
```



Member Forces in Load Case 1 and Maximum Deflection from Load Case 3

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	470	1.00C	0.04	18.78	0.00	0.00	0.00	27.74		4.83
	481	0.79C	0.03	-19.40	0.00	0.00	0.00	@ 1.803		@ 1.802

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 1, 27.73, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	14.191 / 218.381 =	0.065	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Pz = Ag.py	38.21 x 275 =	1050.775 kN	
n = F/Pz	1 / 1050.775 =	0.001	OK
Srx = Fn(Sxx, n)	314.4, 0.001	314.4 cm³	
Mrx = Srx.py	314.4 x 275	86.46 kN.m	

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$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(19.964/86.46)^2+(0)^1=$	0.053	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x3.593/8.71 =	41.3	OK
Pcx = Area.pcx	38.21x259.023/10 =	989.727 kN	Table 24 a
λy = Ley/ryy	100x1x1.193/3.18 =	37.6	OK
Pcy = Area.pcy	38.21x253.06/10 =	966.928 kN	Table 24 b

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x16+.5x11+.15x6)/20 ≥0.44	0.629	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x15+.6x27+.1x16)/28 ≥.8x28/28	0.902	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 1.193 =	1.193 m	
λ = Le/ry	1.193 / 3.18	37.56	OK
v = Fn (x,Le,ry,λ)	21.437, 1.193, 3.18, 37.56	0.965	Table 19
λ_{LT} = u.v.λ.√βW	0.882 x 0.965 x 37.56 √ 1	31.98	
pb = Fn (py,λ_{LT})	275, 31.98	275 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 275 ≤ 86.46 =	86.460 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.629x20/86.5	0.145	
$r_c=F_c/P_{cy}$	1/966.9	0.001	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.145•32+0.001•37.6)/(0.145+0.001)	32.015	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.145+0.001)/(0.145+0.001)	34.179	
$M_{ob}=M_b(1-F_c/P_{cy})$	86.460(1-1/966.9)	86.371	
$M_{xy}=M_{cx}(1-F_c/P_{cy})^{½}$	86.460(1-1/966.9)^{½}	86.415	
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-1/989.7)/(1+0.5•1/989.7)	86.329	
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-1/966.9)/(1+1.0(1/966.9))	18.936	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	32.015, 34.179, 1.000, 86.415, 86.371	86.415	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	41.271, 1.000, 86.460, 86.329	86.414	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	37.559, 1.000, 18.975, 18.936	18.963	
$m_x.M_x/M_{ax}$	0.902x27.7/86.4	0.290	OK
$m_{LT}.M_{LT}/M_{ab}$	0.629x20/86.4	0.145	OK
$m_x.M_x/M_{ax}$	0.902x27.7/86.4	0.208	OK
Compare with Simplied to 4.8.3.3	0.326, 0.146, 0.146	0.326	
Compare with MoreExact to 4.8.3.3	0.291, 0.146, 0.145	0.291	

Deflection Check - Load Case 3

δ ≤ Span/360	4.83 ≤ 3593 / 360	4.83 mm	OK

AXIAL WITH MOMENTS (MEMBER)

Member 720 (K8-N.473) @ Level 6 in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
L1 + 1.4 A1

   D1 PTRY -000.568 0.000 1.759 -000.411
   L1 PTRY -000.341 0.000 1.759 -000.246
   A1 D     078.500              ( kN/m³)
```

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Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
720	471	0.60C	0.00	-1.44	0.00	0.00	0.00	-0.61		0.02
	473	0.60C	0.00	1.33	0.00	0.00	0.00	@ 0.871		@ 0.871

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 0.6, 0.61, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	0.027 / 218.381 =	0	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Pz = Ag.py	38.21 x 275 =	1050.775 kN	
n = F/Pz	0.596 / 1050.775 =	0.001	OK
Srx = Fn(Sxx, n)	314.4, 0.001	314.4 cm³	
Mrx = Srx.py	314.4 x 275	86.46 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(0.606/86.46)^2+(0)^1$=	0	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x1.759/8.71 =	20.2	OK
Pcx = Area.pcx	38.21x273.235/10 =	1044.031 kN	Table 24 a
λy = Ley/ryy	100x1x1.759/3.18 =	55.4	OK
Pcy = Area.pcy	38.21x228.3/10 =	872.321 kN	Table 24 b

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x0+.5x1+.15x0)/1 ≥0.44	0.924	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x0+.6x1+.1x0)/1 ≥.8x1/1	0.949	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 1.759 =	1.759 m	
λ = Le/ry	1.759 / 3.18	55.38	OK
v = Fn (x,Le,ry,λ)	21.437, 1.759, 3.18, 55.38	0.931	Table 19
λ_{LT} = u.v.λ.√βw	0.882 x 0.931 x 55.38 √ 1	45.47	
pb = Fn (py,λ_{LT})	275, 45.47	248.93 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 248.93 ≤ 86.46 =	78.264 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.924x0.6/78.3	0.007	
$r_c=F_c/P_{cy}$	0.6/872.3	0.001	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.007•45.5+0.001•55.4)/(0.007+0.001)	46.329	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.007+0.001)/(0.007+0.001)	32.806	
$M_{ob}=M_b(1-F_c/P_{cy})$	78.264(1-0.6/872.3)	78.211	
$M_{xy}=M_{cx}(1-F_c/P_{cy})^{½}$	86.460(1-0.6/872.3)^{½}	86.430	
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-0.6/1044)/(1+0.5•0.6/1044)	86.386	
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-0.6/872.3)/(1+1.0(0.6/872.3))	18.949	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	46.329, 32.806, 1.000, 86.430, 78.211	84.355	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	20.207, 1.000, 86.460, 86.386	86.457	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	55.379, 1.000, 18.975, 18.949	18.961	
$m_x.M_x/M_{ax}$	0.949x0.6/86.5	0.007	OK
$m_{LT}.M_{LT}/M_{ab}$	0.924x0.6/84.4	0.007	OK
$m_x.M_x/M_{ax}$	0.949x0.6/86.5	0.007	OK
Compare with Simplied to 4.8.3.3	0.008, 0.008, 0.008	0.008	
Compare with MoreExact to 4.8.3.3	0.007, 0.008, 0.006	0.008	

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Deflection Check - Load Case 10

$\delta \leq$ Span/360	0.02 ≤ 1759 / 360	0.02 mm	OK

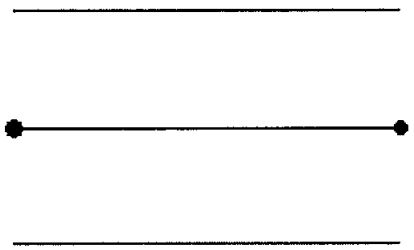
AXIAL WITH MOMENTS (MEMBER)

Member 722 (N.473-P4) @ Level 6 in Load Case 1

Member Loading and Member Forces

Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6 L1 + 1.4 A1

D1 PTRY -000.396 0.000 2.027 -000.738
L1 PTRY -000.238 0.000 2.027 -000.443
A1 D 078.500 (kN/m³)



Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
Member Forces in Load Case 1 and Maximum Deflection from Load Case 10										
722	473	1.72C	0.00	1.65	0.00	0.00	0.00	0.90		0.04
	482	1.72C	0.00	-1.92	0.00	0.00	0.00	@ 1.045		@ 1.024

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 1.72, 0.9, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	1.914 / 218.381 =	0.009	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	275 x 314.4≤1.2 x 275 x 280.1 =	86.46 kN.m	
Pz = Ag.py	38.21 x 275 =	1050.775 kN	
n = F/Pz	1.721 / 1050.775 =	0.002	OK
Srx = Fn(Sxx, n)	314.4, 0.002	314.4 cm³	
Mrx = Srx.py	314.4 x 275	86.46 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(0.002/86.46)^2+(0)^1$=	0.002	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x2.027/8.71 =	23.3	OK
Pcx = Area.pcx	38.21x271.414/10 =	1037.071 kN	Table 24 a
λy = Ley/ryy	100x1x2.027/3.18 =	63.8	OK
Pcy = Area.pcy	38.21x213.74/10 =	816.691 kN	Table 24 b

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x1+.5x1+.15x1)/1 ≥0.44	0.923	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x1+.6x1+.1x1)/1 ≥.8x1/1	0.948	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2.027 =	2.027 m	
λ = Le/ry	2.027 / 3.18	63.82	OK
v = Fn (x,Le,ry,λ)	21.437, 2.027, 3.18, 63.82	0.912	Table 19
$\lambda_{LT} = u.v.\lambda.\sqrt{\beta_W}$	0.882 x 0.912 x 63.82 √ 1	51.37	
pb = Fn (py,λ_{LT})	275, 51.37	234.63 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 234.63 ≤ 86.46 =	73.767 kN.m	

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Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.923x0.9/73.8	0.011	
$r_c=F_c/P_{cy}$	1.7/816.7	0.002	
$\lambda_r=(r_b \lambda_{LT}+r_c \lambda_y)/(r_b+r_c)$	(0.011•51.4+0.002•63.8)/(0.011+0.002)	53.329	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.011+0.002)/(0.011+0.002)	31.600	
$M_{ob}=M_b(1-F_c/P_{cy})$	73.767(1-1.7/816.7)	73.611	
$M_{xy}=M_{cx}(1-F_c/P_{cy})^{½}$	86.460(1-1.7/816.7)^{½}	86.369	
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-1.7/1037.1)/(1+0.5•1.7/1037.1)	86.245	
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-1.7/816.7)/(1+1.0(1.7/816.7))	18.895	
$M_{ab}=fn(\lambda_r, \lambda_{ro}, \varepsilon, M_{xy}, M_{ob})$	53.329, 31.600, 1.000, 86.369, 73.611	81.309	
$M_{ax}=fn(\lambda_x, \varepsilon, M_{rx}, M_{ox})$	23.282, 1.000, 86.460, 86.245	86.440	
$M_{ay}=fn(\lambda_y, \varepsilon, M_{ry}, M_{oy})$	63.816, 1.000, 18.975, 18.895	18.921	
$m_x.M_x/M_{ax}$	0.948x0.9/86.4	0.010	OK
$m_{LT}.M_{LT}/M_{ab}$	0.923x0.9/81.3	0.010	OK
$m_x.M_x/M_{ax}$	0.948x0.9/86.4	0.010	OK
Compare with Simplied to 4.8.3.3	0.013, 0.013, 0.013	0.013	
Compare with MoreExact to 4.8.3.3	0.012, 0.013, 0.01	0.013	

Deflection Check - Load Case 10

$\delta \le$ Span/360	0.04 ≤ 2027 / 360	0.04 mm	OK

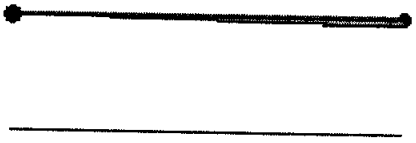
AXIAL WITH MOMENTS (MEMBER)

Member 723 (A4-N.485) @ Level 6 in Load Case 1

Member Loading and Member Forces

Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6 L1 + 1.4 A1

A1 D 078.500 (kN/m³)



Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
723	474	0.45T	-0.29	9.68	0.00	0.00	0.00			0.13
	485	0.45T	0.29	7.41	0.00	16.09	0.00			@ 1.073

Classification and Properties (BS 5950: 2000)

Section (86.06 kg/m)	203x203 UC 86 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	5.1, 12.66, 265, 0, 16.09, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	7.413 / 448.688 =	0.017	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	265 x 976.7≤1.2 x 265 x 850.7 =	258.826 kN.m	
Pz =Ae.py	109.63x265 =	2905.195 kN	
n = F/Pz	-0.452 / 2905.195 =	0.000	OK
Srx = Fn(Sxx, n)	976.7, 0	976.7 cm³	
Mrx = Srx.py	976.7 x 265	258.826 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(16.092/258.826)^2+(0)^1$=	0.004	OK

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Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x4+.5x9+.15x12)/16 ≥0.44	0.624	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x4+.6x9+.1x12)/16 ≥.8x12/16	0.625	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 1.883 =	1.883 m	
λ = Le/ry	1.883 / 5.34	35.24	OK
v = Fn (x,Le,ry,λ)	10.21, 1.883, 5.34, 35.24	0.89	Table 19
λ_{LT} = u.v.λ.$\sqrt{\beta_W}$	0.85 x 0.89 x 35.24 √ 1	26.66	
pb = Fn (py,λ_{LT})	265, 26.66	265 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	976.7 x 265 ≤ 258.826 =	258.826 kN.m	

Simplified Approach

py.Zx	265x850.7	225.436 kN.m	
F/Pc+mx.Mx/py.Zx	0+0.625x16.1/225.4	0.045	OK
F/Pcy+m_{LT}.M_{LT}/Mb	0+0.624x15.6/258.8	0.038	OK

More Exact Approach

Max=Mcx/(1+.5F/Pcx)	258.8/(1+.5x0/2875.4)	258.826 kN.m	
F/Pcx+mx.Mx/Max	0/2875.4+0.625x16.1/258.8	0.039	OK
F/Pcy+m_{LT}.M_{LT}/Mb	0/2607+0.624x15.6/258.8	0.038	OK

Deflection Check - Load Case 10

δ ≤ Span/360	0.13 ≤ 1883 / 360	0.13 mm	OK

AXIAL WITH MOMENTS (MEMBER)

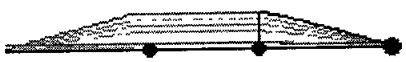
Members 725, 735, 738 and 740 (H5-H2) @ Level 6

Between 0 and 2.4 m, in Load Case 1

Member Loading and Member Forces

Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6 L1 + 1.4 A1

A1 D 078.500 (kN/m³)



Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
	479	0.12C	-4.91	-35.74	0.00	0.00	0.00	-77.66		13.52
	498	0.03C	-2.02	34.27	0.00	0.00	0.00	@ 3.555		@ 3.485

Classification and Properties (BS 5950: 2000)

Section (86.06 kg/m)	203x203 UC 86 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	5.1, 12.66, 265, 0.92, 77.66, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	1.382 / 448.688 =	0.003	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	265 x 976.7≤1.2 x 265 x 850.7 =	258.826 kN.m	
Pz = Ag.py	109.63 x 265 =	2905.195 kN	

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n = F/Pz	0.921 / 2905.195 =	0.000	OK
Srx = Fn(Sxx, n)	976.7, 0	976.7 cm³	
Mrx = Srx.py	976.7 x 265	258.825 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(76.862/258.825)^2+(0)^1$=	0.088	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x7.017/9.29 =	75.6	OK
Pcx = Area.pcx	109.63x185.678/10 =	2035.589 kN	Table 24 b
λy = Ley/ryy	100x1x2.4/5.34 =	44.9	OK
Pcy = Area.pcy	109.63x221.98/10 =	2433.559 kN	Table 24 c

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x21+.5x42+.15x62)/77 ≥0.44	0.636	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x61+.6x78+.1x58)/78 ≥.8x78/78	0.953	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2.4 =	2.4 m	
λ = Le/ry	2.4 / 5.34	44.91	OK
v = Fn (x,Le,ry,λ)	10.21, 2.4, 5.34, 44.91	0.844	Table 19
λ_{LT} = u.v.λ.$\sqrt{\beta_W}$	0.85 x 0.844 x 44.91 √ 1	32.25	
pb = Fn (py,λ_{LT})	265, 32.25	265 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	976.7 x 265 ≤ 258.826 =	258.826 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.636x76.9/258.8	0.189	
$r_c=F_c/P_{cy}$	0.9/2433.6	0.000	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.189•32.3+0•44.9)/(0.189+0)	32.276	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1.019(2•0.189+0)/(0.189+0)	34.906	
$M_{ob}=M_b(1-F_c/P_{cy})$	258.826(1-0.9/2433.6)	258.728	
$M_{xy}=M_{cx}(1-F_c/P_{cy})^{½}$	258.826(1-0.9/2433.6)^{½}	258.777	
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	258.826(1-0.9/2035.6)/(1+0.5•0.9/2035.6)	258.650	
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	95.209(1-0.9/2433.6)/(1+1.0(0.9/2433.6))	95.137	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	32.276, 34.906, 1.019, 258.777, 258.728	258.777	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	75.568, 1.019, 258.825, 258.650	258.680	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	44.914, 1.019, 95.209, 95.137	95.181	
$m_x.M_x/M_{ax}$	0.953x77.7/258.7	0.286	OK
$m_{LT}.M_{LT}/M_{ab}$	0.636x76.9/258.8	0.189	OK
$m_x.M_x/M_{ax}$	0.953x77.7/258.7	0.283	OK
Compare with Simplied to 4.8.3.3	0.329, 0.189, 0.189	0.329	
Compare with MoreExact to 4.8.3.3	0.287, 0.189, 0.189	0.287	

Deflection Check - Load Case 10

δ ≤ Span/360	13.52 ≤ 7017 / 360	13.52 mm	OK

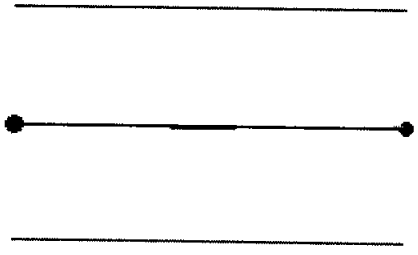
AXIAL WITH MOMENTS (MEMBER)

Member 726 (P4-M6) @ Level 6 in Load Case 1

Member Loading and Member Forces

```
   Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6
L1 + 1.4 A1

  D1 PTRY -001.298 0.000 2.055 -000.778
  L1 PTRY -000.779 0.000 2.055 -000.467
  A1 D     078.500              ( kN/m³)
```



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Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
726	482	6.52C	0.00	3.16	0.00	0.00	0.00	1.52		0.07
	483	6.52C	0.00	-2.74	0.00	0.00	0.00	@ 0.996		@ 1.017

Classification and Properties (BS 5950: 2000)

Section (29.99 kg/m)	203x133 UB 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.97, 26.94, 275, 6.52, 1.52, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	2.737 / 218.381 =	0.013	Low Shear
Pz = Ag.py	38.21 x 275 =	1050.775 kN	OK
F/Ag.py	6.515 / 1050.775 =	0.006	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x2.055/8.71 =	23.6	OK
Pcx = Area.pcx	38.21x271.217/10 =	1036.322 kN	Table 24 a
λy = Ley/ryy	100x1x2.055/3.18 =	64.7	OK
Pcy = Area.pcy	38.21x212.11/10 =	810.463 kN	Table 24 b

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x1+.5x2+.15x1)/2 ≥0.44	0.924	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x1+.6x2+.1x1)/2 ≥.8x2/2	0.949	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2.055 =	2.055 m	
λ = Le/ry	2.055 / 3.18	64.7	OK
v = Fn (x,Le,ry,λ)	21.437, 2.055, 3.18, 64.7	0.91	Table 19
λ_{LT} = u.v.λ.$\sqrt{\beta_W}$	0.882 x 0.91 x 64.7 √ 1	51.97	
pb = Fn (py,λ_{LT})	275, 51.97	233.16 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	314.4 x 233.16 ≤ 86.46 =	73.305 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.924x1.5/73.3	0.019	
$r_c=F_c/P_{cy}$	6.5/810.5	0.008	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.019•52+0.008•64.7)/(0.019+0.008)	55.745	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1(2•0.019+0.008)/(0.019+0.008)	29.212	
$M_{ob}=M_b(1-F_c/P_{cy})$	73.305(1-6.5/810.5)	72.715	
$M_{xy}=M_{cx}(1-F_c/P_{cy})^{½}$	86.460(1-6.5/810.5)^{½}	86.112	
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	86.460(1-6.5/1036.3)/(1+0.5•6.5/1036.3)	85.647	
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	18.975(1-6.5/810.5)/(1+1.0(6.5/810.5))	18.672	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	55.745, 29.212, 1.000, 86.112, 72.715	80.012	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	23.607, 1.000, 86.454, 85.647	86.378	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	64.698, 1.000, 18.975, 18.672	18.765	
$m_x.M_x/M_{ax}$	0.949x1.5/86.4	0.017	OK
$m_{LT}.M_{LT}/M_{ab}$	0.924x1.5/80	0.017	OK
$m_x.M_x/M_{ax}$	0.949x1.5/86.4	0.017	OK
Compare with Simplied to 4.8.3.3	0.027, 0.027, 0.027	0.027	
Compare with MoreExact to 4.8.3.3	0.023, 0.027, 0.016	0.027	

Deflection Check - Load Case 10

δ ≤ Span/360	0.07 ≤ 2055 / 360	0.07 mm	OK

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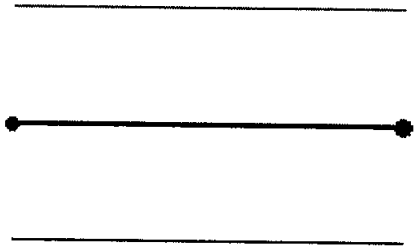
AXIAL WITH MOMENTS (MEMBER)

Member 728 (M6-M5) @ Level 6 in Load Case 7

Member Loading and Member Forces

Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.4 W1 + 1.4 A1

A1 D 078.500 (kN/m³)



Member Forces in Load Case 7 and Maximum Deflection from Load Case 8									
Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
728	483	5.86T	0.00	-1.21	0.00	0.00	0.00	-0.61		0.01
	496	5.86T	0.00	1.21	0.00	0.00	0.00	@ 1.008		@ 1.008

Classification and Properties (BS 5950: 2000)

Section (86.06 kg/m)	203x203 UC 86 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	5.1, 12.66, 265, 0, 0.61, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	1.212 / 448.688 =	0.003	Low Shear
Pz =Ae.py	109.63x265 =	2905.195 kN	OK
F/Ae.py	-5.861 / 2905.195 =	0.002	OK

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x0+.5x1+.15x0)/1 ≥0.44	0.925	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x0+.6x1+.1x0)/1 ≥.8x1/1	0.95	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2.016 =	2.016 m	
λ = Le/ry	2.016 / 5.34	37.72	OK
v = Fn (x,Le,ry,λ)	10.21, 2.016, 5.34, 37.72	0.878	Table 19
$\lambda_{LT} = u.v.\lambda.\sqrt{\beta_W}$	0.85 x 0.878 x 37.72 √ 1	28.17	
pb = Fn (py,λ_{LT})	265, 28.17	265 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	976.7 x 265 ≤ 258.826 =	258.826 kN.m	

Simplified Approach

py.Zx	265x850.7	225.436 kN.m	
F/Pc+mx.Mx/py.Zx	0+0.95x0.6/225.4	0.003	OK
$F/Pcy+m_{LT}.M_{LT}/Mb$	0+0.925x0.6/258.8	0.002	OK

More Exact Approach

Max=Mcx/(1+.5F/Pcx)	258.8/(1+.5x0/2860.1)	258.826 kN.m	
F/Pcx+mx.Mx/Max	0/2860.1+0.95x0.6/258.8	0.002	OK
$F/Pcy+m_{LT}.M_{LT}/Mb$	0/2563.6+0.925x0.6/258.8	0.002	OK

Deflection Check - Load Case 8

δ ≤ Span/360	0.01 ≤ 2016 / 360	0.01 mm	OK

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AXIAL WITH MOMENTS (MEMBER)
Members 729 and 743 (N6-N.504) @ Level 6
Between 0 and 2.4 m, in Load Case 1

Member Loading and Member Forces

Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6 L1 + 1.4 A1

A1 D 078.500 (kN/m³)

Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
	484	0.30C	0.01	-1.51	0.00	0.00	0.00		0.00	2.47
	504	1.38C	-0.01	-28.00	0.00	-62.71	0.00		@ 2.499	@ 2.499

Classification and Properties (BS 5950: 2000)

Section (86.06 kg/m)	203x203 UC 86 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	5.1, 12.66, 265, 1.38, 62.71, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	0.06 / 448.688 =	0	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	265 x 976.7≤1.2 x 265 x 850.7 =	258.826 kN.m	
Pz = Ag.py	109.63 x 265 =	2905.195 kN	
n = F/Pz	1.375 / 2905.195 =	0.000	OK
Srx = Fn(Sxx, n)	976.7, 0	976.7 cm³	
Mrx = Srx.py	976.7 x 265	258.825 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(0.939/258.825)^2+(0)^1=$	0	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x4.64/9.29 =	50	OK
Pcx = Area.pcx	109.63x228.75/10 =	2507.785 kN	Table 24 b
λy = Ley/ryy	100x1x2.4/5.34 =	44.9	OK
Pcy = Area.pcy	109.63x221.98/10 =	2433.559 kN	Table 24 c

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x1+.5x1+.15x1)/1 ≥0.44	0.931	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x1+.6x0+.1x29)/63 ≥.8x29/63	0.375	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2.4 =	2.4 m	
λ = Le/ry	2.4 / 5.34	44.91	OK
v = Fn (x,Le,ry,λ)	10.21, 2.4, 5.34, 44.91	0.844	Table 19
λ_{LT} = u.v.λ.$\sqrt{\beta_W}$	0.85 x 0.844 x 44.91 √ 1	32.25	
pb = Fn (py,λ_{LT})	265, 32.25	265 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	976.7 x 265 ≤ 258.826 =	258.826 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.931x0.9/258.8	0.003	
$r_c=F_c/P_{cy}$	1.4/2433.6	0.001	

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$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.003•32.3+0.001•44.9)/(0.003+0.001)	34.068	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1.019(2•0.003+0.001)/(0.003+0.001)	32.434	
$M_{ob}=M_b(1-F_c/P_{cy})$	258.826(1-1.4/2433.6)	258.679	
$M_{xy}=M_{cx}(1-F_c/P_{cy})^{½}$	258.826(1-1.4/2433.6)^{½}	258.752	
$M_{ox}=M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	258.826(1-1.4/2507.8)/(1+0.5•1.4/2507.8)	258.613	
$M_{oy}=M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	95.209(1-1.4/2433.6)/(1+1.0(1.4/2433.6))	95.102	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	34.068, 32.434, 1.019, 258.752, 258.679	258.752	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	49.970, 1.019, 258.825, 258.613	258.727	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	44.914, 1.019, 95.209, 95.102	95.167	
$m_x.M_x/M_{ax}$	0.375x62.7/258.7	0.091	OK
$m_{LT}.M_{LT}/M_{ab}$	0.931x0.9/258.8	0.003	OK
$m_x.M_x/M_{ax}$	0.375x62.7/258.7	0.001	OK
Compare with Simplied to 4.8.3.3	0.105, 0.004, 0.004	0.105	
Compare with MoreExact to 4.8.3.3	0.092, 0.004, 0.003	0.092	

Deflection Check - Load Case 10

$\delta \le$ Span/360	2.47 ≤ 4640 / 360	2.47 mm	OK

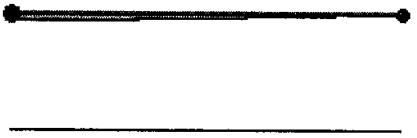
AXIAL WITH MOMENTS (MEMBER)

Member 730 (N.485-A2) @ Level 6 in Load Case 1

Member Loading and Member Forces

Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6 L1 + 1.4 A1

A1 D 078.500 (kN/m³)



Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
730	485	0.42C	-0.26	-1.42	0.00	16.12	0.00			0.76
	491	0.42C	0.26	-6.39	0.00	0.00	0.00			@ 1.815

Classification and Properties (BS 5950: 2000)

Section (86.06 kg/m)	203x203 UC 86 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	5.1, 12.66, 265, 0.42, 16.12, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	1.422 / 448.688 =	0.003	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	265 x 976.7≤1.2 x 265 x 850.7 =	258.826 kN.m	
Pz = Ag.py	109.63 x 265 =	2905.195 kN	
n = F/Pz	0.422 / 2905.195 =	0.000	OK
Srx = Fn(Sxx, n)	976.7, 0	976.7 cm³	
Mrx = Srx.py	976.7 x 265	258.826 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(16.116/258.826)^2+(0)^1$=	0.004	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x4.125/9.29 =	44.4	OK
Pcx = Area.pcx	109.63x236.071/10 =	2588.045 kN	Table 24 b

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λy = Ley/ryy	100x1x4.125/5.34 =	77.2	OK
Pcy = Area.pcy	109.63x162.56/10 =	1782.118 kN	Table 24 c

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x14+.5x11+.15x6)/16 ≥0.44	0.715	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x14+.6x11+.1x6)/16 ≥.8x14/16	0.719	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 4.125 =	4.125 m	
λ = Le/ry	4.125 / 5.34	77.2	OK
v = Fn (x,Le,ry,λ)	10.21, 4.125, 5.34, 77.2	0.714	Table 19
$\lambda_{LT} = u.v.\lambda.\sqrt{\beta_W}$	0.85 x 0.714 x 77.2 √ 1	46.84	
pb = Fn (py,λ_{LT})	265, 46.84	238.26 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	976.7 x 238.26 ≤ 258.826 =	232.707 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.715x16.1/232.7	0.050	
$r_c=F_c/P_{cy}$	0.4/1782.1	0.000	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.05•46.8+0•77.2)/(0.05+0)	46.987	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1.019(2•0.05+0)/(0.05+0)	34.858	
$M_{ob} = M_b(1-F_c/P_{cy})$	232.707(1-0.4/1782.1)	232.652	
$M_{xy} = M_{cx}(1-F_c/P_{cy})^{½}$	258.826(1-0.4/1782.1)^{½}	258.795	
$M_{ox} = M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	258.826(1-0.4/2588)/(1+0.5•0.4/2588)	258.762	
$M_{oy} = M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	95.209(1-0.4/1782.1)/(1+1.0(0.4/1782.1))	95.164	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	46.987, 34.858, 1.019, 258.795, 232.652	252.784	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	44.426, 1.019, 258.826, 258.762	258.801	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	77.196, 1.019, 95.209, 95.164	95.171	
$m_x.M_x/M_{ax}$	0.719x16.1/258.8	0.045	OK
$m_{LT}.M_{LT}/M_{ab}$	0.715x16.1/252.8	0.046	OK
$m_x.M_x/M_{ax}$	0.719x16.1/258.8	0.045	OK
Compare with Simplied to 4.8.3.3	0.052, 0.05, 0.05	0.052	
Compare with MoreExact to 4.8.3.3	0.045, 0.05, 0.045	0.05	

Deflection Check - Load Case 10

δ ≤ Span/360	0.76 ≤ 4125 / 360	0.76 mm	OK

AXIAL WITH MOMENTS (MEMBER)

Members 733 and 744 (Q6-N.507) @ Level 6 in Load Case 1

Member Loading and Member Forces

Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6 L1 + 1.4 A1

A1 D 078.500 (kN/m³)

Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
	487	0.32T	0.01	-0.82	0.00	-0.57	0.00	1.06		3.02
	507	0.64T	0.00	-14.00	0.00	-32.75	0.00	@ 2.456		@ 2.481

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Classification and Properties (BS 5950: 2000)

Section (86.06 kg/m)	203x203 UC 86 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	5.1, 12.66, 265, 0, 32.75, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	14.006 / 448.688 =	0.031	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	265 x 976.7≤1.2 x 265 x 850.7 =	258.826 kN.m	
Fvy/Pvy	0.001 / 1226.811 =	0	Low Shear
Mcy = py.Syy≤1.2 py.Zyy	265 x 456.2≤1.2 x 265 x 299.4 =	95.209 kN.m	
Pz =Ae.py	109.63x265 =	2905.195 kN	
n = F/Pz	-0.638 / 2905.195 =	0.000	OK
Srx = Fn(Sxx, n)	976.7, 0	976.7 cm³	
Mrx = Srx.py	976.7 x 265	258.826 kN.m	
Sry = Fn(Syy, n)	456.2, 0	456.2 cm³	
Mry = Sry.py	456.2 x 265	95.209 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(32.742/258.826)^{2}+(0.004/95.209)^{1}$=	0.016	OK

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x1+.5x1+.15x16)/33 ≥0.44	0.44	Table 18
$m_y=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x0+.6x0+.1x0)/0 ≥.8x0/0	0.6	Table 26
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x1+.6x-1+.1x16)/33 ≥.8x16/33	0.385	Table 26
$m_{yx}=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x0+.6x0+.1x0)/0 ≥.8x0/0	0.6	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 4.622 =	4.622 m	
λ = Le/ry	4.622 / 5.34	86.5	OK
v = Fn (x,Le,ry,λ)	10.21, 4.622, 5.34, 86.5	0.683	Table 19
$\lambda_{LT} = u.v.\lambda.\sqrt{\beta_W}$	0.85 x 0.683 x 86.5 √ 1	50.26	
pb = Fn (py,λ_{LT})	265, 50.26	230.35 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	976.7 x 230.35 ≤ 258.826 =	224.983 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.44x32.7/225	0.064	
$r_c=F_c/P_{cy}$	0/1594.9	0.000	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.064•50.3+0•86.5)/(0.064+0)	50.260	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1.019(2•0.064+0)/(0.064+0)	34.941	
$M_{ob} = M_b(1-F_c/P_{cy})$	224.983(1-0/1594.9)	224.983	
$M_{xy} = M_{cx}(1-F_c/P_{cy})^{½}$	258.826(1-0/1594.9)^{½}	258.826	
$M_{ox} = M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	258.826(1-0/2510.6)/(1+0.5•0/2510.6)	258.826	
$M_{oy} = M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	95.209(1-0/1594.9)/(1+1.0(0/1594.9))	95.209	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	50.260, 34.941, 1.019, 258.826, 224.983	248.944	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	49.783, 1.019, 258.826, 258.826	258.826	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	86.497, 1.019, 95.209, 95.209	95.209	
$m_x.M_x/M_{ax}+.5m_{yx}.M_y/M_{cy}(1-F_c/P_{cx})$	0.385x32.7/258.8+.5x0.6x0/(95.2(1-0/2510.6))	0.049	OK
$m_{LT}.M_{LT}/M_{ab}+m_y.M_y/M_{ay}$	0.44x32.7/248.9+0.6x0/95.2	0.058	OK
$m_x.M_x/M_{ax}+m_y.M_y/M_{ay}$	0.385x32.7/258.8+0.6x0/95.2	0.049	OK
Compare with Simplied to 4.8.3.3	0.056, 0.064, 0.064	0.064	
Compare with MoreExact to 4.8.3.3	0.049, 0.064, 0.056	0.064	

Deflection Check - Load Case 10

δ ≤ Span/360	3.02 ≤ 4622 / 360	3.02 mm	OK

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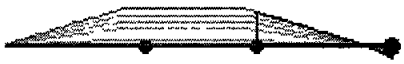
AXIAL WITH MOMENTS (MEMBER)
Members 739, 741-742 and 745 (M5-M2) @ Level 6
Between 0 and 2.4 m, in Load Case 1

Member Loading and Member Forces

Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6 L1 + 1.4 A1

A1 D 078.500 (kN/m³)



Member Forces in Load Case 1 and Maximum Deflection from Load Case 10										
Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN)		Bending Moment (kN.m)		Maximum Moment (kN.m @ m)		Maximum Deflection (mm @ m)
				x-x	y-y	x-x	y-y	x-x	y-y	
	496	5.14C	0.01	-54.31	0.00	27.01	0.00	-80.42	0.00	12.29
	505	1.02C	-0.01	38.34	0.00	0.00	0.00	@ 3.456	@ 0.495	@ 3.627

Classification and Properties (BS 5950: 2000)

Section (86.06 kg/m)	203x203 UC 86 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	5.1, 12.66, 265, 5.14, 80.42, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	36.361 / 448.688 =	0.081	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	265 x 976.7≤1.2 x 265 x 850.7 =	258.826 kN.m	
Fvy/Pvy	0 / 1226.811 =	0	Low Shear
Mcy = py.Syy≤1.2 py.Zyy	265 x 456.2≤1.2 x 265 x 299.4 =	95.209 kN.m	
Pz = Ag.py	109.63 x 265 =	2905.195 kN	
n = F/Pz	5.141 / 2905.195 =	0.002	OK
Srx = Fn(Sxx, n)	976.7, 0.002	976.69 cm³	
Mrx = Srx.py	976.69 x 265	258.824 kN.m	
Sry = Fn(Syy, n)	456.2, 0.002	456.2 cm³	
Mry = Sry.py	456.2 x 265	95.209 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(71.245/258.824)^2+(0.002/95.209)^1$=	0.076	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x6.926/9.29 =	74.6	OK
Pcx = Area.pcx	109.63x187.57/10 =	2056.326 kN	Table 24 b
λy = Ley/ryy	100x1x2.4/5.34 =	44.9	OK
Pcy = Area.pcy	109.63x221.98/10 =	2433.559 kN	Table 24 c

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x4+.5x27+.15x49)/71 ≥0.44	0.5	Table 18
$m_y=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x0+.6x0+.1x0)/0 ≥.8x0/0	0.733	Table 26
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x47+.6x80+.1x65)/80 ≥.8x80/80	0.938	Table 26
$m_{yx}=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x0+.6x0+.1x0)/0 ≥.8x0/0	0.733	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 2.4 =	2.4 m	
λ = Le/ry	2.4 / 5.34	44.91	OK
v = Fn (x,Le,ry,λ)	10.21, 2.4, 5.34, 44.91	0.844	Table 19

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PROPOSED OFFICE DEVELOPMENT AT 18 ORCHARD STREET NEATH

THOMAS PARRY DESIGN PARTNERSHIP

THE OLD SKETTY COACH HOUSE

GOWER ROAD

SWANSEA

STRUCTURAL ENGINEERS

SLOWIKOWSKI, BLACKSHAW AND PARTNERS

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PROJECT NO: GOA/A/1511

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$\lambda_{LT} = u.v.\lambda.\sqrt{\beta_W}$	0.85 x 0.844 x 44.91 √ 1	32.25	
pb = Fn (py,λ_{LT})	265, 32.25	265 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	976.7 x 265 ≤ 258.826 =	258.826 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.5x71.2/258.8	0.138	
$r_c=F_c/P_{cy}$	5.1/2433.6	0.002	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.138•32.3+0.002•44.9)/(0.138+0.002)	32.442	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1.019(2•0.138+0.002)/(0.138+0.002)	34.677	
$M_{ob} = M_b(1-F_c/P_{cy})$	258.826(1-5.1/2433.6)	258.279	
$M_{xy} = M_{cx}(1-F_c/P_{cy})^{½}$	258.826(1-5.1/2433.6)^{½}	258.552	
$M_{ox} = M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	258.826(1-5.1/2056.3)/(1+0.5•5.1/2056.3)	257.856	
$M_{oy} = M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	95.209(1-5.1/2433.6)/(1+1.0(5.1/2433.6))	94.808	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	32.442, 34.677, 1.019, 258.552, 258.279	258.552	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	74.589, 1.019, 258.824, 257.856	258.033	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	44.914, 1.019, 95.209, 94.808	95.052	
$m_x.M_x/M_{ax}+.5m_{yx}.M_y/M_{cy}(1-F_c/P_{cx})$	0.938x80.4/258+.5x0.733x0/(95.2(1-5.1/2056.3))	0.293	OK
$m_{LT}.M_{LT}/M_{ab}+m_y.M_y/M_{ay}$	0.5x71.2/258.6+0.733x0/95.1	0.138	OK
$m_x.M_x/M_{ax}+m_y.M_y/M_{ay}$	0.938x80.4/258+0.733x0/95.1	0.259	OK
Compare with Simplied to 4.8.3.3	0.337, 0.14, 0.14	0.337	
Compare with MoreExact to 4.8.3.3	0.295, 0.14, 0.138	0.295	

Deflection Check - Load Case 10

δ ≤ Span/360	12.29 ≤ 6926 / 360	12.29 mm	OK

AXIAL WITH MOMENTS (MEMBER)
Members 746-747 (N.504-N2) @ Level 6
Between 0 and 2.4 m, in Load Case 1

Member Loading and Member Forces

Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6 L1 + 1.4 A1

A1 D 078.500 (kN/m³)

Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
	504	1.45C	0.00	-1.30	0.00	-62.71	0.00	-63.41		4.04
	508	1.04C	-0.01	30.59	0.00	0.00	0.00	@ 1.071		@ 1.971

Classification and Properties (BS 5950: 2000)

Section (86.06 kg/m)	203x203 UC 86 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	5.1, 12.66, 265, 1.45, 63.41, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	0.032 / 448.688 =	0	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	265 x 976.7≤1.2 x 265 x 850.7 =	258.826 kN.m	

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Pz = Ag.py	109.63 x 265 =	2905.195 kN	
n = F/Pz	1.447 / 2905.195 =	0.000	OK
Srx = Fn(Sxx, n)	976.7, 0	976.7 cm³	
Mrx = Srx.py	976.7 x 265	258.825 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(63.407/258.825)^2+(0)^1=$	0.06	OK
Compression Resistance Pc			
$\lambda x = Lex/rxx$	100x1x4.284/9.29 =	46.1	OK
Pcx = Area.pcx	109.63x233.882/10 =	2564.045 kN	Table 24 b
$\lambda y = Ley/ryy$	100x1x2.4/5.34 =	44.9	OK
Pcy = Area.pcy	109.63x221.98/10 =	2433.559 kN	Table 24 c
Equivalent Uniform Moment Factors mLT, mx, my and myx			
$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x63+.5x63+.15x63)/63 ≥0.44	0.999	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x63+.6x63+.1x32)/63 ≥.8x63/63	0.944	Table 26
Lateral Buckling Check Mb			
Le = 1.00 L	1 x 2.4 =	2.4 m	
λ = Le/ry	2.4 / 5.34	44.91	OK
v = Fn (x,Le,ry,λ)	10.21, 2.4, 5.34, 44.91	0.844	Table 19
$\lambda_{LT} = u.v.\lambda.\sqrt{\beta_W}$	0.85 x 0.844 x 44.91 √ 1	32.25	
pb = Fn (py,λ_{LT})	265, 32.25	265 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	976.7 x 265 ≤ 258.826 =	258.826 kN.m	
Combined Axial Compression and Bending to Annex I			
$r_b=m_{LT}.M_{LT}/M_b$	0.999x63.4/258.8	0.245	
$r_c=F_c/P_{cy}$	1.4/2433.6	0.001	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.245•32.3+0.001•44.9)/(0.245+0.001)	32.281	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1.019(2•0.245+0.001)/(0.245+0.001)	34.899	
$M_{ob} = M_b(1-F_c/P_{cy})$	258.826(1-1.4/2433.6)	258.672	
$M_{xy} = M_{cx}\ (1-F_c / P_{cy})^{½}$	$258.826(1-1.4/2433.6)^{½}$	258.749	
$M_{ox} = M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	258.826(1-1.4/2564)/(1+0.5•1.4/2564)	258.607	
$M_{oy} = M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	95.209(1-1.4/2433.6)/(1+1.0(1.4/2433.6))	95.096	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	32.281, 34.899, 1.019, 258.749, 258.672	258.749	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	46.137, 1.019, 258.825, 258.607	258.736	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	44.914, 1.019, 95.209, 95.096	95.165	
$m_x.M_x/M_{ax}$	0.944x63.4/258.7	0.231	OK
$m_{LT}.M_{LT}/M_{ab}$	0.999x63.4/258.7	0.245	OK
$m_x.M_x/M_{ax}$	0.944x63.4/258.7	0.231	OK
Compare with Simplied to 4.8.3.3	0.266, 0.245, 0.245	0.266	
Compare with MoreExact to 4.8.3.3	0.232, 0.245, 0.245	0.245	
Deflection Check - Load Case 10			
δ ≤ Span/360	4.04 ≤ 4284 / 360	4.04 mm	OK

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AXIAL WITH MOMENTS (MEMBER)

Members 746-747 (N.504-N2) @ Level 6

Between 2.4 and 4.284 m, in Load Case 1

Member Loading and Member Forces

Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6 L1 + 1.4 A1

A1 D 078.500 (kN/m³)

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
	504	1.45C	0.00	-1.30	0.00	-62.71	0.00	-63.41		4.04
	508	1.04C	-0.01	30.59	0.00	0.00	0.00	@ 1.071		@ 1.971

Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Classification and Properties (BS 5950: 2000)

Section (86.06 kg/m)	203x203 UC 86 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	5.1, 12.66, 265, 1.45, 63.41, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	28.315 / 448.688 =	0.063	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	265 x 976.7≤1.2 x 265 x 850.7 =	258.826 kN.m	
Pz = Ag.py	109.63 x 265 =	2905.195 kN	
n = F/Pz	1.447 / 2905.195 =	0.000	OK
Srx = Fn(Sxx, n)	976.7, 0	976.7 cm³	
Mrx = Srx.py	976.7 x 265	258.825 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(55.479/258.825)^2+(0)^1$=	0.046	OK

Compression Resistance Pc

λx = Lex/rxx	100x1x4.284/9.29 =	46.1	OK
Pcx = Area.pcx	109.63x233.882/10 =	2564.045 kN	Table 24 b
λy = Ley/ryy	100x1x1.884/5.34 =	35.3	OK
Pcy = Area.pcy	109.63x237.77/10 =	2606.694 kN	Table 24 c

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x42+.5x28+.15x14)/55 ≥0.44	0.607	Table 18
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x63+.6x63+.1x32)/63 ≥.8x63/63	0.944	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 1.884 =	1.884 m	
λ = Le/ry	1.884 / 5.34	35.26	OK
v = Fn (x,Le,ry,λ)	10.21, 1.884, 5.34, 35.26	0.89	Table 19
λ_{LT} = u.v.λ.√βw	0.85 x 0.89 x 35.26 √ 1	26.67	
pb = Fn (py,λ_{LT})	265, 26.67	265 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	976.7 x 265 ≤ 258.826 =	258.826 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.607x55.5/258.8	0.130
$r_c=F_c/P_{cy}$	1.4/2606.7	0.001
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.13•26.7+0.001•35.3)/(0.13+0.001)	26.711
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1.019(2•0.13+0.001)/(0.13+0.001)	34.867

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$M_{ob} = M_b(1-F_c/P_{cy})$	258.826(1-1.4/2606.7)	258.682	
$M_{xy} = M_{cx}(1-F_c/P_{cy})^{½}$	258.826(1-1.4/2606.7)^{½}	258.754	
$M_{ox} = M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	258.826(1-1.4/2564)/(1+0.5•1.4/2564)	258.607	
$M_{oy} = M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	95.209(1-1.4/2606.7)/(1+1.0(1.4/2606.7))	95.104	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	26.711, 34.867, 1.019, 258.754, 258.682	258.754	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	46.137, 1.019, 258.825, 258.607	258.736	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	35.255, 1.019, 95.209, 95.104	95.182	
$m_x.M_x/M_{ax}$	0.944x63.4/258.7	0.232	OK
$m_{LT}.M_{LT}/M_{ab}$	0.607x55.5/258.8	0.130	OK
$m_x.M_x/M_{ax}$	0.944x63.4/258.7	0.202	OK
Compare with Simplied to 4.8.3.3	0.266, 0.131, 0.131	0.266	
Compare with MoreExact to 4.8.3.3	0.232, 0.131, 0.13	0.232	

Deflection Check - Load Case 10

δ ≤ Span/360	4.04 ≤ 4284 / 360	4.04 mm	OK

AXIAL WITH MOMENTS (MEMBER)

Members 748-749 (N.507-Q2) @ Level 6 in Load Case 1

Member Loading and Member Forces

Loading Combination : 1 UT + 1.4 D0 + 1.4 D1 + 1.6 L1 + 1.4 A1

A1 D 078.500 (kN/m³)

Member Forces in Load Case 1 and Maximum Deflection from Load Case 10

Member No.	Node End1 End2	Axial Force (kN)	Torque Moment (kN.m)	Shear Force (kN) x-x	Shear Force (kN) y-y	Bending Moment (kN.m) x-x	Bending Moment (kN.m) y-y	Maximum Moment (kN.m @ m) x-x	Maximum Moment (kN.m @ m) y-y	Maximum Deflection (mm @ m)
	507	0.19T	0.01	-1.29	0.00	-32.75	0.00	-33.44	0.00	2.15
	510	0.17C	0.00	16.59	0.00	0.00	0.00	@ 1.071	@ 2.121	@ 1.971

Classification and Properties (BS 5950: 2000)

Section (86.06 kg/m)	203x203 UC 86 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	5.1, 12.66, 265, 0.17, 33.44, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Local Capacity Check

Fvx/Pvx	0.101 / 448.688 =	0	Low Shear
Mcx = py.Sxx≤1.2 py.Zxx	265 x 976.7≤1.2 x 265 x 850.7 =	258.826 kN.m	
Fvy/Pvy	0 / 1226.811 =	0	Low Shear
Mcy = py.Syy≤1.2 py.Zyy	265 x 456.2≤1.2 x 265 x 299.4 =	95.209 kN.m	
Pz =Ae.py	109.63x265 =	2905.195 kN	
n = F/Pz	-0.194 / 2905.195 =	0.000	OK
Srx = Fn(Sxx, n)	976.7, 0	976.7 cm³	
Mrx = Srx.py	976.7 x 265	258.826 kN.m	
Sry = Fn(Syy, n)	456.2, 0	456.2 cm³	
Mry = Sry.py	456.2 x 265	95.209 kN.m	
$(Mx/Mrx)^{Z1}+(My/Mry)^{Z2}$	$(33.439/258.826)^2+(0.001/95.209)^1$=	0.017	OK

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Compression Resistance Pc

λx = Lex/rxx	100x1x4.283/9.29 =	46.1	OK
Pcx = Area.pcx	109.63x233.888/10 =	2564.114 kN	Table 24 b
λy = Ley/ryy	100x1x4.283/5.34 =	80.2	OK
Pcy = Area.pcy	109.63x157.03/10 =	1721.537 kN	Table 24 c

Equivalent Uniform Moment Factors mLT, mx, my and myx

$m_{LT}=0.2+(.15M_2+.5M_3+.15M_4)/M_{max}$	0.2+(.15x33+.5x33+.15x17)/33 ≥0.44	0.916	Table 18
$m_y=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x0+.6x0+.1x0)/0 ≥.8x0/0	1	Table 26
$m_x=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x33+.6x33+.1x17)/33 ≥.8x33/33	0.939	Table 26
$m_{yx}=0.2+(.1M_2+.6M_3+.1M_4)/M_{max}$	0.2+(.1x0+.6x0+.1x0)/0 ≥.8x0/0	1	Table 26

Lateral Buckling Check Mb

Le = 1.00 L	1 x 4.283 =	4.283 m	
λ = Le/ry	4.283 / 5.34	80.15	OK
v = Fn (x,Le,ry,λ)	10.21, 4.283, 5.34, 80.15	0.704	Table 19
$\lambda_{LT} = u.v.\lambda.\sqrt{\beta_W}$	0.85 x 0.704 x 80.15 $\sqrt{}$ 1	47.96	
pb = Fn (py,λ_{LT})	265, 47.96	235.69 N/mm²	Table 16
Mb = Sx.pb ≤ Mc	976.7 x 235.69 ≤ 258.826 =	230.198 kN.m	

Combined Axial Compression and Bending to Annex I

$r_b=m_{LT}.M_{LT}/M_b$	0.916x33.4/230.2	0.133	
$r_c=F_c/P_{cy}$	0.2/1721.5	0.000	
$\lambda_r=(r_b\lambda_{LT}+r_c\lambda_y)/(r_b+r_c)$	(0.133•48+0•80.2)/(0.133+0)	47.982	
$\lambda_{ro}=17.15\ \varepsilon\ (2r_b+r_c)/(r_b+r_c)$	17.15•1.019(2•0.133+0)/(0.133+0)	34.928	
$M_{ob} = M_b(1-F_c/P_{cy})$	230.198(1-0.2/1721.5)	230.175	
$M_{xy} = M_{cx}(1-F_c/P_{cy})^{½}$	258.826(1-0.2/1721.5)^{½}	258.813	
$M_{ox} = M_{cx}(1-F_c/P_{cx})/(1+0.5F_c/P_{cx})$	258.826(1-0.2/2564.1)/(1+0.5•0.2/2564.1)	258.799	
$M_{oy} = M_{cy}(1-F_c/P_{cy})/(1+k_y(F_c/P_{cy}))$	95.209(1-0.2/1721.5)/(1+1.0(0.2/1721.5))	95.190	
M_{ab}=fn(λ_r, λ_{ro}, ε, M_{xy}, M_{ob})	47.982, 34.928, 1.019, 258.813, 230.175	251.698	
M_{ax}=fn(λ_x, ε, M_{rx}, M_{ox})	46.132, 1.019, 258.826, 258.799	258.815	
M_{ay}=fn(λ_y, ε, M_{ry}, M_{oy})	80.153, 1.019, 95.209, 95.190	95.192	
$m_x.M_x/M_{ax}$	0.939x33.4/258.8	0.121	OK
$m_{LT}.M_{LT}/M_{ab}$	0.916x33.4/251.7	0.122	OK
$m_x.M_x/M_{ax}$	0.939x33.4/258.8	0.121	OK
Compare with Simplied to 4.8.3.3	0.139, 0.133, 0.133	0.139	
Compare with MoreExact to 4.8.3.3	0.121, 0.133, 0.118	0.133	

Deflection Check - Load Case 10

δ ≤ Span/360	2.15 ≤ 4283 / 360	2.15 mm	OK

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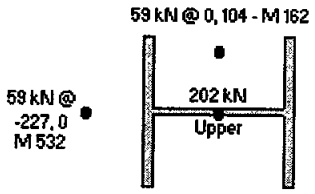
DESIGN OF COLUMNS AT BASEMENT LEVEL [LEVEL 1]

COLUMNS IN SIMPLE CONSTRUCTION
Member 830 (Q1) @ Level 1 in Load Case 1



Classification and Properties (BS 5950: 2000

Section (73.08 kg/m)	254x254 UC 73 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	8.96, 23.29, 275, 320.41, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Applied Factored Loads

Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	202.17+0+59.44+58.8+0+0	320.411 kN
Mxo=-Fx2.ex2	-59x227	13.496 kN.m
Myo=Fy1.ey1	59x104	6.133 kN.m
Mx=Mxo.(Ix/L)/(Ix/L+Ix.u/L.u)	13.496x(11414/3)/((11414/3)+(11414/2.9))	6.634 kN.m
My=Myo.(Iy/L)/(Iy/L+Iy.u/L.u)	6.133x(3915/3)/((3915/3)+(3915/2.9))	3.014 kN.m

Compression Resistance P

λx = Lex/rxx	100x1x3/11.07 =	27.1	OK
Pcx = Area.pcx	93.1x264.809/10 =	2465.372 kN	Table 24 b
λy = Ley/ryy	100x1x3/6.48 =	46.3	OK
Pcy = Area.pcy	93.1x227.13/10 =	2114.618 kN	Table 24 c

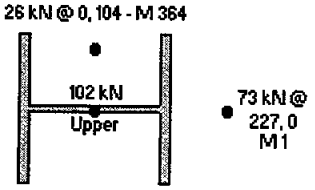
Buckling Resistance Moment Mb

λLT = 0.5 (L/ry)	0.5(100x3/6.48)	23.13	OK
pb = Fn (py,λLT)	275, 23.13	275 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	992.1 x 275 ≤ 272.828 =	272.828 kN.m	

Columns in Simple Construction 4.7.7

Fc/Pc+Mx/Mbs+My/py.Zy	320.411/2114.618+6.634/272.828+3.014/(275x307.5)	0.211	OK

COLUMNS IN SIMPLE CONSTRUCTION
Member 790 (B15) @ Level 1 in Load Case 1



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Classification and Properties (BS 5950: 2000)

Section (73.08 kg/m)	254x254 UC 73 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	8.96, 23.29, 275, 201.72, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Applied Factored Loads

Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	102.344+72.913+0+26.463+0+0	201.721 kN
Mxo=Fx1.ex1	73x227	16.555 kN.m
Myo=Fy1.ey1	26x104	2.76 kN.m
Mx=Mxo.(Ix/L)/(Ix/L+Ix.u/L.u)	16.555x(11414/3)/((11414/3)+(11414/2.9))	8.137 kN.m
My=Myo.(Iy/L)/(Iy/L+Iy.u/L.u)	2.76x(3915/3)/((3915/3)+(3915/2.9))	1.357 kN.m

Compression Resistance Pc

λx = Lex/rxx	100x1x3/11.07 =	27.1	OK
Pcx = Area.pcx	93.1x264.809/10 =	2465.372 kN	Table 24 b
λy = Ley/ryy	100x1x3/6.48 =	46.3	OK
Pcy = Area.pcy	93.1x227.13/10 =	2114.618 kN	Table 24 c

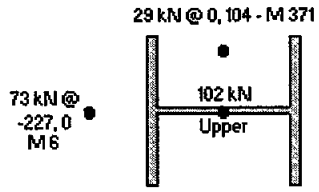
Buckling Resistance Moment Mbs

λLT = 0.5 (L/ry)	0.5(100x3/6.48)	23.13	OK
pb = Fn (py,λLT)	275, 23.13	275 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	992.1 x 275 ≤ 272.828 =	272.828 kN.m	

Columns in Simple Construction 4.7.7

Fc/Pc+Mx/Mbs+My/py.Zy	201.721/2114.618+8.137/272.828+1.357/(275x307.5)	0.141	OK

COLUMNS IN SIMPLE CONSTRUCTION
Member 792 (F15) @ Level 1 in Load Case 1



Classification and Properties (BS 5950: 2000)

Section (73.08 kg/m)	254x254 UC 73 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	8.96, 23.29, 275, 204.62, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Applied Factored Loads

Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	102.41+0+72.914+29.293+0+0	204.617 kN
Mxo=-Fx2.ex2	-73x227	16.555 kN.m
Myo=Fy1.ey1	29x104	3.055 kN.m
Mx=Mxo.(Ix/L)/(Ix/L+Ix.u/L.u)	16.555x(11414/3)/((11414/3)+(11414/2.9))	8.137 kN.m
My=Myo.(Iy/L)/(Iy/L+Iy.u/L.u)	3.055x(3915/3)/((3915/3)+(3915/2.9))	1.502 kN.m

Compression Resistance Pc

λx = Lex/rxx	100x1x3/11.07 =	27.1	OK
Pcx = Area.pcx	93.1x264.809/10 =	2465.372 kN	Table 24 b
λy = Ley/ryy	100x1x3/6.48 =	46.3	OK

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Pcy = Area.pcy	93.1x227.13/10 =	2114.618 kN	Table 24 c

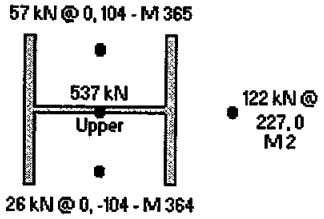
Buckling Resistance Moment Mbs

λLT = 0.5 (L/ry)	0.5(100x3/6.48)	23.13	OK
pb = Fn (py,λLT)	275, 23.13	275 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	992.1 x 275 ≤ 272.828 =	272.828 kN.m	

Columns in Simple Construction 4.7.7

Fc/Pc+Mx/Mbs+My/py.Zy	204.617/2114.618+8.137/272.828+1.502/(275x307.5)	0.144	OK

COLUMNS IN SIMPLE CONSTRUCTION
Member 793 (B14) @ Level 1 in Load Case 1



Classification and Properties (BS 5950: 2000

Section (73.08 kg/m)	254x254 UC 73 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	8.96, 23.29, 275, 743.02, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Applied Factored Load

Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	537.434+121.924+0+57.379+26.281+0	743.018 kN
Mxo=Fx1.ex1	122x227	27.683 kN.m
Myo=Fy1.ey1-Fy2.ey2	57x104-26x104	3.243 kN.m
Mx=Mxo.(Ix/L)/(Ix/L+Ix.u/L.u)	27.683x(11414/3)/((11414/3)+(11414/2.9))	13.607 kN.m
My=Myo.(Iy/L)/(Iy/L+Iy.u/L.u)	3.243x(3915/3)/((3915/3)+(3915/2.9))	1.594 kN.m

Compression Resistance P

λx = Lex/rxx	100x1x3/11.07 =	27.1	OK
Pcx = Area.pcx	93.1x264.809/10 =	2465.372 kN	Table 24 b
λy = Ley/ryy	100x1x3/6.48 =	46.3	OK
Pcy = Area.pcy	93.1x227.13/10 =	2114.618 kN	Table 24 c

Buckling Resistance Moment Mb

λLT = 0.5 (L/ry)	0.5(100x3/6.48)	23.13	OK
pb = Fn (py,λLT)	275, 23.13	275 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	992.1 x 275 ≤ 272.828 =	272.828 kN.m	

Columns in Simple Construction 4.7.7

Fc/Pc+Mx/Mbs+My/py.Zy	743.018/2114.618+13.607/272.828+1.594/(275x307.5)	0.42	OK

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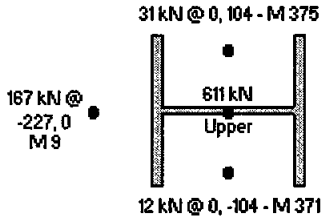
COLUMNS IN SIMPLE CONSTRUCTION
Member 795 (N.13-N.55) @ Level 1 in Load Case 1



Classification and Properties (BS 5950: 2000)

Section (73.08 kg/m)	254x254 UC 73 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	8.96, 23.29, 275, 821.4, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Applied Factored Loads

Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	611.108+0+167.336+30.946+12.009+0	821.398 kN
Mxo=-Fx2.ex2	-167x227	37.994 kN.m
Myo=Fy1.ey1-Fy2.ey2	31x104-12x104	1.975 kN.m
Mx=Mxo.(Ix/L)/(Ix/L+Ix.u/L.u)	37.994x(11414/3)/((11414/3)+(11414/2.9))	18.675 kN.m
My=Myo.(Iy/L)/(Iy/L+Iy.u/L.u)	1.975x(3915/3)/((3915/3)+(3915/2.9))	0.971 kN.m

Compression Resistance Pc

λx = Lex/rxx	100x1x3/11.07 =	27.1	OK
Pcx = Area.pcx	93.1x264.809/10 =	2465.372 kN	Table 24 b
λy = Ley/ryy	100x1x3/6.48 =	46.3	OK
Pcy = Area.pcy	93.1x227.13/10 =	2114.618 kN	Table 24 c

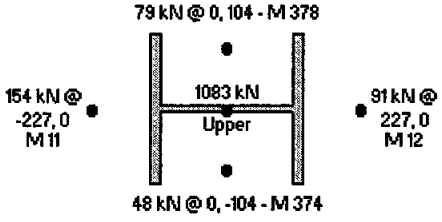
Buckling Resistance Moment Mbs

λLT = 0.5 (L/ry)	0.5(100x3/6.48)	23.13	OK
pb = Fn (py,λLT)	275, 23.13	275 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	992.1 x 275 ≤ 272.828 =	272.828 kN.m	

Columns in Simple Construction 4.7.7

Fc/Pc+Mx/Mbs+My/py.Zy	821.398/2114.618+18.675/272.828+0.971/(275x307.5)	0.468	OK

COLUMNS IN SIMPLE CONSTRUCTION
Member 796 (F13) @ Level 1 in Load Case 1



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Classification and Properties (BS 5950: 2000)

Section (73.08 kg/m)	254x254 UC 73 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	8.96, 23.29, 275, 1454.6, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Applied Factored Loads

Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	1082.741+90.576+153.952+79.335+47.989+0	1454.595 kN	
Mxo=Fx1.ex1-Fx2.ex2	91x227-154x227	14.39 kN.m	
Myo=Fy1.ey1-Fy2.ey2	79x104-48x104	3.269 kN.m	
Mx=Mxo.(Ix/L)/(Ix/L+Ix.u/L.u)	14.39x(11414/3)/((11414/3)+(11414/2.9))	7.073 kN.m	
My=Myo.(Iy/L)/(Iy/L+Iy.u/L.u)	3.269x(3915/3)/((3915/3)+(3915/2.9))	1.607 kN.m	

Compression Resistance Pc

λx = Lex/rxx	100x1x3/11.07 =	27.1	OK
Pcx = Area.pcx	93.1x264.809/10 =	2465.372 kN	Table 24 b
λy = Ley/ryy	100x1x3/6.48 =	46.3	OK
Pcy = Area.pcy	93.1x227.13/10 =	2114.618 kN	Table 24 c

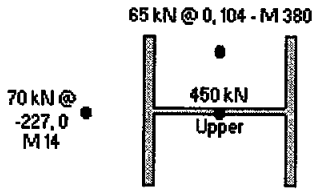
Buckling Resistance Moment Mbs

λLT = 0.5 (L/ry)	0.5(100x3/6.48)	23.13	OK
pb = Fn (py,λLT)	275, 23.13	275 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	992.1 x 275 ≤ 272.828 =	272.828 kN.m	

Columns in Simple Construction 4.7.7

Fc/Pc+Mx/Mbs+My/py.Zy	1454.595/2114.618+7.073/272.828+1.607/(275x307.5)	0.733	OK

COLUMNS IN SIMPLE CONSTRUCTION
Member 797 (K13) @ Level 1 in Load Case 1



Classification and Properties (BS 5950: 2000)

Section (73.08 kg/m)	254x254 UC 73 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	8.96, 23.29, 275, 585.28, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Applied Factored Loads

Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	450.496+0+70.202+64.585+0+0	585.284 kN	
Mxo=-Fx2.ex2	-70x227	15.939 kN.m	
Myo=Fy1.ey1	65x104	6.736 kN.m	
Mx=Mxo.(Ix/L)/(Ix/L+Ix.u/L.u)	15.939x(11414/3)/((11414/3)+(11414/2.9))	7.835 kN.m	
My=Myo.(Iy/L)/(Iy/L+Iy.u/L.u)	6.736x(3915/3)/((3915/3)+(3915/2.9))	3.311 kN.m	

Compression Resistance Pc

λx = Lex/rxx	100x1x3/11.07 =	27.1	OK
Pcx = Area.pcx	93.1x264.809/10 =	2465.372 kN	Table 24 b
λy = Ley/ryy	100x1x3/6.48 =	46.3	OK

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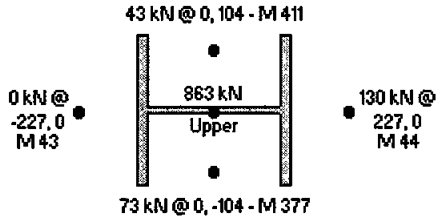
Pcy = Area.pcy	93.1x227.13/10 =	2114.618 kN	Table 24 c

Buckling Resistance Moment Mbs

λLT = 0.5 (L/ry)	0.5(100x3/6.48)	23.13	OK
pb = Fn (py,λLT)	275, 23.13	275 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	992.1 x 275 ≤ 272.828 =	272.828 kN.m	
Columns in Simple Construction 4.7.7			
Fc/Pc+Mx/Mbs+My/py.Zy	585.284/2114.618+7.835/272.828+3.311/(275x307.5)	0.345	OK

COLUMNS IN SIMPLE CONSTRUCTION
Member 798 (E12) @ Level 1 in Load Case 1



Classification and Properties (BS 5950: 2000)

Section (73.08 kg/m)	254x254 UC 73 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	8.96, 23.29, 275, 1109.58, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Applied Factored Loads

Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	862.59+130.17+0.392+43.277+73.152+0	1109.581 kN
Mxo=Fx1.ex1-Fx2.ex2	130x227-0x227	29.466 kN.m
Myo=Fy1.ey1-Fy2.ey2	43x104-73x104	3.116 kN.m
Mx=Mxo.(Ix/L)/(Ix/L+Ix.u/L.u)	29.466x(11414/3)/((11414/3)+(11414/2.9))	14.483 kN.m
My=Myo.(Iy/L)/(Iy/L+Iy.u/L.u)	3.116x(3915/3)/((3915/3)+(3915/2.9))	1.532 kN.m

Compression Resistance Pc

λx = Lex/rxx	100x1x3/11.07 =	27.1	OK
Pcx = Area.pcx	93.1x264.809/10 =	2465.372 kN	Table 24 b
λy = Ley/ryy	100x1x3/6.48 =	46.3	OK
Pcy = Area.pcy	93.1x227.13/10 =	2114.618 kN	Table 24 c

Buckling Resistance Moment Mbs

λLT = 0.5 (L/ry)	0.5(100x3/6.48)	23.13	OK
pb = Fn (py,λLT)	275, 23.13	275 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	992.1 x 275 ≤ 272.828 =	272.828 kN.m	

Columns in Simple Construction 4.7.7

Fc/Pc+Mx/Mbs+My/py.Zy	1109.581/2114.618+14.483/272.828+1.532/(275x307.5)	0.596	OK

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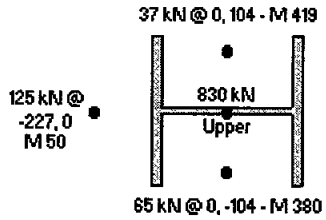
COLUMNS IN SIMPLE CONSTRUCTION
Member 799 (K12) @ Level 1 in Load Case 1



Classification and Properties (BS 5950: 2000)

Section (73.08 kg/m)	254x254 UC 73 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	8.96, 23.29, 275, 1056.37, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Applied Factored Loads

Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	830.184+0+124.552+37.051+64.585+0	1056.373 kN
Mxo=-Fx2.ex2	-125x227	28.28 kN.m
Myo=Fy1.ey1-Fy2.ey2	37x104-65x104	2.872 kN.m
Mx=Mxo.(Ix/L)/(Ix/L+Ix.u/L.u)	28.28x(11414/3)/((11414/3)+(11414/2.9))	13.9 kN.m
My=Myo.(Iy/L)/(Iy/L+Iy.u/L.u)	2.872x(3915/3)/((3915/3)+(3915/2.9))	1.412 kN.m

Compression Resistance Pc

λx = Lex/rxx	100x1x3/11.07 =	27.1	OK
Pcx = Area.pcx	93.1x264.809/10 =	2465.372 kN	Table 24 b
λy = Ley/ryy	100x1x3/6.48 =	46.3	OK
Pcy = Area.pcy	93.1x227.13/10 =	2114.618 kN	Table 24 c

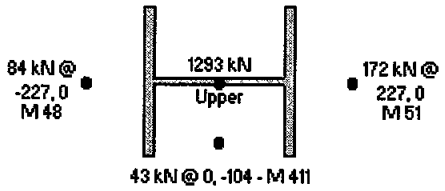
Buckling Resistance Moment Mbs

λLT = 0.5 (L/ry)	0.5(100x3/6.48)	23.13	OK
pb = Fn (py,λLT)	275, 23.13	275 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	992.1 x 275 ≤ 272.828 =	272.828 kN.m	

Columns in Simple Construction 4.7.7

Fc/Pc+Mx/Mbs+My/py.Zy	1056.373/2114.618+13.9/272.828+1.412/(275x307.5)	0.567	OK

COLUMNS IN SIMPLE CONSTRUCTION
Member 800 (E10) @ Level 1 in Load Case 1



Classification and Properties (BS 5950: 2000)

Section (73.08 kg/m)	254x254 UC 73 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	8.96, 23.29, 275, 1593.01, 0, 0	(Axial: Non-Slender)	Plastic

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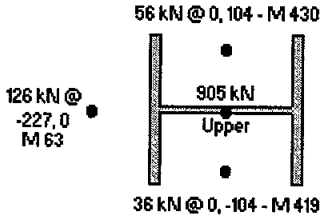
Auto Design Load Cases	1-2, 6-7 and 9		
Applied Factored Loads			
Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	1293.337+171.977+84.422+0+43.277+0	1593.013 kN	
Mxo=Fx1.ex1-Fx2.ex2	172x227-84x227	19.879 kN.m	
Myo=-Fy2.ey2	-43x104	4.514 kN.m	
Mx=Mxo.(Ix/L)/(Ix/L+Ix.u/L.u)	19.879x(11414/3)/((11414/3)+(11414/2.9))	9.771 kN.m	
My=Myo.(Iy/L)/(Iy/L+Iy.u/L.u)	4.514x(3915/3)/((3915/3)+(3915/2.9))	2.219 kN.m	
Compression Resistance Pc			
λx = Lex/rxx	100x1x3/11.07 =	27.1	OK
Pcx = Area.pcx	93.1x264.809/10 =	2465.372 kN	Table 24 b
λy = Ley/ryy	100x1x3/6.48 =	46.3	OK
Pcy = Area.pcy	93.1x227.13/10 =	2114.618 kN	Table 24 c
Buckling Resistance Moment Mbs			
λLT = 0.5 (L/ry)	0.5(100x3/6.48)	23.13	OK
pb = Fn (py,λLT)	275, 23.13	275 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	992.1 x 275 ≤ 272.828 =	272.828 kN.m	
Columns in Simple Construction 4.7.7			
Fc/Pc+Mx/Mbs+My/py.Zy	1593.013/2114.618+9.771/272.828+2.219/(275x307.5)	0.815	OK

COLUMNS IN SIMPLE CONSTRUCTION
Member 801 (K10) @ Level 1 in Load Case 1



Classification and Properties (BS 5950: 2000)			
Section (73.08 kg/m)	254x254 UC 73 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	8.96, 23.29, 275, 1121.85, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		
Applied Factored Loads			
Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	904.51+0+125.518+56.052+35.768+0	1121.848 kN	
Mxo=-Fx2.ex2	-126x227	28.499 kN.m	
Myo=Fy1.ey1-Fy2.ey2	56x104-36x104	2.116 kN.m	
Mx=Mxo.(Ix/L)/(Ix/L+Ix.u/L.u)	28.499x(11414/3)/((11414/3)+(11414/2.9))	14.008 kN.m	
My=Myo.(Iy/L)/(Iy/L+Iy.u/L.u)	2.116x(3915/3)/((3915/3)+(3915/2.9))	1.04 kN.m	
Compression Resistance Pc			
λx = Lex/rxx	100x1x3/11.07 =	27.1	OK
Pcx = Area.pcx	93.1x264.809/10 =	2465.372 kN	Table 24 b
λy = Ley/ryy	100x1x3/6.48 =	46.3	OK
Pcy = Area.pcy	93.1x227.13/10 =	2114.618 kN	Table 24 c
Buckling Resistance Moment Mbs			
λLT = 0.5 (L/ry)	0.5(100x3/6.48)	23.13	OK

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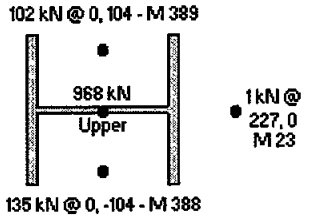
pb = Fn (py,λLT)	275, 23.13	275 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	992.1 x 275 ≤ 272.828 =	272.828 kN.m	

Columns in Simple Construction 4.7.7

Fc/Pc+Mx/Mbs+My/py.Zy	1121.848/2114.618+14.008/272.828+1.04/(275x307.5)	0.594	OK

COLUMNS IN SIMPLE CONSTRUCTION
Member 802 (B9) @ Level 1 in Load Case 1



Classification and Properties (BS 5950: 2000)

Section (73.08 kg/m)	254x254 UC 73 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	8.96, 23.29, 275, 1205.51, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Applied Factored Loads

Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	967.53+0.576+0+102.435+134.974+0	1205.514 kN
Mxo=Fx1.ex1	1x227	0.131 kN.m
Myo=Fy1.ey1-Fy2.ey2	102x104-135x104	3.394 kN.m
Mx=Mxo.(Ix/L)/(Ix/L+Ix.u/L.u)	0.131x(11414/3)/((11414/3)+(11414/2.9))	0.064 kN.m
My=Myo.(Iy/L)/(Iy/L+Iy.u/L.u)	3.394x(3915/3)/((3915/3)+(3915/2.9))	1.668 kN.m

Compression Resistance Pc

λx = Lex/rxx	100x1x3/11.07 =	27.1	OK
Pcx = Area.pcx	93.1x264.809/10 =	2465.372 kN	Table 24 b
λy = Ley/ryy	100x1x3/6.48 =	46.3	OK
Pcy = Area.pcy	93.1x227.13/10 =	2114.618 kN	Table 24 c

Buckling Resistance Moment Mbs

λLT = 0.5 (L/ry)	0.5(100x3/6.48)	23.13	OK
pb = Fn (py,λLT)	275, 23.13	275 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	992.1 x 275 ≤ 272.828 =	272.828 kN.m	

Columns in Simple Construction 4.7.7

Fc/Pc+Mx/Mbs+My/py.Zy	1205.514/2114.618+0.064/272.828+1.668/(275x307.5)	0.59	OK

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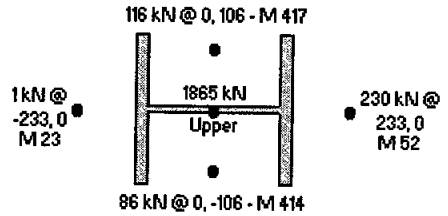
COLUMNS IN SIMPLE CONSTRUCTION
Member 803 (D9) @ Level 1 in Load Case 1



Classification and Properties (BS 5950: 2000)

Section (107.1 kg/m)	254x254 UC 107 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.31, 15.65, 265, 2298.43, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Applied Factored Loads

Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	1864.673+230.342+0.576+116.474+86.36+0	2298.425 kN
Mxo=Fx1.ex1-Fx2.ex2	230x233-1x233	53.616 kN.m
Myo=Fy1.ey1-Fy2.ey2	116x106-86x106	3.204 kN.m
Mx=Mxo.(Ix/L)/(Ix/L+Ix.u/L.u)	53.616x(17517/3)/((17517/3)+(17517/2.9))	26.354 kN.m
My=Myo.(Iy/L)/(Iy/L+Iy.u/L.u)	3.204x(5935/3)/((5935/3)+(5935/2.9))	1.575 kN.m

Compression Resistance Pc

λx = Lex/rxx	100x1x3/11.33 =	26.5	OK
Pcx = Area.pcx	136.38x256.151/10 =	3493.385 kN	Table 24 b
λy = Ley/ryy	100x1x3/6.6 =	45.5	OK
Pcy = Area.pcy	136.38x221.02/10 =	3014.313 kN	Table 24 c

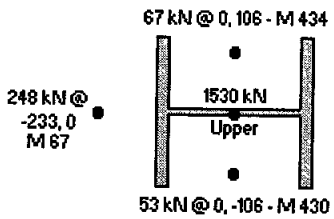
Buckling Resistance Moment Mbs

λLT = 0.5 (L/ry)	0.5(100x3/6.6)	22.74	OK
pb = Fn (py,λLT)	265, 22.74	265 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	1484.4 x 265 ≤ 393.366 =	393.366 kN.m	

Columns in Simple Construction 4.7.7

Fc/Pc+Mx/Mbs+My/py.Zy	2298.425/3014.313+26.354/393.366+1.575/(265x458.6)	0.842	OK

COLUMNS IN SIMPLE CONSTRUCTION
Member 804 (K9) @ Level 1 in Load Case 1



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Classification and Properties (BS 5950: 2000)

Section (107.1 kg/m)	254x254 UC 107 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.31, 15.65, 265, 1898.28, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Applied Factored Loads

Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	1529.815+0+247.685+67.485+53.297+0	1898.282 kN
Mxo=-Fx2.ex2	-248x233	57.797 kN.m
Myo=Fy1.ey1-Fy2.ey2	67x106-53x106	1.51 kN.m
Mx=Mxo.(Ix/L)/(Ix/L+Ix.u/L.u)	57.797x(17517/3)/((17517/3)+(17517/2.9))	28.409 kN.m
My=Myo.(Iy/L)/(Iy/L+Iy.u/L.u)	1.51x(5935/3)/((5935/3)+(5935/2.9))	0.742 kN.m

Compression Resistance Pc

λx = Lex/rxx	100x1x3/11.33 =	26.5	OK
Pcx = Area.pcx	136.38x256.151/10 =	3493.385 kN	Table 24 b
λy = Ley/ryy	100x1x3/6.6 =	45.5	OK
Pcy = Area.pcy	136.38x221.02/10 =	3014.313 kN	Table 24 c

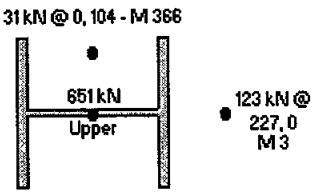
Buckling Resistance Moment Mbs

λLT = 0.5 (L/ry)	0.5(100x3/6.6)	22.74	OK
pb = Fn (py,λLT)	265, 22.74	265 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	1484.4 x 265 ≤ 393.366 =	393.366 kN.m	

Columns in Simple Construction 4.7.7

Fc/Pc+Mx/Mbs+My/py.Zy	1898.282/3014.313+28.409/393.366+0.742/(265x458.6)	0.708	OK

COLUMNS IN SIMPLE CONSTRUCTION
Member 805 (A8) @ Level 1 in Load Case 1



Classification and Properties (BS 5950: 2000)

Section (73.08 kg/m)	254x254 UC 73 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	8.96, 23.29, 275, 805.32, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Applied Factored Loads

Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	651.034+123.132+0+31.154+0+0	805.319 kN
Mxo=Fx1.ex1	123x227	27.957 kN.m
Myo=Fy1.ey1	31x104	3.249 kN.m
Mx=Mxo.(Ix/L)/(Ix/L+Ix.u/L.u)	27.957x(11414/3)/((11414/3)+(11414/2.9))	13.742 kN.m
My=Myo.(Iy/L)/(Iy/L+Iy.u/L.u)	3.249x(3915/3)/((3915/3)+(3915/2.9))	1.597 kN.m

Compression Resistance Pc

λx = Lex/rxx	100x1x3/11.07 =	27.1	OK
Pcx = Area.pcx	93.1x264.809/10 =	2465.372 kN	Table 24 b

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λy = Ley/ryy	100x1x3/6.48 =	46.3	OK
Pcy = Area.pcy	93.1x227.13/10 =	2114.618 kN	Table 24 c

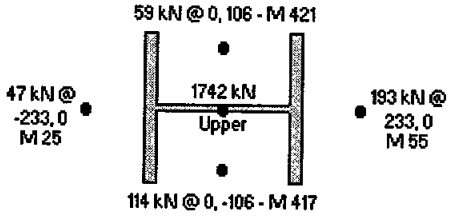
Buckling Resistance Moment Mbs

λLT = 0.5 (L/ry)	0.5(100x3/6.48)	23.13	OK
pb = Fn (py,λLT)	275, 23.13	275 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	992.1 x 275 ≤ 272.828 =	272.828 kN.m	

Columns in Simple Construction 4.7.7

Fc/Pc+Mx/Mbs+My/py.Zy	805.319/2114.618+13.742/272.828+1.597/(275x307.5)	0.45	OK

COLUMNS IN SIMPLE CONSTRUCTION
Member 807 (D8) @ Level 1 in Load Case 1



Classification and Properties (BS 5950: 2000)

Section (107.1 kg/m)	254x254 UC 107 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.31, 15.65, 265, 2155.52, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Applied Factored Loads

Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	1741.99+193.468+46.694+59.395+113.976+0	2155.523 kN
Mxo=Fx1.ex1-Fx2.ex2	193x233-47x233	34.25 kN.m
Myo=Fy1.ey1-Fy2.ey2	59x106-114x106	5.807 kN.m
Mx=Mxo.(Ix/L)/(Ix/L+Ix.u/L.u)	34.25x(17517/3)/((17517/3)+(17517/2.9))	16.835 kN.m
My=Myo.(Iy/L)/(Iy/L+Iy.u/L.u)	5.807x(5935/3)/((5935/3)+(5935/2.9))	2.855 kN.m

Compression Resistance Pc

λx = Lex/rxx	100x1x3/11.33 =	26.5	OK
Pcx = Area.pcx	136.38x256.151/10 =	3493.385 kN	Table 24 b
λy = Ley/ryy	100x1x3/6.6 =	45.5	OK
Pcy = Area.pcy	136.38x221.02/10 =	3014.313 kN	Table 24 c

Buckling Resistance Moment Mbs

λLT = 0.5 (L/ry)	0.5(100x3/6.6)	22.74	OK
pb = Fn (py,λLT)	265, 22.74	265 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	1484.4 x 265 ≤ 393.366 =	393.366 kN.m	

Columns in Simple Construction 4.7.7

Fc/Pc+Mx/Mbs+My/py.Zy	2155.523/3014.313+16.835/393.366+2.855/(265x458.6)	0.781	OK

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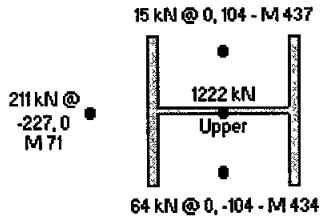
COLUMNS IN SIMPLE CONSTRUCTION
Member 808 (K8) @ Level 1 in Load Case 1



Classification and Properties (BS 5950: 2000)

Section (73.08 kg/m)	254x254 UC 73 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	8.96, 23.29, 275, 1512.9, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Applied Factored Loads

Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	1222.272+0+211.149+15.197+64.28+0	1512.898 kN
Mxo=-Fx2.ex2	-211x227	47.941 kN.m
Myo=Fy1.ey1-Fy2.ey2	15x104-64x104	5.119 kN.m
Mx=Mxo.(Ix/L)/(Ix/L+Ix.u/L.u)	47.941x(11414/3)/((11414/3)+(11414/2.9))	23.564 kN.m
My=Myo.(Iy/L)/(Iy/L+Iy.u/L.u)	5.119x(3915/3)/((3915/3)+(3915/2.9))	2.516 kN.m

Compression Resistance Pc

λx = Lex/rxx	100x1x3/11.07 =	27.1	OK
Pcx = Area.pcx	93.1x264.809/10 =	2465.372 kN	Table 24 b
λy = Ley/ryy	100x1x3/6.48 =	46.3	OK
Pcy = Area.pcy	93.1x227.13/10 =	2114.618 kN	Table 24 c

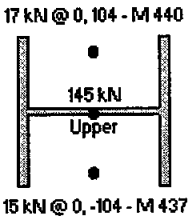
Buckling Resistance Moment Mbs

λLT = 0.5 (L/ry)	0.5(100x3/6.48)	23.13	OK
pb = Fn (py,λLT)	275, 23.13	275 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	992.1 x 275 ≤ 272.828 =	272.828 kN.m	

Columns in Simple Construction 4.7.7

Fc/Pc+Mx/Mbs+My/py.Zy	1512.898/2114.618+23.564/272.828+2.516/(275x307.5)	0.832	OK

COLUMNS IN SIMPLE CONSTRUCTION
Member 815 (N.33-N.130) @ Level 1 in Load Case 1



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Classification and Properties (BS 5950: 2000)

Section (73.08 kg/m)	254x254 UC 73 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	8.96, 23.29, 275, 177.22, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Applied Factored Loads

Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	145.288+0+0+17.432+14.503+0	177.223 kN
Myo=Fy1.ey1-Fy2.ey2	17x104-15x104	0.305 kN.m
My=Myo.(Iy/L)/(Iy/L+Iy.u/L.u)	0.305x(3915/3)/((3915/3)+(3915/2.9))	0.15 kN.m

Compression Resistance Pc

λx = Lex/rxx	100x1x3/11.07 =	27.1	OK
Pcx = Area.pcx	93.1x264.809/10 =	2465.372 kN	Table 24 b
λy = Ley/ryy	100x1x3/6.48 =	46.3	OK
Pcy = Area.pcy	93.1x227.13/10 =	2114.618 kN	Table 24 c

Buckling Resistance Moment Mbs

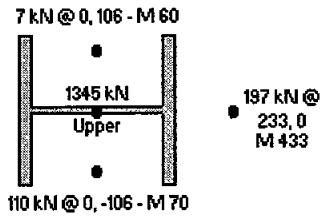
λLT = 0.5 (L/ry)	0.5(100x3/6.48)	23.13	OK
pb = Fn (py,λLT)	275, 23.13	275 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	992.1 x 275 ≤ 272.828 =	272.828 kN.m	

Columns in Simple Construction 4.7.7

Fc/Pc+Mx/Mbs+My/py.Zy	177.223/2114.618+0/272.828+0.15/(275x307.5)	0.086	OK

COLUMNS IN SIMPLE CONSTRUCTION

Member 816 (H5) @ Level 1 in Load Case 1



Classification and Properties (BS 5950: 2000)

Section (107.1 kg/m)	254x254 UC 107 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.31, 15.65, 265, 1657.51, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Applied Factored Loads

Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	1344.667+196.555+0+6.718+109.566+0	1657.506 kN
Mxo=Fx1.ex1	197x233	45.866 kN.m
Myo=Fy1.ey1-Fy2.ey2	7x106-110x106	10.943 kN.m
Mx=Mxo.(Ix/L)/(Ix/L+Ix.u/L.u)	45.866x(17517/3)/((17517/3)+(17517/2.9))	22.544 kN.m
My=Myo.(Iy/L)/(Iy/L+Iy.u/L.u)	10.943x(5935/3)/((5935/3)+(5935/2.9))	5.379 kN.m

Compression Resistance Pc

λx = Lex/rxx	100x1x3/11.33 =	26.5	OK
Pcx = Area.pcx	136.38x256.151/10 =	3493.385 kN	Table 24 b
λy = Ley/ryy	100x1x3/6.6 =	45.5	OK
Pcy = Area.pcy	136.38x221.02/10 =	3014.313 kN	Table 24 c

Buckling Resistance Moment Mbs

λLT = 0.5 (L/ry)	0.5(100x3/6.6)	22.74	OK

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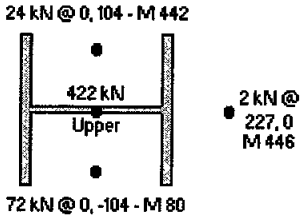
pb = Fn (py,λLT)	265, 22.74	265 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	1484.4 x 265 ≤ 393.366 =	393.366 kN.m	

Columns in Simple Construction 4.7.7

Fc/Pc+Mx/Mbs+My/py.Zy	1657.506/3014.313+22.544/393.366+5.379/(265x458.6)	0.651	OK

COLUMNS IN SIMPLE CONSTRUCTION
Member 819 (M6) @ Level 1 in Load Case 1



Classification and Properties (BS 5950: 2000)

Section (73.08 kg/m)	254x254 UC 73 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	8.96, 23.29, 275, 520.5, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Applied Factored Loads

Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	421.928+1.862+0+24.495+72.217+0	520.502 kN	
Mxo=Fx1.ex1	2x227	0.423 kN.m	
Myo=Fy1.ey1-Fy2.ey2	24x104-72x104	4.977 kN.m	
Mx=Mxo.(Ix/L)/(Ix/L+Ix.u/L.u)	0.423x(11414/3)/((11414/3)+(11414/2.9))	0.208 kN.m	
My=Myo.(Iy/L)/(Iy/L+Iy.u/L.u)	4.977x(3915/3)/((3915/3)+(3915/2.9))	2.447 kN.m	

Compression Resistance Pc

λx = Lex/rxx	100x1x3/11.07 =	27.1	OK
Pcx = Area.pcx	93.1x264.809/10 =	2465.372 kN	Table 24 b
λy = Ley/ryy	100x1x3/6.48 =	46.3	OK
Pcy = Area.pcy	93.1x227.13/10 =	2114.618 kN	Table 24 c

Buckling Resistance Moment Mbs

λLT = 0.5 (L/ry)	0.5(100x3/6.48)	23.13	OK
pb = Fn (py,λLT)	275, 23.13	275 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	992.1 x 275 ≤ 272.828 =	272.828 kN.m	

Columns in Simple Construction 4.7.7

Fc/Pc+Mx/Mbs+My/py.Zy	520.502/2114.618+0.208/272.828+2.447/(275x307.5)	0.276	OK

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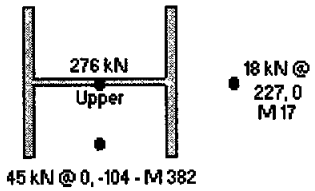
COLUMNS IN SIMPLE CONSTRUCTION
Member 821 (A2) @ Level 1 in Load Case 1



Classification and Properties (BS 5950: 2000)

Section (73.08 kg/m)	254x254 UC 73 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	8.96, 23.29, 275, 338.79, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Applied Factored Loads

Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	276.01+17.679+0+0+45.101+0	338.791 kN
Mxo=Fx1.ex1	18x227	4.014 kN.m
Myo=-Fy2.ey2	-45x104	4.704 kN.m
Mx=Mxo.(Ix/L)/(Ix/L+Ix.u/L.u)	4.014x(11414/3)/((11414/3)+(11414/2.9))	1.973 kN.m
My=Myo.(Iy/L)/(Iy/L+Iy.u/L.u)	4.704x(3915/3)/((3915/3)+(3915/2.9))	2.312 kN.m

Compression Resistance Pc

λx = Lex/rxx	100x1x3/11.07 =	27.1	OK
Pcx = Area.pcx	93.1x264.809/10 =	2465.372 kN	Table 24 b
λy = Ley/ryy	100x1x3/6.48 =	46.3	OK
Pcy = Area.pcy	93.1x227.13/10 =	2114.618 kN	Table 24 c

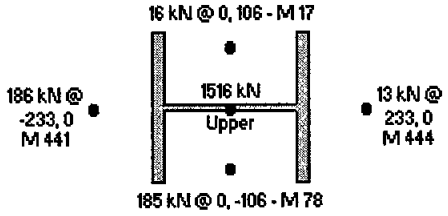
Buckling Resistance Moment Mbs

λLT = 0.5 (L/ry)	0.5(100x3/6.48)	23.13	OK
pb = Fn (py,λLT)	275, 23.13	275 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	992.1 x 275 ≤ 272.828 =	272.828 kN.m	

Columns in Simple Construction 4.7.7

Fc/Pc+Mx/Mbs+My/py.Zy	338.791/2114.618+1.973/272.828+2.312/(275x307.5)	0.195	OK

COLUMNS IN SIMPLE CONSTRUCTION
Member 822 (H2) @ Level 1 in Load Case 1



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Classification and Properties (BS 5950: 2000)

Section (107.1 kg/m)	254x254 UC 107 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.31, 15.65, 265, 1915.71, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Applied Factored Loads

Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	1516.259+12.822+185.914+15.737+184.98+0	1915.711 kN
Mxo=Fx1.ex1-Fx2.ex2	13x233-186x233	40.391 kN.m
Myo=Fy1.ey1-Fy2.ey2	16x106-185x106	18.007 kN.m
Mx=Mxo.(Ix/L)/(Ix/L+Ix.u/L.u)	40.391x(17517/3)/((17517/3)+(17517/2.9))	19.853 kN.m
My=Myo.(Iy/L)/(Iy/L+Iy.u/L.u)	18.007x(5935/3)/((5935/3)+(5935/2.9))	8.851 kN.m

Compression Resistance Pc

λx = Lex/rxx	100x1x3/11.33 =	26.5	OK
Pcx = Area.pcx	136.38x256.151/10 =	3493.385 kN	Table 24 b
λy = Ley/ryy	100x1x3/6.6 =	45.5	OK
Pcy = Area.pcy	136.38x221.02/10 =	3014.313 kN	Table 24 c

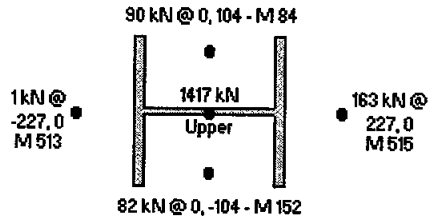
Buckling Resistance Moment Mbs

λLT = 0.5 (L/ry)	0.5(100x3/6.6)	22.74	OK
pb = Fn (py,λLT)	265, 22.74	265 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	1484.4 x 265 ≤ 393.366 =	393.366 kN.m	

Columns in Simple Construction 4.7.7

Fc/Pc+Mx/Mbs+My/py.Zy	1915.711/3014.313+19.853/393.366+8.851/(265x458.6)	0.759	OK

COLUMNS IN SIMPLE CONSTRUCTION
Member 823 (N3) @ Level 1 in Load Case 1



Classification and Properties (BS 5950: 2000)

Section (73.08 kg/m)	254x254 UC 73 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	8.96, 23.29, 275, 1753.35, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Applied Factored Loads

Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	1417.454+162.538+1.278+90.142+81.935+0	1753.347 kN
Mxo=Fx1.ex1-Fx2.ex2	163x227-1x227	36.614 kN.m
Myo=Fy1.ey1-Fy2.ey2	90x104-82x104	0.856 kN.m
Mx=Mxo.(Ix/L)/(Ix/L+Ix.u/L.u)	36.614x(11414/3)/((11414/3)+(11414/2.9))	17.997 kN.m
My=Myo.(Iy/L)/(Iy/L+Iy.u/L.u)	0.856x(3915/3)/((3915/3)+(3915/2.9))	0.421 kN.m

Compression Resistance Pc

λx = Lex/rxx	100x1x3/11.07 =	27.1	OK
Pcx = Area.pcx	93.1x264.809/10 =	2465.372 kN	Table 24 b
λy = Ley/ryy	100x1x3/6.48 =	46.3	OK
Pcy = Area.pcy	93.1x227.13/10 =	2114.618 kN	Table 24 c

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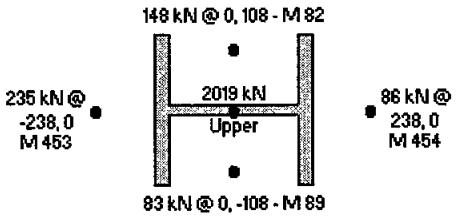
Buckling Resistance Moment Mbs

λLT = 0.5 (L/ry)	0.5(100x3/6.48)	23.13	OK
pb = Fn (py,λLT)	275, 23.13	275 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	992.1 x 275 ≤ 272.828 =	272.828 kN.m	

Columns in Simple Construction 4.7.7

Fc/Pc+Mx/Mbs+My/py.Zy	1753.347/2114.618+17.997/272.828+0.421/(275x307.5)	0.9	OK

COLUMNS IN SIMPLE CONSTRUCTION
Member 824 (M2) @ Level 1 in Load Case 1



Classification and Properties (BS 5950: 2000)

Section (132.0 kg/m)	254x254 UC 132 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	5.16, 13.09, 265, 2570.19, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Applied Factored Loads

Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	2018.744+86.149+234.591+147.771+82.938+0	2570.193 kN
Mxo=Fx1.ex1-Fx2.ex2	86x238-235x238	35.351 kN.m
Myo=Fy1.ey1-Fy2.ey2	148x108-83x108	6.979 kN.m
Mx=Mxo.(Ix/L)/(Ix/L+Ix.u/L.u)	35.351x(22536/3)/((22536/3)+(22536/2.9))	17.376 kN.m
My=Myo.(Iy/L)/(Iy/L+Iy.u/L.u)	6.979x(7538/3)/((7538/3)+(7538/2.9))	3.431 kN.m

Compression Resistance Pc

λx = Lex/rxx	100x1x3/11.58 =	25.9	OK
Pcx = Area.pcx	168.13x256.714/10 =	4316.125 kN	Table 24 b
λy = Ley/ryy	100x1x3/6.7 =	44.8	OK
Pcy = Area.pcy	168.13x222.17/10 =	3735.289 kN	Table 24 c

Buckling Resistance Moment Mbs

λLT = 0.5 (L/ry)	0.5(100x3/6.7)	22.4	OK
pb = Fn (py,λLT)	265, 22.4	265 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	1869.4 x 265 ≤ 495.391 =	495.391 kN.m	

Columns in Simple Construction 4.7.7

Fc/Pc+Mx/Mbs+My/py.Zy	2570.193/3735.289+17.376/495.391+3.431/(265x576.9)	0.746	OK

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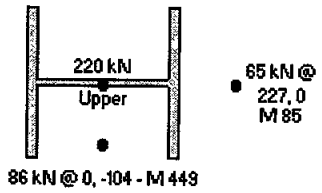
COLUMNS IN SIMPLE CONSTRUCTION
Member 825 (J1) @ Level 1 in Load Case 1



Classification and Properties (BS 5950: 2000)

Section (73.08 kg/m)	254x254 UC 73 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	8.96, 23.29, 275, 371.84, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Applied Factored Loads

Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	220.263+65.185+0+0+86.39+0	371.838 kN
Mxo=Fx1.ex1	65x227	14.8 kN.m
Myo=-Fy2.ey2	-86x104	9.01 kN.m
Mx=Mxo.(Ix/L)/(Ix/L+Ix.u/L.u)	14.8x(11414/3)/((11414/3)+(11414/2.9))	7.275 kN.m
My=Myo.(Iy/L)/(Iy/L+Iy.u/L.u)	9.01x(3915/3)/((3915/3)+(3915/2.9))	4.429 kN.m

Compression Resistance Pc

λx = Lex/rxx	100x1x3/11.07 =	27.1	OK
Pcx = Area.pcx	93.1x264.809/10 =	2465.372 kN	Table 24 b
λy = Ley/ryy	100x1x3/6.48 =	46.3	OK
Pcy = Area.pcy	93.1x227.13/10 =	2114.618 kN	Table 24 c

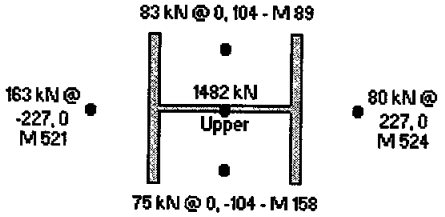
Buckling Resistance Moment Mbs

λLT = 0.5 (L/ry)	0.5(100x3/6.48)	23.13	OK
pb = Fn (py,λLT)	275, 23.13	275 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	992.1 x 275 ≤ 272.828 =	272.828 kN.m	

Columns in Simple Construction 4.7.7

Fc/Pc+Mx/Mbs+My/py.Zy	371.838/2114.618+7.275/272.828+4.429/(275x307.5)	0.255	OK

COLUMNS IN SIMPLE CONSTRUCTION
Member 826 (N2) @ Level 1 in Load Case 1



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Classification and Properties (BS 5950: 2000)

Section (73.08 kg/m)	254x254 UC 73 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	8.96, 23.29, 275, 1883.4, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Applied Factored Loads

Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	1482.303+80.465+162.6+82.938+75.091+0	1883.397 kN
Mxo=Fx1.ex1-Fx2.ex2	80x227-163x227	18.649 kN.m
Myo=Fy1.ey1-Fy2.ey2	83x104-75x104	0.818 kN.m
Mx=Mxo.(Ix/L)/(Ix/L+Ix.u/L.u)	18.649x(11414/3)/((11414/3)+(11414/2.9))	9.166 kN.m
My=Myo.(Iy/L)/(Iy/L+Iy.u/L.u)	0.818x(3915/3)/((3915/3)+(3915/2.9))	0.402 kN.m

Compression Resistance Pc

λx = Lex/rxx	100x1x3/11.07 =	27.1	OK
Pcx = Area.pcx	93.1x264.809/10 =	2465.372 kN	Table 24 b
λy = Ley/ryy	100x1x3/6.48 =	46.3	OK
Pcy = Area.pcy	93.1x227.13/10 =	2114.618 kN	Table 24 c

Buckling Resistance Moment Mbs

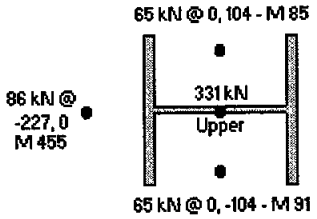
λLT = 0.5 (L/ry)	0.5(100x3/6.48)	23.13	OK
pb = Fn (py,λLT)	275, 23.13	275 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	992.1 x 275 ≤ 272.828 =	272.828 kN.m	

Columns in Simple Construction 4.7.7

Fc/Pc+Mx/Mbs+My/py.Zy	1883.397/2114.618+9.166/272.828+0.402/(275x307.5)	0.929	OK

COLUMNS IN SIMPLE CONSTRUCTION

Member 827 (M1) @ Level 1 in Load Case 1



Classification and Properties (BS 5950: 2000)

Section (73.08 kg/m)	254x254 UC 73 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	8.96, 23.29, 275, 547.25, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Applied Factored Loads

Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	330.947+0+86.182+64.932+65.191+0	547.251 kN
Mxo=-Fx2.ex2	-86x227	19.568 kN.m
Myo=Fy1.ey1-Fy2.ey2	65x104-65x104	0.027 kN.m
Mx=Mxo.(Ix/L)/(Ix/L+Ix.u/L.u)	19.568x(11414/3)/((11414/3)+(11414/2.9))	9.618 kN.m
My=Myo.(Iy/L)/(Iy/L+Iy.u/L.u)	0.027x(3915/3)/((3915/3)+(3915/2.9))	0.013 kN.m

Compression Resistance Pc

λx = Lex/rxx	100x1x3/11.07 =	27.1	OK
Pcx = Area.pcx	93.1x264.809/10 =	2465.372 kN	Table 24 b
λy = Ley/ryy	100x1x3/6.48 =	46.3	OK
Pcy = Area.pcy	93.1x227.13/10 =	2114.618 kN	Table 24 c

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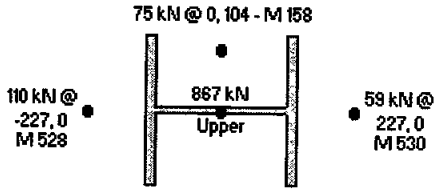
Buckling Resistance Moment Mbs

λLT = 0.5 (L/ry)	0.5(100x3/6.48)	23.13	OK
pb = Fn (py,λLT)	275, 23.13	275 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	992.1 x 275 ≤ 272.828 =	272.828 kN.m	

Columns in Simple Construction 4.7.7

Fc/Pc+Mx/Mbs+My/py.Zy	547.251/2114.618+9.618/272.828+0.013/(275x307.5)	0.294	OK

COLUMNS IN SIMPLE CONSTRUCTION
Member 828 (Q2) @ Level 1 in Load Case 1



Classification and Properties (BS 5950: 2000)

Section (73.08 kg/m)	254x254 UC 73 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	8.96, 23.29, 275, 1111.46, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Applied Factored Loads

Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	867.049+59.448+109.873+75.091+0+0	1111.462 kN
Mxo=Fx1.ex1-Fx2.ex2	59x227-110x227	11.449 kN.m
Myo=Fy1.ey1	75x104	7.832 kN.m
Mx=Mxo.(Ix/L)/(Ix/L+Ix.u/L.u)	11.449x(11414/3)/((11414/3)+(11414/2.9))	5.627 kN.m
My=Myo.(Iy/L)/(Iy/L+Iy.u/L.u)	7.832x(3915/3)/((3915/3)+(3915/2.9))	3.85 kN.m

Compression Resistance Pc

λx = Lex/rxx	100x1x3/11.07 =	27.1	OK
Pcx = Area.pcx	93.1x264.809/10 =	2465.372 kN	Table 24 b
λy = Ley/ryy	100x1x3/6.48 =	46.3	OK
Pcy = Area.pcy	93.1x227.13/10 =	2114.618 kN	Table 24 c

Buckling Resistance Moment Mbs

λLT = 0.5 (L/ry)	0.5(100x3/6.48)	23.13	OK
pb = Fn (py,λLT)	275, 23.13	275 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	992.1 x 275 ≤ 272.828 =	272.828 kN.m	

Columns in Simple Construction 4.7.7

Fc/Pc+Mx/Mbs+My/py.Zy	1111.462/2114.618+5.627/272.828+3.85/(275x307.5)	0.592	OK

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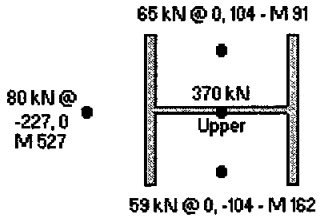
COLUMNS IN SIMPLE CONSTRUCTION
Member 829 (N1) @ Level 1 in Load Case 1



Classification and Properties (BS 5950: 2000)

Section (73.08 kg/m)	254x254 UC 73 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	8.96, 23.29, 275, 574.79, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Applied Factored Loads

Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	370.314+0+80.482+65.191+58.8+0	574.787 kN
Mxo=-Fx2.ex2	-80x227	18.274 kN.m
Myo=Fy1.ey1-Fy2.ey2	65x104-59x104	0.667 kN.m
Mx=Mxo.(Ix/L)/(Ix/L+Ix.u/L.u)	18.274x(11414/3)/((11414/3)+(11414/2.9))	8.982 kN.m
My=Myo.(Iy/L)/(Iy/L+Iy.u/L.u)	0.667x(3915/3)/((3915/3)+(3915/2.9))	0.328 kN.m

Compression Resistance Pc

λx = Lex/rxx	100x1x3/11.07 =	27.1	OK
Pcx = Area.pcx	93.1x264.809/10 =	2465.372 kN	Table 24 b
λy = Ley/ryy	100x1x3/6.48 =	46.3	OK
Pcy = Area.pcy	93.1x227.13/10 =	2114.618 kN	Table 24 c

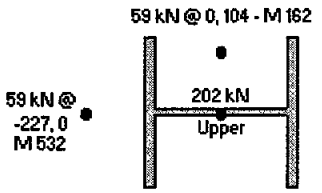
Buckling Resistance Moment Mbs

λLT = 0.5 (L/ry)	0.5(100x3/6.48)	23.13	OK
pb = Fn (py,λLT)	275, 23.13	275 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	992.1 x 275 ≤ 272.828 =	272.828 kN.m	

Columns in Simple Construction 4.7.7

Fc/Pc+Mx/Mbs+My/py.Zy	574.787/2114.618+8.982/272.828+0.328/(275x307.5)	0.309	OK

COLUMNS IN SIMPLE CONSTRUCTION
Member 830 (Q1) @ Level 1 in Load Case 1



Classification and Properties (BS 5950: 2000)

Section (73.08 kg/m)	254x254 UC 73 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	8.96, 23.29, 275, 320.41, 0, 0	(Axial: Non-Slender)	Plastic

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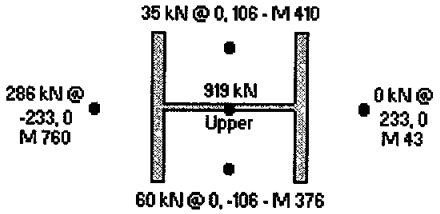
Auto Design Load Cases	1-2, 6-7 and 9		
Applied Factored Loads			
Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	202.17+0+59.44+58.8+0+0	320.411 kN	
Mxo=-Fx2.ex2	-59x227	13.496 kN.m	
Myo=Fy1.ey1	59x104	6.133 kN.m	
Mx=Mxo.(Ix/L)/(Ix/L+Ix.u/L.u)	13.496x(11414/3)/((11414/3)+(11414/2.9))	6.634 kN.m	
My=Myo.(Iy/L)/(Iy/L+Iy.u/L.u)	6.133x(3915/3)/((3915/3)+(3915/2.9))	3.014 kN.m	
Compression Resistance Pc			
λx = Lex/rxx	100x1x3/11.07 =	27.1	OK
Pcx = Area.pcx	93.1x264.809/10 =	2465.372 kN	Table 24 b
λy = Ley/ryy	100x1x3/6.48 =	46.3	OK
Pcy = Area.pcy	93.1x227.13/10 =	2114.618 kN	Table 24 c
Buckling Resistance Moment Mbs			
λLT = 0.5 (L/ry)	0.5(100x3/6.48)	23.13	OK
pb = Fn (py,λLT)	275, 23.13	275 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	992.1 x 275 ≤ 272.828 =	272.828 kN.m	
Columns in Simple Construction 4.7.7			
Fc/Pc+Mx/Mbs+My/py.Zy	320.411/2114.618+6.634/272.828+3.014/(275x307.5)	0.211	OK

COLUMNS IN SIMPLE CONSTRUCTION
Member 840 (N.69-N.94) @ Level 1 in Load Case 9



Classification and Properties (BS 5950: 2000)			
Section (107.1 kg/m)	254x254 UC 107 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	6.31, 15.65, 265, 1299.84, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		
Applied Factored Loads			
Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	918.537+0.336+285.777+35.109+60.083+0	1299.841 kN	
Mxo=Fx1.ex1-Fx2.ex2	0x233-286x233	66.608 kN.m	
Myo=Fy1.ey1-Fy2.ey2	35x106-60x106	2.657 kN.m	
Mx=Mxo.(Ix/L)/(Ix/L+Ix.u/L.u)	66.608x(17517/3)/((17517/3)+(17517/2.9))	32.739 kN.m	
My=Myo.(Iy/L)/(Iy/L+Iy.u/L.u)	2.657x(5935/3)/((5935/3)+(5935/2.9))	1.306 kN.m	
Compression Resistance Pc			
λx = Lex/rxx	100x1x3/11.33 =	26.5	OK
Pcx = Area.pcx	136.38x256.151/10 =	3493.385 kN	Table 24 b
λy = Ley/ryy	100x1x3/6.6 =	45.5	OK
Pcy = Area.pcy	136.38x221.02/10 =	3014.313 kN	Table 24 c
Buckling Resistance Moment Mbs			
λLT = 0.5 (L/ry)	0.5(100x3/6.6)	22.74	OK

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pb = Fn (py,λLT)	265, 22.74	265 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	1484.4 x 265 ≤ 393.366 =	393.366 kN.m	

Columns in Simple Construction 4.7.7

Fc/Pc+Mx/Mbs+My/py.Zy	1299.841/3014.313+32.739/393.366+1.306/(265x458.6)	0.525	OK

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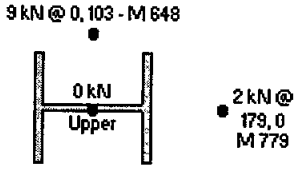
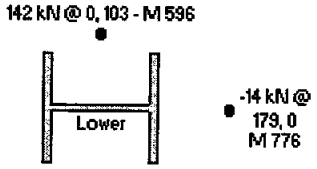
DESIGN OF COLUMNS AT ROOF LEVEL [LEVEL 6]

COLUMNS IN SIMPLE CONSTRUCTION
Member 943 (B12) @ Level 6 in Load Case 1





Classification and Properties (BS 5950: 2000)

Section (30.03 kg/m)	152x152 UC 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	8.13, 19.02, 275, 11.36, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Applied Factored Loads

Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	0.389+1.61+0+9.365+0+0	11.363 kN	
MxU=Fx1.ex1	2x179	0.288 kN.m	
MyU=Fy1.ey1	9x103	0.967 kN.m	
MxoL=Fx1.ex1	-14x179	2.529 kN.m	
MyoL=Fy1.ey1	142x103	14.708 kN.m	
MxL=Mxo.(Ix/L)/(Ix/L+Ix.l/L.l)	2.529x(1749/2.9)/((1749/2.9)+(11414/2.9))	0.336 kN.m	
MyL=Myo.(Iy/L)/(Iy/L+Iy.l/L.l)	14.708x(561/2.9)/((561/2.9)+(3915/2.9))	1.845 kN.m	
Mx=Max(MxU,MxL)	0.288, 0.336	0.336 kN.m	
My=Max(MyU,MyL)	0.967, 1.845	1.845 kN.m	

Compression Resistance Pc

λx = Lex/rxx	100x1x2.9/6.76 =	42.9	OK
Pcx = Area.pcx	38.26x246.395/10 =	942.706 kN	Table 24 b
λy = Ley/ryy	100x1x2.9/3.83 =	75.7	OK
Pcy = Area.pcy	38.26x169.73/10 =	649.375 kN	Table 24 c

Buckling Resistance Moment Mbs

λLT = 0.5 (L/ry)	0.5(100x2.9/3.83)	37.85	OK
pb = Fn (py,λLT)	275, 37.85	266.84 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	247.7 x 266.84 ≤ 68.118 =	66.096 kN.m	

Columns in Simple Construction 4.7.7

Fc/Pc+Mx/Mbs+My/py.Zy	11.363/649.375+0.336/66.096+1.845/(275x73.4)	0.114	OK

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COLUMNS IN SIMPLE CONSTRUCTION
Member 946 (A8) @ Level 6 in Load Case 1

Classification and Properties (BS 5950: 2000)

Section (30.03 kg/m)	152x152 UC 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	8.13, 19.02, 275, 20.52, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Applied Factored Loads

Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	0+17.559+0+2.958+0+0	20.517 kN
MxU=Fx1.ex1	18x179	3.14 kN.m
MyU=Fy1.ey1	3x103	0.305 kN.m
MxoL=Fx1.ex1	122x179	21.815 kN.m
MyoL=Fy1.ey1	33x103	3.362 kN.m
MxL=Mxo.(Ix/L)/(Ix/L+Ix.l/L.l)	21.815x(1749/2.9)/((1749/2.9)+(11414/2.9))	2.898 kN.m
MyL=Myo.(Iy/L)/(Iy/L+Iy.l/L.l)	3.362x(561/2.9)/((561/2.9)+(3915/2.9))	0.422 kN.m
Mx=Max(MxU,MxL)	3.14, 2.898	3.14 kN.m
My=Max(MyU,MyL)	0.305, 0.422	0.422 kN.m

Compression Resistance Pc

λx = Lex/rxx	100x1x2.9/6.76 =	42.9	OK
Pcx = Area.pcx	38.26x246.395/10 =	942.706 kN	Table 24 b
λy = Ley/ryy	100x1x2.9/3.83 =	75.7	OK
Pcy = Area.pcy	38.26x169.73/10 =	649.375 kN	Table 24 c

Buckling Resistance Moment Mbs

λLT = 0.5 (L/ry)	0.5(100x2.9/3.83)	37.85	OK
pb = Fn (py,λLT)	275, 37.85	266.84 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	247.7 x 266.84 ≤ 68.118 =	66.096 kN.m	

Columns in Simple Construction 4.7.7

Fc/Pc+Mx/Mbs+My/py.Zy	20.517/649.375+3.14/66.096+0.422/(275x73.4)	0.1	OK

COLUMNS IN SIMPLE CONSTRUCTION
Member 961 (B9) @ Level 6 in Load Case 1

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Classification and Properties (BS 5950: 2000)

Section (30.03 kg/m)	152x152 UC 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	8.13, 19.02, 275, 1.26, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Applied Factored Loads

Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	0+-22.662+0+12.247+11.676+0	1.261 kN
MxU=Fx1.ex1	-23x179	4.052 kN.m
MyU=Fy1.ey1-Fy2.ey2	12x103-12x103	0.059 kN.m
MxoL=Fx1.ex1	1x179	0.103 kN.m
MyoL=Fy1.ey1-Fy2.ey2	104x103-135x103	3.234 kN.m
MxL=Mxo.(Ix/L)/(Ix/L+Ix.l/L.l)	0.103x(1749/2.9)/((1749/2.9)+(11414/2.9))	0.014 kN.m
MyL=Myo.(Iy/L)/(Iy/L+Iy.l/L.l)	3.234x(561/2.9)/((561/2.9)+(3915/2.9))	0.406 kN.m
Mx=Max(MxU,MxL)	4.052, 0.014	4.052 kN.m
My=Max(MyU,MyL)	0.059, 0.406	0.406 kN.m

Compression Resistance Pc

λx = Lex/rxx	100x1x2.9/6.76 =	42.9	OK
Pcx = Area.pcx	38.26x246.395/10 =	942.706 kN	Table 24 b
λy = Ley/ryy	100x1x2.9/3.83 =	75.7	OK
Pcy = Area.pcy	38.26x169.73/10 =	649.375 kN	Table 24 c

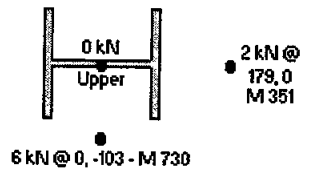
Buckling Resistance Moment Mbs

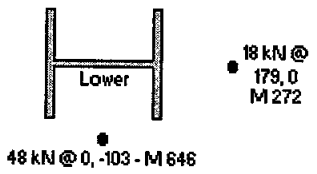
λLT = 0.5 (L/ry)	0.5(100x2.9/3.83)	37.85	OK
pb = Fn (py,λLT)	275, 37.85	266.84 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	247.7 x 266.84 ≤ 68.118 =	66.096 kN.m	

Columns in Simple Construction 4.7.7

Fc/Pc+Mx/Mbs+My/py.Zy	1.261/649.375+4.052/66.096+0.406/(275x73.4)	0.083	OK

COLUMNS IN SIMPLE CONSTRUCTION
Member 973 (A2) @ Level 6 in Load Case 1





Classification and Properties (BS 5950: 2000)

Section (30.03 kg/m)	152x152 UC 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	8.13, 19.02, 275, 8.61, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Applied Factored Loads

Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	0+2.223+0+0+6.392+0	8.615 kN
MxU=Fx1.ex1	2x179	0.397 kN.m
MyU=-Fy2.ey2	-6x103	0.66 kN.m
MxoL=Fx1.ex1	18x179	3.161 kN.m
MyoL=-Fy2.ey2	-48x103	4.99 kN.m

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MxL=Mxo.(Ix/L)/(Ix/L+Ix.l/L.l)	3.161x(1749/2.9)/((1749/2.9)+(11414/2.9))	0.42 kN.m	
MyL=Myo.(Iy/L)/(Iy/L+Iy.l/L.l)	4.99x(561/2.9)/((561/2.9)+(3915/2.9))	0.626 kN.m	
Mx=Max(MxU,MxL)	0.397, 0.42	0.42 kN.m	
My=Max(MyU,MyL)	0.66, 0.626	0.66 kN.m	

Compression Resistance Pc

λx = Lex/rxx	100x1x2.9/6.76 =	42.9	OK
Pcx = Area.pcx	38.26x246.395/10 =	942.706 kN	Table 24 b
λy = Ley/ryy	100x1x2.9/3.83 =	75.7	OK
Pcy = Area.pcy	38.26x169.73/10 =	649.375 kN	Table 24 c

Buckling Resistance Moment Mbs

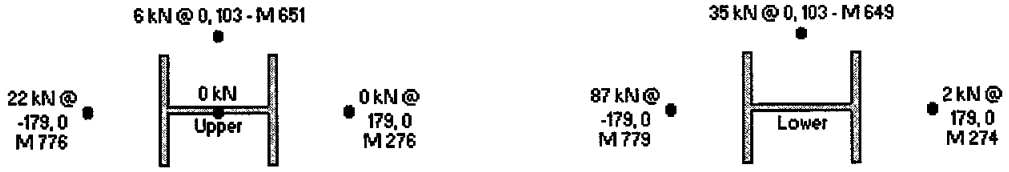
λLT = 0.5 (L/ry)	0.5(100x2.9/3.83)	37.85	OK
pb = Fn (py,λLT)	275, 37.85	266.84 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	247.7 x 266.84 ≤ 68.118 =	66.096 kN.m	

Columns in Simple Construction 4.7.7

Fc/Pc+Mx/Mbs+My/py.Zy	8.615/649.375+0.42/66.096+0.66/(275x73.4)	0.052	OK

COLUMNS IN SIMPLE CONSTRUCTION

Member 974 (N.385-N.387) @ Level 6 in Load Case 9



Classification and Properties (BS 5950: 2000)

Section (30.03 kg/m)	152x152 UC 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	8.13, 19.02, 275, 27.69, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Applied Factored Loads

Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	0+-0.439+22.024+6.107+0+0	27.693 kN
MxU=Fx1.ex1-Fx2.ex2	0x179-22x179	4.016 kN.m
MyU=Fy1.ey1	6x103	0.631 kN.m
MxoL=Fx1.ex1-Fx2.ex2	2x179-87x179	15.222 kN.m
MyoL=Fy1.ey1	35x103	3.625 kN.m
MxL=Mxo.(Ix/L)/(Ix/L+Ix.l/L.l)	15.222x(1749/2.9)/((1749/2.9)+(17517/2.9))	1.382 kN.m
MyL=Myo.(Iy/L)/(Iy/L+Iy.l/L.l)	3.625x(561/2.9)/((561/2.9)+(5935/2.9))	0.313 kN.m
Mx=Max(MxU,MxL)	4.016, 1.382	4.016 kN.m
My=Max(MyU,MyL)	0.631, 0.313	0.631 kN.m

Compression Resistance Pc

λx = Lex/rxx	100x1x2.9/6.76 =	42.9	OK
Pcx = Area.pcx	38.26x246.395/10 =	942.706 kN	Table 24 b
λy = Ley/ryy	100x1x2.9/3.83 =	75.7	OK
Pcy = Area.pcy	38.26x169.73/10 =	649.375 kN	Table 24 c

Buckling Resistance Moment Mbs

λLT = 0.5 (L/ry)	0.5(100x2.9/3.83)	37.85	OK

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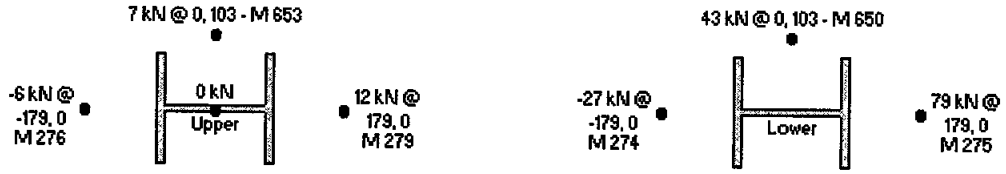
pb = Fn (py,λLT)	275, 37.85	266.84 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	247.7 x 266.84 ≤ 68.118 =	66.096 kN.m	

Columns in Simple Construction 4.7.7

Fc/Pc+Mx/Mbs+My/py.Zy	27.693/649.375+4.016/66.096+0.631/(275x73.4)	0.135	OK

COLUMNS IN SIMPLE CONSTRUCTION
Member 975 (E12) @ Level 6 in Load Case 1



Classification and Properties (BS 5950: 2000)

Section (30.03 kg/m)	152x152 UC 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	8.13, 19.02, 275, 12.81, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Applied Factored Loads

Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	0+11.623+-6.104+7.288+0+0	12.808 kN
MxU=Fx1.ex1-Fx2.ex2	12x179--6x179	3.17 kN.m
MyU=Fy1.ey1	7x103	0.752 kN.m
MxoL=Fx1.ex1-Fx2.ex2	79x179--27x179	19.009 kN.m
MyoL=Fy1.ey1	43x103	4.468 kN.m
MxL=Mxo.(Ix/L)/(Ix/L+Ix.l/L.l)	19.009x(1749/2.9)/((1749/2.9)+(11414/2.9))	2.526 kN.m
MyL=Myo.(Iy/L)/(Iy/L+Iy.l/L.l)	4.468x(561/2.9)/((561/2.9)+(3915/2.9))	0.56 kN.m
Mx=Max(MxU,MxL)	3.17, 2.526	3.17 kN.m
My=Max(MyU,MyL)	0.752, 0.56	0.752 kN.m

Compression Resistance Pc

λx = Lex/rxx	100x1x2.9/6.76 =	42.9	OK
Pcx = Area.pcx	38.26x246.395/10 =	942.706 kN	Table 24 b
λy = Ley/ryy	100x1x2.9/3.83 =	75.7	OK
Pcy = Area.pcy	38.26x169.73/10 =	649.375 kN	Table 24 c

Buckling Resistance Moment Mbs

λLT = 0.5 (L/ry)	0.5(100x2.9/3.83)	37.85	OK
pb = Fn (py,λLT)	275, 37.85	266.84 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	247.7 x 266.84 ≤ 68.118 =	66.096 kN.m	

Columns in Simple Construction 4.7.7

Fc/Pc+Mx/Mbs+My/py.Zy	12.808/649.375+3.17/66.096+0.752/(275x73.4)	0.105	OK

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COLUMNS IN SIMPLE CONSTRUCTION
Member 976 (E10) @ Level 6 in Load Case 1

Classification and Properties (BS 5950: 2000)

Section (30.03 kg/m)	152x152 UC 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	8.13, 19.02, 275, 81.58, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Applied Factored Loads

Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	0+42.402+31.894+0+7.288+0	81.584 kN
MxU=Fx1.ex1-Fx2.ex2	42x179-32x179	1.879 kN.m
MyU=-Fy2.ey2	-7x103	0.752 kN.m
MxoL=Fx1.ex1-Fx2.ex2	172x179-84x179	15.658 kN.m
MyoL=-Fy2.ey2	-43x103	4.468 kN.m
MxL=Mxo.(Ix/L)/(Ix/L+Ix.l/L.l)	15.658x(1749/2.9)/((1749/2.9)+(11414/2.9))	2.08 kN.m
MyL=Myo.(Iy/L)/(Iy/L+Iy.l/L.l)	4.468x(561/2.9)/((561/2.9)+(3915/2.9))	0.56 kN.m
Mx=Max(MxU,MxL)	1.879, 2.08	2.08 kN.m
My=Max(MyU,MyL)	0.752, 0.56	0.752 kN.m

Compression Resistance Pc

λx = Lex/rxx	100x1x2.9/6.76 =	42.9	OK
Pcx = Area.pcx	38.26x246.395/10 =	942.706 kN	Table 24 b
λy = Ley/ryy	100x1x2.9/3.83 =	75.7	OK
Pcy = Area.pcy	38.26x169.73/10 =	649.375 kN	Table 24 c

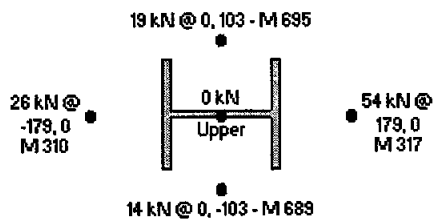
Buckling Resistance Moment Mbs

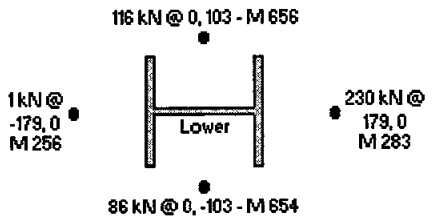
λLT = 0.5 (L/ry)	0.5(100x2.9/3.83)	37.85	OK
pb = Fn (py,λLT)	275, 37.85	266.84 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	247.7 x 266.84 ≤ 68.118 =	66.096 kN.m	

Columns in Simple Construction 4.7.7

Fc/Pc+Mx/Mbs+My/py.Zy	81.584/649.375+2.08/66.096+0.752/(275x73.4)	0.194	OK

COLUMNS IN SIMPLE CONSTRUCTION
Member 977 (D9) @ Level 6 in Load Case 1





Classification and Properties (BS 5950: 2000)

Section (30.03 kg/m)	152x152 UC 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	8.13, 19.02, 275, 112.89, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

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Applied Factored Loads

Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	0+53.584+25.963+19.236+14.102+0	112.885 kN	
MxU=Fx1.ex1-Fx2.ex2	54x179-26x179	4.939 kN.m	
MyU=Fy1.ey1-Fy2.ey2	19x103-14x103	0.53 kN.m	
MxoL=Fx1.ex1-Fx2.ex2	230x179-1x179	40.981 kN.m	
MyoL=Fy1.ey1-Fy2.ey2	116x103-86x103	3.109 kN.m	
MxL=Mxo.(Ix/L)/(Ix/L+Ix.l/L.l)	40.981x(1749/2.9)/((1749/2.9)+(17517/2.9))	3.72 kN.m	
MyL=Myo.(Iy/L)/(Iy/L+Iy.l/L.l)	3.109x(561/2.9)/((561/2.9)+(5935/2.9))	0.269 kN.m	
Mx=Max(MxU,MxL)	4.939, 3.72	4.939 kN.m	
My=Max(MyU,MyL)	0.53, 0.269	0.53 kN.m	

Compression Resistance Pc

λx = Lex/rxx	100x1x2.9/6.76 =	42.9	OK
Pcx = Area.pcx	38.26x246.395/10 =	942.706 kN	Table 24 b
λy = Ley/ryy	100x1x2.9/3.83 =	75.7	OK
Pcy = Area.pcy	38.26x169.73/10 =	649.375 kN	Table 24 c

Buckling Resistance Moment Mbs

λLT = 0.5 (L/ry)	0.5(100x2.9/3.83)	37.85	OK
pb = Fn (py,λLT)	275, 37.85	266.84 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	247.7 x 266.84 ≤ 68.118 =	66.096 kN.m	

Columns in Simple Construction 4.7.7

Fc/Pc+Mx/Mbs+My/py.Zy	112.885/649.375+4.939/66.096+0.53/(275x73.4)	0.275	OK

COLUMNS IN SIMPLE CONSTRUCTION

Member 978 (K12) @ Level 6 in Load Case 1

Classification and Properties (BS 5950: 2000)

Section (30.03 kg/m)	152x152 UC 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	8.13, 19.02, 275, 23.26, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Applied Factored Loads

Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	0+0+11.245+12.017+0+0	23.263 kN
MxU=-Fx2.ex2	-11x179	2.011 kN.m
MyU=Fy1.ey1	12x103	1.241 kN.m
MxoL=-Fx2.ex2	-77x179	13.787 kN.m
MyoL=Fy1.ey1	38x103	3.94 kN.m
MxL=Mxo.(Ix/L)/(Ix/L+Ix.l/L.l)	13.787x(1749/2.9)/((1749/2.9)+(11414/2.9))	1.832 kN.m
MyL=Myo.(Iy/L)/(Iy/L+Iy.l/L.l)	3.94x(561/2.9)/((561/2.9)+(3915/2.9))	0.494 kN.m
Mx=Max(MxU,MxL)	2.011, 1.832	2.011 kN.m
My=Max(MyU,MyL)	1.241, 0.494	1.241 kN.m

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Compression Resistance Pc

λx = Lex/rxx	100x1x2.9/6.76 =	42.9	OK
Pcx = Area.pcx	38.26x246.395/10 =	942.706 kN	Table 24 b
λy = Ley/ryy	100x1x2.9/3.83 =	75.7	OK
Pcy = Area.pcy	38.26x169.73/10 =	649.375 kN	Table 24 c

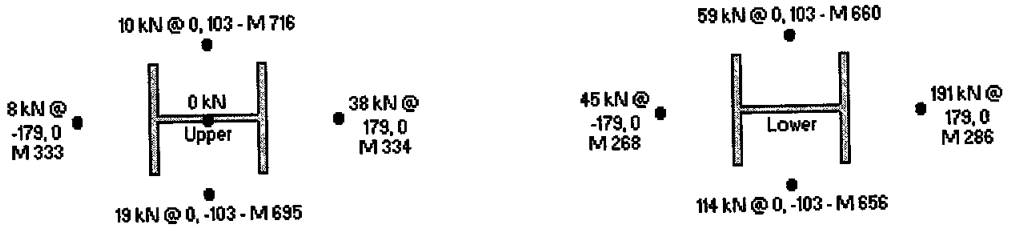
Buckling Resistance Moment Mbs

λLT = 0.5 (L/ry)	0.5(100x2.9/3.83)	37.85	OK
pb = Fn (py,λLT)	275, 37.85	266.84 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	247.7 x 266.84 ≤ 68.118 =	66.096 kN.m	

Columns in Simple Construction 4.7.7

Fc/Pc+Mx/Mbs+My/py.Zy	23.263/649.375+2.011/66.096+1.241/(275x73.4)	0.128	OK

COLUMNS IN SIMPLE CONSTRUCTION
Member 979 (D8) @ Level 6 in Load Case 1



Classification and Properties (BS 5950: 2000)

Section (30.03 kg/m)	152x152 UC 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	8.13, 19.02, 275, 74.55, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Applied Factored Loads

Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	0+37.685+8.076+9.953+18.842+0	74.555 kN
MxU=Fx1.ex1-Fx2.ex2	38x179-8x179	5.294 kN.m
MyU=Fy1.ey1-Fy2.ey2	10x103-19x103	0.918 kN.m
MxoL=Fx1.ex1-Fx2.ex2	191x179-45x179	26.093 kN.m
MyoL=Fy1.ey1-Fy2.ey2	59x103-114x103	5.636 kN.m
MxL=Mxo.(Ix/L)/(Ix/L+Ix.l/L.l)	26.093x(1749/2.9)/((1749/2.9)+(17517/2.9))	2.369 kN.m
MyL=Myo.(Iy/L)/(Iy/L+Iy.l/L.l)	5.636x(561/2.9)/((561/2.9)+(5935/2.9))	0.487 kN.m
Mx=Max(MxU,MxL)	5.294, 2.369	5.294 kN.m
My=Max(MyU,MyL)	0.918, 0.487	0.918 kN.m

Compression Resistance Pc

λx = Lex/rxx	100x1x2.9/6.76 =	42.9	OK
Pcx = Area.pcx	38.26x246.395/10 =	942.706 kN	Table 24 b
λy = Ley/ryy	100x1x2.9/3.83 =	75.7	OK
Pcy = Area.pcy	38.26x169.73/10 =	649.375 kN	Table 24 c

Buckling Resistance Moment Mbs

λLT = 0.5 (L/ry)	0.5(100x2.9/3.83)	37.85	OK
pb = Fn (py,λLT)	275, 37.85	266.84 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	247.7 x 266.84 ≤ 68.118 =	66.096 kN.m	

Columns in Simple Construction 4.7.7

Fc/Pc+Mx/Mbs+My/py.Zy	74.555/649.375+5.294/66.096+0.918/(275x73.4)	0.24	OK

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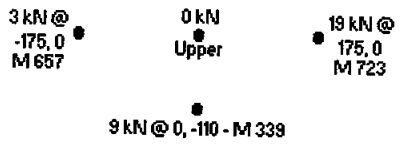
COLUMNS IN SIMPLE CONSTRUCTION
Member 980 (A4) @ Level 6 in Load Case 1



Classification and Properties (BS 5950: 2000)

Section (23.55 kg/m)	150x20 Flat 23.55 [Grade 43]		
Class = Fn(b/t,py)	7.5, 265	(Axial: Non-Slender)	Compact
Auto Design Load Cases	1-2, 6-7 and 9		

Applied Factored Loads

Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	-0.001+19.122+2.958+0+8.846+0	30.925 kN
Mx=Fx1.ex1-Fx2.ex2	19x175-3x175	2.829 kN.m
My=-Fy2.ey2	-9x110	0.973 kN.m

Compression Resistance Pc

λx = Lex/rxx	100x1x0.1/4.33 =	2.3	OK
Pcx = Area.pcx	30x265/10 =	795.000 kN	Table 24 b
λy = Ley/ryy	100x1x0.1/0.58 =	17.3	OK
Pcy = Area.pcy	30x265/10 =	795.000 kN	Table 24 b

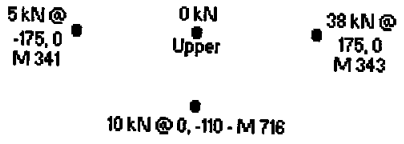
Buckling Resistance Moment Mbs

λLT = 0.5 (L/ry)	0.5(100x0.1/0.58)	112.21	OK
pb = Fn (py,λLT)	265, 112.21	104.29 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	112.5 x 104.29 ≤ 23.85 =	11.732 kN.m	

Columns in Simple Construction 4.7.7

Fc/Pc+Mx/Mbs+My/py.Zy	30.925/795+2.829/11.732+0.973/(265x10)	0.647	OK

COLUMNS IN SIMPLE CONSTRUCTION
Member 982 (D4) @ Level 6 in Load Case 1



Classification and Properties (BS 5950: 2000)

Section (23.55 kg/m)	150x20 Flat 23.55 [Grade 43]		
Class = Fn(b/t,py)	7.5, 265	(Axial: Non-Slender)	Compact
Auto Design Load Cases	1-2, 6-7 and 9		

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Applied Factored Loads

Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	0+37.538+4.724+0+10.018+0	52.28 kN
Mx=Fx1.ex1-Fx2.ex2	38x175-5x175	5.743 kN.m
My=-Fy2.ey2	-10x110	1.102 kN.m

Compression Resistance Pc

λx = Lex/rxx	100x1x0.1/4.33 =	2.3	OK
Pcx = Area.pcx	30x265/10 =	795.000 kN	Table 24 b
λy = Ley/ryy	100x1x0.1/0.58 =	17.3	OK
Pcy = Area.pcy	30x265/10 =	795.000 kN	Table 24 b

Buckling Resistance Moment Mbs

λLT = 0.5 (L/ry)	0.5(100x0.1/0.58)	112.21	OK
pb = Fn (py,λLT)	265, 112.21	104.29 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	112.5 x 104.29 ≤ 23.85 =	11.732 kN.m	

Columns in Simple Construction 4.7.7

Fc/Pc+Mx/Mbs+My/py.Zy	52.28/795+5.743/11.732+1.102/(265x10)	0.971	OK

COLUMNS IN SIMPLE CONSTRUCTION
Member 983 (H5) @ Level 6 in Load Case 1

Classification and Properties (BS 5950: 2000)

Section (30.03 kg/m)	152x152 UC 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	8.13, 19.02, 275, 59.21, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Applied Factored Loads

Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	0+35.738+0+2.969+20.506+0	59.212 kN
MxU=Fx1.ex1	36x179	6.39 kN.m
MyU=Fy1.ey1-Fy2.ey2	3x103-21x103	1.811 kN.m
MxoL=Fx1.ex1	201x179	35.852 kN.m
MyoL=Fy1.ey1-Fy2.ey2	7x103-110x103	10.619 kN.m
MxL=Mxo.(Ix/L)/(Ix/L+Ix.l/L.l)	35.852x(1749/2.9)/((1749/2.9)+(17517/2.9))	3.255 kN.m
MyL=Myo.(Iy/L)/(Iy/L+Iy.l/L.l)	10.619x(561/2.9)/((561/2.9)+(5935/2.9))	0.918 kN.m
Mx=Max(MxU,MxL)	6.39, 3.255	6.39 kN.m
My=Max(MyU,MyL)	1.811, 0.918	1.811 kN.m

Compression Resistance Pc

λx = Lex/rxx	100x1x2.9/6.76 =	42.9	OK
Pcx = Area.pcx	38.26x246.395/10 =	942.706 kN	Table 24 b
λy = Ley/ryy	100x1x2.9/3.83 =	75.7	OK
Pcy = Area.pcy	38.26x169.73/10 =	649.375 kN	Table 24 c

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Buckling Resistance Moment Mbs

λLT = 0.5 (L/ry)	0.5(100x2.9/3.83)	37.85	OK
pb = Fn (py,λLT)	275, 37.85	266.84 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	247.7 x 266.84 ≤ 68.118 =	66.096 kN.m	

Columns in Simple Construction 4.7.7

Fc/Pc+Mx/Mbs+My/py.Zy	59.212/649.375+6.39/66.096+1.811/(275x73.4)	0.278	OK

COLUMNS IN SIMPLE CONSTRUCTION
Member 987 (K8) @ Level 6 in Load Case 1

Classification and Properties (BS 5950: 2000)

Section (30.03 kg/m)	152x152 UC 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	8.13, 19.02, 275, 52.23, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Applied Factored Loads

Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	0+0+46.585+1.44+4.202+0	52.227 kN
MxU=-Fx2.ex2	-47x179	8.329 kN.m
MyU=Fy1.ey1-Fy2.ey2	1x103-4x103	0.285 kN.m
MxoL=-Fx2.ex2	-200x179	35.716 kN.m
MyoL=Fy1.ey1-Fy2.ey2	16x103-76x103	6.178 kN.m
MxL=Mxo.(Ix/L)/(Ix/L+Ix.l/L.l)	35.716x(1749/2.9)/((1749/2.9)+(11414/2.9))	4.745 kN.m
MyL=Myo.(Iy/L)/(Iy/L+Iy.l/L.l)	6.178x(561/2.9)/((561/2.9)+(3915/2.9))	0.775 kN.m
Mx=Max(MxU,MxL)	8.329, 4.745	8.329 kN.m
My=Max(MyU,MyL)	0.285, 0.775	0.775 kN.m

Compression Resistance Pc

λx = Lex/rxx	100x1x2.9/6.76 =	42.9	OK
Pcx = Area.pcx	38.26x246.395/10 =	942.706 kN	Table 24 b
λy = Ley/ryy	100x1x2.9/3.83 =	75.7	OK
Pcy = Area.pcy	38.26x169.73/10 =	649.375 kN	Table 24 c

Buckling Resistance Moment Mbs

λLT = 0.5 (L/ry)	0.5(100x2.9/3.83)	37.85	OK
pb = Fn (py,λLT)	275, 37.85	266.84 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	247.7 x 266.84 ≤ 68.118 =	66.096 kN.m	

Columns in Simple Construction 4.7.7

Fc/Pc+Mx/Mbs+My/py.Zy	52.227/649.375+8.329/66.096+0.775/(275x73.4)	0.245	OK

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COLUMNS IN SIMPLE CONSTRUCTION
Member 988 (H2) @ Level 6 in Load Case 1

Classification and Properties (BS 5950: 2000)

Section (30.03 kg/m)	152x152 UC 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	8.13, 19.02, 275, 48.68, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Applied Factored Loads

Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	0+0+34.27+1.918+12.493+0	48.68 kN
MxU=-Fx2.ex2	-34x179	6.127 kN.m
MyU=Fy1.ey1-Fy2.ey2	2x103-12x103	1.092 kN.m
MxoL=-Fx2.ex2	-190x179	33.956 kN.m
MyoL=Fy1.ey1-Fy2.ey2	16x103-100x103	8.715 kN.m
MxL=Mxo.(Ix/L)/(Ix/L+Ix.l/L.l)	33.956x(1749/2.9)/((1749/2.9)+(17517/2.9))	3.082 kN.m
MyL=Myo.(Iy/L)/(Iy/L+Iy.l/L.l)	8.715x(561/2.9)/((561/2.9)+(5935/2.9))	0.753 kN.m
Mx=Max(MxU,MxL)	6.127, 3.082	6.127 kN.m
My=Max(MyU,MyL)	1.092, 0.753	1.092 kN.m

Compression Resistance Pc

λx = Lex/rxx	100x1x2.9/6.76 =	42.9	OK
Pcx = Area.pcx	38.26x246.395/10 =	942.706 kN	Table 24 b
λy = Ley/ryy	100x1x2.9/3.83 =	75.7	OK
Pcy = Area.pcy	38.26x169.73/10 =	649.375 kN	Table 24 c

Buckling Resistance Moment Mbs

λLT = 0.5 (L/ry)	0.5(100x2.9/3.83)	37.85	OK
pb = Fn (py,λLT)	275, 37.85	266.84 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	247.7 x 266.84 ≤ 68.118 =	66.096 kN.m	

Columns in Simple Construction 4.7.7

Fc/Pc+Mx/Mbs+My/py.Zy	48.68/649.375+6.127/66.096+1.092/(275x73.4)	0.222	OK

COLUMNS IN SIMPLE CONSTRUCTION
Member 989 (N.429-N.473) @ Level 6 in Load Case 1

Classification and Properties (BS 5950: 2000)

Section (30.03 kg/m)	152x152 UC 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	8.13, 19.02, 275, 2.98, 0, 0	(Axial: Non-Slender)	Plastic

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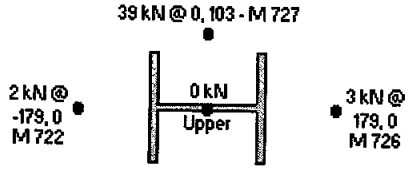
Auto Design Load Cases	1-2, 6-7 and 9		
Applied Factored Loads			
Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	0+0+0+1.646+1.33+0	2.976 kN	
MyU=Fy1.ey1-Fy2.ey2	2x103-1x103	0.033 kN.m	
MyoL=Fy1.ey1-Fy2.ey2	18x103-15x103	0.313 kN.m	
MyL=Myo.(Iy/L)/(Iy/L+Iy.l/L.l)	0.313x(561/2.9)/((561/2.9)+(3915/2.9))	0.039 kN.m	
My=Max(MyU,MyL)	0.033, 0.039	0.039 kN.m	
Compression Resistance Pc			
λx = Lex/rxx	100x1x2.9/6.76 =	42.9	OK
Pcx = Area.pcx	38.26x246.395/10 =	942.706 kN	Table 24 b
λy = Ley/ryy	100x1x2.9/3.83 =	75.7	OK
Pcy = Area.pcy	38.26x169.73/10 =	649.375 kN	Table 24 c
Buckling Resistance Moment Mbs			
λLT = 0.5 (L/ry)	0.5(100x2.9/3.83)	37.85	OK
pb = Fn (py,λLT)	275, 37.85	266.84 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	247.7 x 266.84 ≤ 68.118 =	66.096 kN.m	
Columns in Simple Construction 4.7.7			
Fc/Pc+Mx/Mbs+My/py.Zy	2.976/649.375+0/66.096+0.039/(275x73.4)	0.007	OK

COLUMNS IN SIMPLE CONSTRUCTION
Member 991 (P4) @ Level 6 in Load Case 1



Classification and Properties (BS 5950: 2000)			
Section (30.03 kg/m)	152x152 UC 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	8.13, 19.02, 275, 43.85, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		
Applied Factored Loads			
Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	0.001+3.16+1.919+38.776+0+0	43.855 kN	
Mx=Fx1.ex1-Fx2.ex2	3x179-2x179	0.222 kN.m	
My=Fy1.ey1	39x103	4.004 kN.m	
Compression Resistance Pc			
λx = Lex/rxx	100x1x0.1/6.76 =	1.5	OK
Pcx = Area.pcx	38.26x275/10 =	1052.150 kN	Table 24 b
λy = Ley/ryy	100x1x0.1/3.83 =	2.6	OK
Pcy = Area.pcy	38.26x275/10 =	1052.150 kN	Table 24 c
Buckling Resistance Moment Mbs			
λLT = 0.5 (L/ry)	0.5(100x0.1/3.83)	1.31	OK
pb = Fn (py,λLT)	275, 1.31	275 N/mm²	Table 16

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Mbs = Sx.pb ≤ Mc	247.7 x 275 ≤ 68.118 =	68.118 kN.m	
Columns in Simple Construction 4.7.7			
Fc/Pc+Mx/Mbs+My/py.Zy	43.855/1052.15+0.222/68.118+4.004/(275x73.4)	0.243	OK

COLUMNS IN SIMPLE CONSTRUCTION
Member 992 (M6) @ Level 6 in Load Case 1

Classification and Properties (BS 5950: 2000)

Section (30.03 kg/m)	152x152 UC 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	8.13, 19.02, 275, 12.55, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Applied Factored Loads

Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	0+1.214+0+2.738+8.598+0	12.551 kN
MxU=Fx1.ex1	1x179	0.217 kN.m
MyU=Fy1.ey1-Fy2.ey2	3x103-9x103	0.605 kN.m
MxoL=Fx1.ex1	2x179	0.333 kN.m
MyoL=Fy1.ey1-Fy2.ey2	24x103-74x103	5.133 kN.m
MxL=Mxo.(Ix/L)/(Ix/L+Ix.l/L.l)	0.333x(1749/2.9)/((1749/2.9)+(11414/2.9))	0.044 kN.m
MyL=Myo.(Iy/L)/(Iy/L+Iy.l/L.l)	5.133x(561/2.9)/((561/2.9)+(3915/2.9))	0.644 kN.m
Mx=Max(MxU,MxL)	0.217, 0.044	0.217 kN.m
My=Max(MyU,MyL)	0.605, 0.644	0.644 kN.m

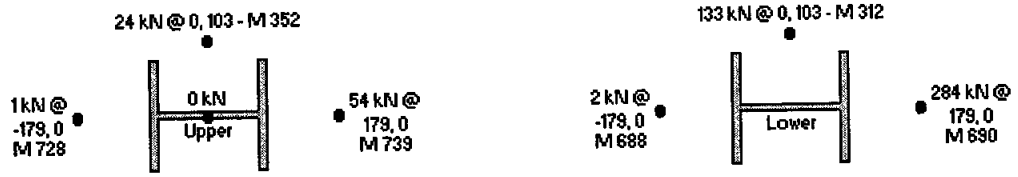
Compression Resistance Pc

λx = Lex/rxx	100x1x2.9/6.76 =	42.9	OK
Pcx = Area.pcx	38.26x246.395/10 =	942.706 kN	Table 24 b
λy = Ley/ryy	100x1x2.9/3.83 =	75.7	OK
Pcy = Area.pcy	38.26x169.73/10 =	649.375 kN	Table 24 c

Buckling Resistance Moment Mbs

λLT = 0.5 (L/ry)	0.5(100x2.9/3.83)	37.85	OK
pb = Fn (py,λLT)	275, 37.85	266.84 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	247.7 x 266.84 ≤ 68.118 =	66.096 kN.m	
Columns in Simple Construction 4.7.7			
Fc/Pc+Mx/Mbs+My/py.Zy	12.551/649.375+0.217/66.096+0.644/(275x73.4)	0.055	OK

COLUMNS IN SIMPLE CONSTRUCTION
Member 993 (M5) @ Level 6 in Load Case 1



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Classification and Properties (BS 5950: 2000)

Section (30.03 kg/m)	152x152 UC 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	8.13, 19.02, 275, 79.76, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Applied Factored Loads

Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	0+54.314+1.214+24.234+0+0	79.763 kN
MxU=Fx1.ex1-Fx2.ex2	54x179-1x179	9.494 kN.m
MyU=Fy1.ey1	24x103	2.502 kN.m
MxoL=Fx1.ex1-Fx2.ex2	284x179-2x179	50.398 kN.m
MyoL=Fy1.ey1	133x103	13.768 kN.m
MxL=Mxo.(Ix/L)/(Ix/L+Ix.l/L.l)	50.398x(1749/2.9)/((1749/2.9)+(22536/2.9))	3.63 kN.m
MyL=Myo.(Iy/L)/(Iy/L+Iy.l/L.l)	13.768x(561/2.9)/((561/2.9)+(7538/2.9))	0.954 kN.m
Mx=Max(MxU,MxL)	9.494, 3.63	9.494 kN.m
My=Max(MyU,MyL)	2.502, 0.954	2.502 kN.m

Compression Resistance Pc

λx = Lex/rxx	100x1x2.9/6.76 =	42.9	OK
Pcx = Area.pcx	38.26x246.395/10 =	942.706 kN	Table 24 b
λy = Ley/ryy	100x1x2.9/3.83 =	75.7	OK
Pcy = Area.pcy	38.26x169.73/10 =	649.375 kN	Table 24 c

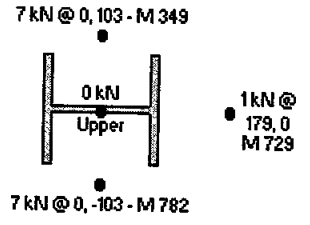
Buckling Resistance Moment Mbs

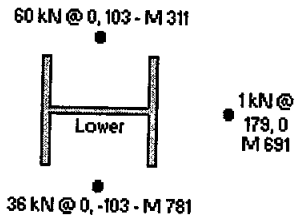
λLT = 0.5 (L/ry)	0.5(100x2.9/3.83)	37.85	OK
pb = Fn (py,λLT)	275, 37.85	266.84 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	247.7 x 266.84 ≤ 68.118 =	66.096 kN.m	

Columns in Simple Construction 4.7.7

Fc/Pc+Mx/Mbs+My/py.Zy	79.763/649.375+9.494/66.096+2.502/(275x73.4)	0.39	OK

COLUMNS IN SIMPLE CONSTRUCTION
Member 994 (N6) @ Level 6 in Load Case 9





Classification and Properties (BS 5950: 2000)

Section (30.03 kg/m)	152x152 UC 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	8.13, 19.02, 275, 15.48, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Applied Factored Loads

Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	0.217+1.29+0+7.026+6.946+0	15.479 kN
MxU=Fx1.ex1	1x179	0.231 kN.m
MyU=Fy1.ey1-Fy2.ey2	7x103-7x103	0.008 kN.m
MxoL=Fx1.ex1	1x179	0.196 kN.m
MyoL=Fy1.ey1-Fy2.ey2	60x103-36x103	2.548 kN.m
MxL=Mxo.(Ix/L)/(Ix/L+Ix.l/L.l)	0.196x(1749/2.9)/((1749/2.9)+(17517/2.9))	0.018 kN.m

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MyL=Myo.(Iy/L)/(Iy/L+Iy.l/L.l)	2.548x(561/2.9)/((561/2.9)+(5935/2.9))	0.22 kN.m	
Mx=Max(MxU,MxL)	0.231, 0.018	0.231 kN.m	
My=Max(MyU,MyL)	0.008, 0.22	0.22 kN.m	

Compression Resistance Pc

λx = Lex/rxx	100x1x2.9/6.76 =	42.9	OK
Pcx = Area.pcx	38.26x246.395/10 =	942.706 kN	Table 24 b
λy = Ley/ryy	100x1x2.9/3.83 =	75.7	OK
Pcy = Area.pcy	38.26x169.73/10 =	649.375 kN	Table 24 c

Buckling Resistance Moment Mbs

λLT = 0.5 (L/ry)	0.5(100x2.9/3.83)	37.85	OK
pb = Fn (py,λLT)	275, 37.85	266.84 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	247.7 x 266.84 ≤ 68.118 =	66.096 kN.m	

Columns in Simple Construction 4.7.7

Fc/Pc+Mx/Mbs+My/py.Zy	15.479/649.375+0.231/66.096+0.22/(275x73.4)	0.038	OK

COLUMNS IN SIMPLE CONSTRUCTION
Member 997 (N3) @ Level 6 in Load Case 1

Classification and Properties (BS 5950: 2000)

Section (30.03 kg/m)	152x152 UC 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	8.13, 19.02, 275, 60.8, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Applied Factored Loads

Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	0+30.575+1.505+15.042+13.672+0	60.795 kN
MxU=Fx1.ex1-Fx2.ex2	31x179-2x179	5.198 kN.m
MyU=Fy1.ey1-Fy2.ey2	15x103-14x103	0.141 kN.m
MxoL=Fx1.ex1-Fx2.ex2	163x179-1x179	28.833 kN.m
MyoL=Fy1.ey1-Fy2.ey2	90x103-82x103	0.847 kN.m
MxL=Mxo.(Ix/L)/(Ix/L+Ix.l/L.l)	28.833x(1749/2.9)/((1749/2.9)+(11414/2.9))	3.831 kN.m
MyL=Myo.(Iy/L)/(Iy/L+Iy.l/L.l)	0.847x(561/2.9)/((561/2.9)+(3915/2.9))	0.106 kN.m
Mx=Max(MxU,MxL)	5.198, 3.831	5.198 kN.m
My=Max(MyU,MyL)	0.141, 0.106	0.141 kN.m

Compression Resistance Pc

λx = Lex/rxx	100x1x2.9/6.76 =	42.9	OK
Pcx = Area.pcx	38.26x246.395/10 =	942.706 kN	Table 24 b
λy = Ley/ryy	100x1x2.9/3.83 =	75.7	OK
Pcy = Area.pcy	38.26x169.73/10 =	649.375 kN	Table 24 c

Buckling Resistance Moment Mbs

λLT = 0.5 (L/ry)	0.5(100x2.9/3.83)	37.85	OK
pb = Fn (py,λLT)	275, 37.85	266.84 N/mm²	Table 16

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Mbs = Sx.pb ≤ Mc	247.7 x 266.84 ≤ 68.118 =	66.096 kN.m	

Columns in Simple Construction 4.7.7

Fc/Pc+Mx/Mbs+My/py.Zy	60.795/649.375+5.198/66.096+0.141/(275x73.4)	0.179	OK

COLUMNS IN SIMPLE CONSTRUCTION
Member 999 (M2) @ Level 6 in Load Case 1

Classification and Properties (BS 5950: 2000)

Section (30.03 kg/m)	152x152 UC 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	8.13, 19.02, 275, 55.79, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Applied Factored Loads

Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	0+0+38.339+9.89+7.56+0	55.79 kN
MxU=-Fx2.ex2	-38x179	6.855 kN.m
MyU=Fy1.ey1-Fy2.ey2	10x103-8x103	0.241 kN.m
MxoL=-Fx2.ex2	-235x179	41.945 kN.m
MyoL=Fy1.ey1-Fy2.ey2	98x103-66x103	3.367 kN.m
MxL=Mxo.(Ix/L)/(Ix/L+Ix.l/L.l)	41.945x(1749/2.9)/((1749/2.9)+(22536/2.9))	3.021 kN.m
MyL=Myo.(Iy/L)/(Iy/L+Iy.l/L.l)	3.367x(561/2.9)/((561/2.9)+(7538/2.9))	0.233 kN.m
Mx=Max(MxU,MxL)	6.855, 3.021	6.855 kN.m
My=Max(MyU,MyL)	0.241, 0.233	0.241 kN.m

Compression Resistance Pc

λx = Lex/rxx	100x1x2.9/6.76 =	42.9	OK
Pcx = Area.pcx	38.26x246.395/10 =	942.706 kN	Table 24 b
λy = Ley/ryy	100x1x2.9/3.83 =	75.7	OK
Pcy = Area.pcy	38.26x169.73/10 =	649.375 kN	Table 24 c

Buckling Resistance Moment Mbs

λLT = 0.5 (L/ry)	0.5(100x2.9/3.83)	37.85	OK
pb = Fn (py,λLT)	275, 37.85	266.84 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	247.7 x 266.84 ≤ 68.118 =	66.096 kN.m	

Columns in Simple Construction 4.7.7

Fc/Pc+Mx/Mbs+My/py.Zy	55.79/649.375+6.855/66.096+0.241/(275x73.4)	0.202	OK

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COLUMNS IN SIMPLE CONSTRUCTION
Member 1001 (Q6) @ Level 6 in Load Case 9

Classification and Properties (BS 5950: 2000)

Section (30.03 kg/m)	152x152 UC 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	8.13, 19.02, 275, 35.89, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Applied Factored Loads

Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	0+8.128+0+27.763+0+0	35.891 kN
MxU=Fx1.ex1	8x179	1.453 kN.m
MyU=Fy1.ey1	28x103	2.867 kN.m
MxoL=Fx1.ex1	51x179	9.051 kN.m
MyoL=Fy1.ey1	98x103	10.135 kN.m
MxL=Mxo.(Ix/L)/(Ix/L+Ix.l/L.l)	9.051x(1749/2.9)/((1749/2.9)+(17517/2.9))	0.822 kN.m
MyL=Myo.(Iy/L)/(Iy/L+Iy.l/L.l)	10.135x(561/2.9)/((561/2.9)+(5935/2.9))	0.876 kN.m
Mx=Max(MxU,MxL)	1.453, 0.822	1.453 kN.m
My=Max(MyU,MyL)	2.867, 0.876	2.867 kN.m

Compression Resistance Pc

λx = Lex/rxx	100x1x2.9/6.76 =	42.9	OK
Pcx = Area.pcx	38.26x246.395/10 =	942.706 kN	Table 24 b
λy = Ley/ryy	100x1x2.9/3.83 =	75.7	OK
Pcy = Area.pcy	38.26x169.73/10 =	649.375 kN	Table 24 c

Buckling Resistance Moment Mbs

λLT = 0.5 (L/ry)	0.5(100x2.9/3.83)	37.85	OK
pb = Fn (py,λLT)	275, 37.85	266.84 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	247.7 x 266.84 ≤ 68.118 =	66.096 kN.m	

Columns in Simple Construction 4.7.7

Fc/Pc+Mx/Mbs+My/py.Zy	35.891/649.375+1.453/66.096+2.867/(275x73.4)	0.219	OK

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COLUMNS IN SIMPLE CONSTRUCTION
Member 1002 (Q3) @ Level 6 in Load Case 1

Classification and Properties (BS 5950: 2000)

Section (30.03 kg/m)	152x152 UC 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	8.13, 19.02, 275, 32.41, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Applied Factored Loads

Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	0+16.585+2.172+13.654+0+0	32.411 kN
MxU=Fx1.ex1-Fx2.ex2	17x179-2x179	2.577 kN.m
MyU=Fy1.ey1	14x103	1.41 kN.m
MxoL=Fx1.ex1-Fx2.ex2	109x179-4x179	18.822 kN.m
MyoL=Fy1.ey1	82x103	8.449 kN.m
MxL=Mxo.(Ix/L)/(Ix/L+Ix.l/L.l)	18.822x(1749/2.9)/((1749/2.9)+(17517/2.9))	1.709 kN.m
MyL=Myo.(Iy/L)/(Iy/L+Iy.l/L.l)	8.449x(561/2.9)/((561/2.9)+(5935/2.9))	0.73 kN.m
Mx=Max(MxU,MxL)	2.577, 1.709	2.577 kN.m
My=Max(MyU,MyL)	1.41, 0.73	1.41 kN.m

Compression Resistance Pc

λx = Lex/rxx	100x1x2.9/6.76 =	42.9	OK
Pcx = Area.pcx	38.26x246.395/10 =	942.706 kN	Table 24 b
λy = Ley/ryy	100x1x2.9/3.83 =	75.7	OK
Pcy = Area.pcy	38.26x169.73/10 =	649.375 kN	Table 24 c

Buckling Resistance Moment Mbs

λLT = 0.5 (L/ry)	0.5(100x2.9/3.83)	37.85	OK
pb = Fn (py,λLT)	275, 37.85	266.84 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	247.7 x 266.84 ≤ 68.118 =	66.096 kN.m	

Columns in Simple Construction 4.7.7

Fc/Pc+Mx/Mbs+My/py.Zy	32.411/649.375+2.577/66.096+1.41/(275x73.4)	0.159	OK

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COLUMNS IN SIMPLE CONSTRUCTION
Member 1003 (Q2) @ Level 6 in Load Case 1

Classification and Properties (BS 5950: 2000)

Section (30.03 kg/m)	152x152 UC 30 [S 275]		
Class = Fn(b/T,d/t,py,F,Mx,My)	8.13, 19.02, 275, 23.43, 0, 0	(Axial: Non-Slender)	Plastic
Auto Design Load Cases	1-2, 6-7 and 9		

Applied Factored Loads

Fc=F+Fx1+Fx2+Fy1+Fy2+Fa	0+0+16.585+6.844+0+0	23.429 kN
MxU=-Fx2.ex2	-17x179	2.965 kN.m
MyU=Fy1.ey1	7x103	0.707 kN.m
MxoL=-Fx2.ex2	-109x179	19.476 kN.m
MyoL=Fy1.ey1	61x103	6.334 kN.m
MxL=Mxo.(Ix/L)/(Ix/L+Ix.l/L.l)	19.476x(1749/2.9)/((1749/2.9)+(11414/2.9))	2.588 kN.m
MyL=Myo.(Iy/L)/(Iy/L+Iy.l/L.l)	6.334x(561/2.9)/((561/2.9)+(3915/2.9))	0.794 kN.m
Mx=Max(MxU,MxL)	2.965, 2.588	2.965 kN.m
My=Max(MyU,MyL)	0.707, 0.794	0.794 kN.m

Compression Resistance Pc

λx = Lex/rxx	100x1x2.9/6.76 =	42.9	OK
Pcx = Area.pcx	38.26x246.395/10 =	942.706 kN	Table 24 b
λy = Ley/ryy	100x1x2.9/3.83 =	75.7	OK
Pcy = Area.pcy	38.26x169.73/10 =	649.375 kN	Table 24 c

Buckling Resistance Moment Mbs

λLT = 0.5 (L/ry)	0.5(100x2.9/3.83)	37.85	OK
pb = Fn (py,λLT)	275, 37.85	266.84 N/mm²	Table 16
Mbs = Sx.pb ≤ Mc	247.7 x 266.84 ≤ 68.118 =	66.096 kN.m	

Columns in Simple Construction 4.7.7

Fc/Pc+Mx/Mbs+My/py.Zy	23.429/649.375+2.965/66.096+0.794/(275x73.4)	0.12	OK

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Design of bracing members

STRUT AND TIE (MEMBER)
Member 753 (B13-B12) @ Level 2

Classification and Properties (BS 5950: 2000)

Section (23.55 kg/m)	150x20 Flat 23.55 [Grade 43]		
Class = Fn(b/t,py)	7.5, 265	(Axial: Non-Slender)	Compact
Auto Design Load Cases	1-2, 6-7 and 9		

Axially Loaded Member in Tension : 3.4.3 (Case 1)

Ae = Fn(Ag,A.net,py,Us)	30,30,265,410	30 cm²	
Tc = Ae.py	30x265/10 =	795 kN	
F (Tie)/Tc	3.646 / 795	0.005	OK

STRUT AND TIE (MEMBER)
Member 754 (B13-B12) @ Level 2

Classification and Properties (BS 5950: 2000)

Section (23.55 kg/m)	150x20 Flat 23.55 [Grade 43]		
Class = Fn(b/t,py)	7.5, 265	(Axial: Non-Slender)	Compact
Auto Design Load Cases	1-2, 6-7 and 9		

Axially Loaded Member in Tension : 3.4.3 (Case 6)

Ae = Fn(Ag,A.net,py,Us)	30,30,265,410	30 cm²	
Tc = Ae.py	30x265/10 =	795 kN	
F (Tie)/Tc	184.359 / 795	0.232	OK

STRUT AND TIE (MEMBER)
Member 755 (B13-B12) @ Level 3

Classification and Properties (BS 5950: 2000)

Section (23.55 kg/m)	150x20 Flat 23.55 [Grade 43]		
Class = Fn(b/t,py)	7.5, 265	(Axial: Non-Slender)	Compact
Auto Design Load Cases	1-2, 6-7 and 9		

Axially Loaded Member in Tension : 3.4.3 (Case 1)

Ae = Fn(Ag,A.net,py,Us)	30,30,265,410	30 cm²	
Tc = Ae.py	30x265/10 =	795 kN	
F (Tie)/Tc	27.152 / 795	0.034	OK

STRUT AND TIE (MEMBER)
Member 758 (B13-B12) @ Level 3

Classification and Properties (BS 5950: 2000)

Section (23.55 kg/m)	150x20 Flat 23.55 [Grade 43]		
Class = Fn(b/t,py)	7.5, 265	(Axial: Non-Slender)	Compact
Auto Design Load Cases	1-2, 6-7 and 9		

Axially Loaded Member in Tension : 3.4.3 (Case 6)

Ae = Fn(Ag,A.net,py,Us)	30,30,265,410	30 cm²	
Tc = Ae.py	30x265/10 =	795 kN	
F (Tie)/Tc	170.079 / 795	0.214	OK

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STRUT AND TIE (MEMBER)
Member 759 (B13-B12) @ Level 4

Classification and Properties (BS 5950: 2000)

Section (23.55 kg/m)	150x20 Flat 23.55 [Grade 43]		
Class = Fn(b/t,py)	7.5, 265	(Axial: Non-Slender)	Compact
Auto Design Load Cases	1-2, 6-7 and 9		

Axially Loaded Member in Tension : 3.4.3 (Case 1)

Ae = Fn(Ag,A.net,py,Us)	30,30,265,410	30 cm²	
Tc = Ae.py	30x265/10 =	795 kN	
F (Tie)/Tc	80.259 / 795	0.101	OK

STRUT AND TIE (MEMBER)
Member 762 (B13-B12) @ Level 4

Classification and Properties (BS 5950: 2000)

Section (23.55 kg/m)	150x20 Flat 23.55 [Grade 43]		
Class = Fn(b/t,py)	7.5, 265	(Axial: Non-Slender)	Compact
Auto Design Load Cases	1-2, 6-7 and 9		

Axially Loaded Member in Tension : 3.4.3 (Case 6)

Ae = Fn(Ag,A.net,py,Us)	30,30,265,410	30 cm²	
Tc = Ae.py	30x265/10 =	795 kN	
F (Tie)/Tc	129.31 / 795	0.163	OK

STRUT AND TIE (MEMBER)
Member 769 (N6-Q6) @ Level 2

Classification and Properties (BS 5950: 2000)

Section (23.55 kg/m)	150x20 Flat 23.55 [Grade 43]		
Class = Fn(b/t,py)	7.5, 265	(Axial: Non-Slender)	Compact
Auto Design Load Cases	1-2, 6-7 and 9		

Axially Loaded Member in Tension : 3.4.3 (Case 6)

Ae = Fn(Ag,A.net,py,Us)	30,30,265,410	30 cm²	
Tc = Ae.py	30x265/10 =	795 kN	
F (Tie)/Tc	263.166 / 795	0.331	OK

STRUT AND TIE (MEMBER)
Member 770 (N6-Q6) @ Level 2

Classification and Properties (BS 5950: 2000)

Section (23.55 kg/m)	150x20 Flat 23.55 [Grade 43]		
Class = Fn(b/t,py)	7.5, 265	(Axial: Non-Slender)	Compact
Auto Design Load Cases	1-2, 6-7 and 9		

Axially Loaded Member in Tension : 3.4.3 (Case 1)

Ae = Fn(Ag,A.net,py,Us)	30,30,265,410	30 cm²	
Tc = Ae.py	30x265/10 =	795 kN	
F (Tie)/Tc	8.004 / 795	0.010	OK

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STRUT AND TIE (MEMBER)
Member 771 (N6-Q6) @ Level 3

Classification and Properties (BS 5950: 2000)

Section (23.55 kg/m)	150x20 Flat 23.55 [Grade 43]		
Class = Fn(b/t,py)	7.5, 265	(Axial: Non-Slender)	Compact
Auto Design Load Cases	1-2, 6-7 and 9		

Axially Loaded Member in Tension : 3.4.3 (Case 6)

Ae = Fn(Ag,A.net,py,Us)	30,30,265,410	30 cm²	
Tc = Ae.py	30x265/10 =	795 kN	
F (Tie)/Tc	276.743 / 795	0.348	OK

STRUT AND TIE (MEMBER)
Member 772 (N6-Q6) @ Level 3

Classification and Properties (BS 5950: 2000)

Section (23.55 kg/m)	150x20 Flat 23.55 [Grade 43]		
Class = Fn(b/t,py)	7.5, 265	(Axial: Non-Slender)	Compact
Auto Design Load Cases	1-2, 6-7 and 9		

Axially Loaded Member in Tension : 3.4.3 (Case 1)

Ae = Fn(Ag,A.net,py,Us)	30,30,265,410	30 cm²	
Tc = Ae.py	30x265/10 =	795 kN	
F (Tie)/Tc	31.544 / 795	0.040	OK

STRUT AND TIE (MEMBER)
Member 773 (N6-Q6) @ Level 4

Classification and Properties (BS 5950: 2000)

Section (23.55 kg/m)	150x20 Flat 23.55 [Grade 43]		
Class = Fn(b/t,py)	7.5, 265	(Axial: Non-Slender)	Compact
Auto Design Load Cases	1-2, 6-7 and 9		

Axially Loaded Member in Tension : 3.4.3 (Case 6)

Ae = Fn(Ag,A.net,py,Us)	30,30,265,410	30 cm²	
Tc = Ae.py	30x265/10 =	795 kN	
F (Tie)/Tc	201.989 / 795	0.254	OK

STRUT AND TIE (MEMBER)
Member 776 (N6-Q6) @ Level 4

Classification and Properties (BS 5950: 2000)

Section (23.55 kg/m)	150x20 Flat 23.55 [Grade 43]		
Class = Fn(b/t,py)	7.5, 265	(Axial: Non-Slender)	Compact
Auto Design Load Cases	1-2, 6-7 and 9		

Axially Loaded Member in Tension : 3.4.3 (Case 1)

Ae = Fn(Ag,A.net,py,Us)	30,30,265,410	30 cm²	
Tc = Ae.py	30x265/10 =	795 kN	
F (Tie)/Tc	35.983 / 795	0.045	OK

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STRUT AND TIE (MEMBER)
Member 777 (N6-Q6) @ Level 5

Classification and Properties (BS 5950: 2000)

Section (23.55 kg/m)	150x20 Flat 23.55 [Grade 43]		
Class = Fn(b/t,py)	7.5, 265	(Axial: Non-Slender)	Compact
Auto Design Load Cases	1-2, 6-7 and 9		

Axially Loaded Member in Tension : 3.4.3 (Case 6)

Ae = Fn(Ag,A.net,py,Us)	30,30,265,410	30 cm²	
Tc = Ae.py	30x265/10 =	795 kN	
F (Tie)/Tc	109.131 / 795	0.137	OK

STRUT AND TIE (MEMBER)
Member 779 (N6-Q6) @ Level 5

Classification and Properties (BS 5950: 2000)

Section (23.55 kg/m)	150x20 Flat 23.55 [Grade 43]		
Class = Fn(b/t,py)	7.5, 265	(Axial: Non-Slender)	Compact
Auto Design Load Cases	1-2, 6-7 and 9		

Axially Loaded Member in Tension : 3.4.3 (Case 1)

Ae = Fn(Ag,A.net,py,Us)	30,30,265,410	30 cm²	
Tc = Ae.py	30x265/10 =	795 kN	
F (Tie)/Tc	27.222 / 795	0.034	OK

STRUT AND TIE (MEMBER)
Member 755 (B13-B12) @ Level 3

Classification and Properties (BS 5950: 2000)

Section (23.55 kg/m)	150x20 Flat 23.55 [Grade 43]		
Class = Fn(b/t,py)	7.5, 265	(Axial: Non-Slender)	Compact
Auto Design Load Cases	1-2, 6-7 and 9		

Axially Loaded Member in Tension : 3.4.3 (Case 1)

Ae = Fn(Ag,A.net,py,Us)	30,30,265,410	30 cm²	
Tc = Ae.py	30x265/10 =	795 kN	
F (Tie)/Tc	27.152 / 795	0.034	OK

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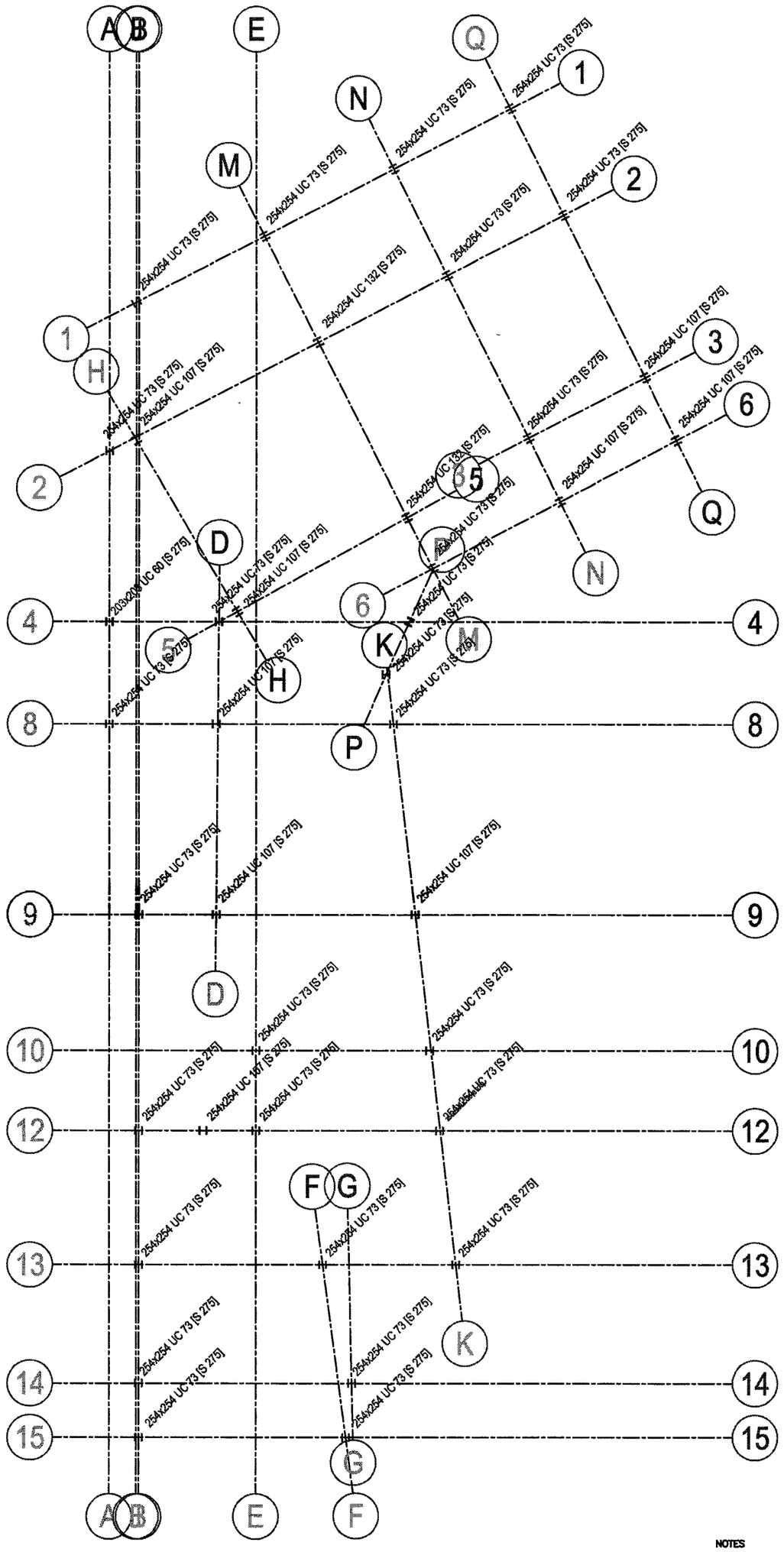

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STRUCTURE	Layout of columns at basement level	Slowikowski, Blackshaw & Partners CIVIL AND STRUCTURAL CONSULTING ENGINEERS			DRAWING NO.
CLIENT	Ginex Ltd	The Maltings, East Tyndall Street, Cardiff Bay, Cardiff CF1 5EA.		Tel: (02920 45134[illegible]) Fax: (02920 45134[illegible])	GOA/A/1511/600

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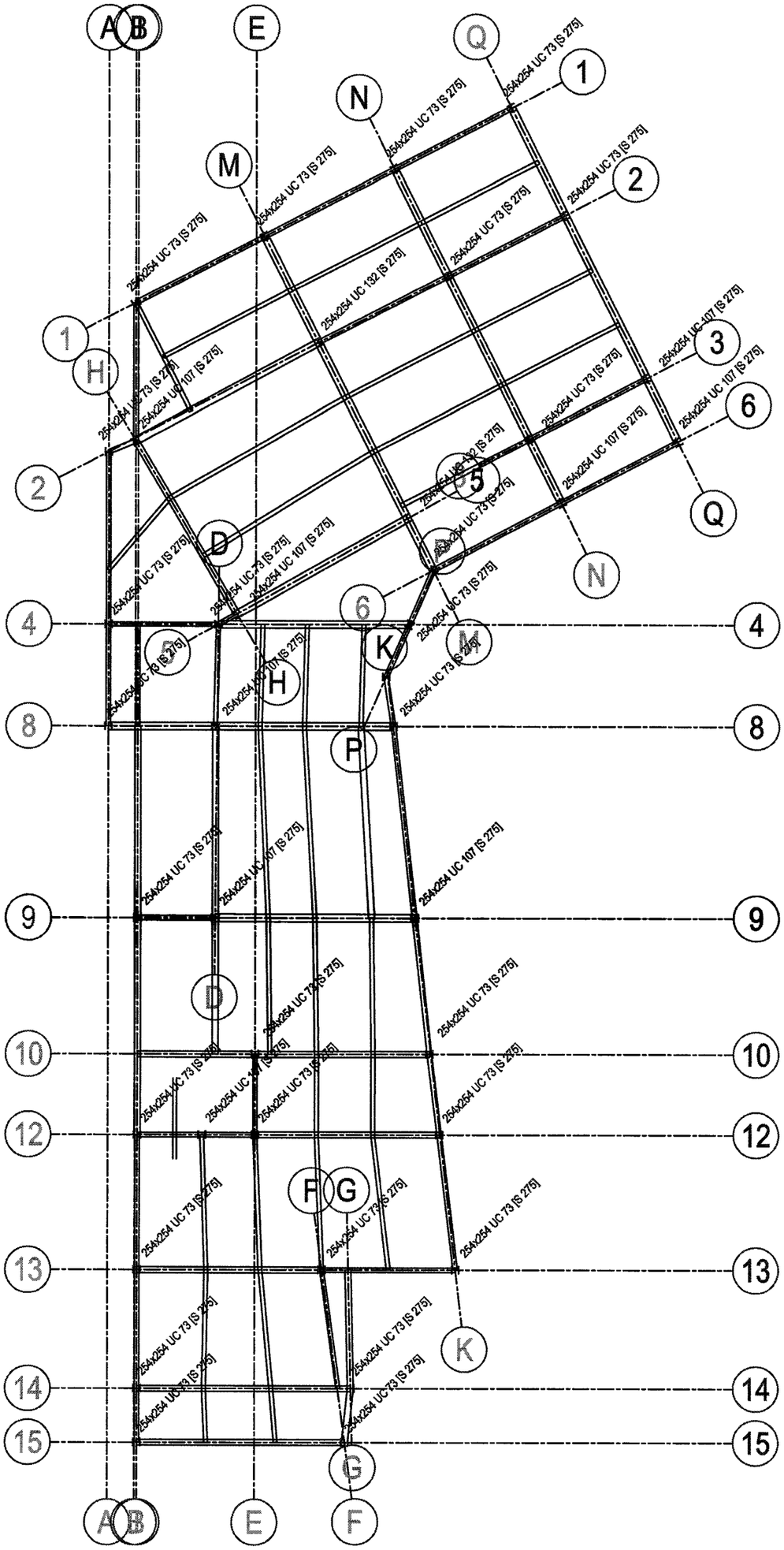

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PROJECT	Proposed office development at Orchard Street Neath	DATE Dec 2007	INITIALS CRFG	REVISION
STRUCTURE	Layout of columns at level 1	Slowikowski, Blackshaw & Partners		DRAWING NO.
CLIENT	Ginex Ltd	CIVIL AND STRUCTURAL CONSULTING ENGINEERS		GOA/A/1511/601

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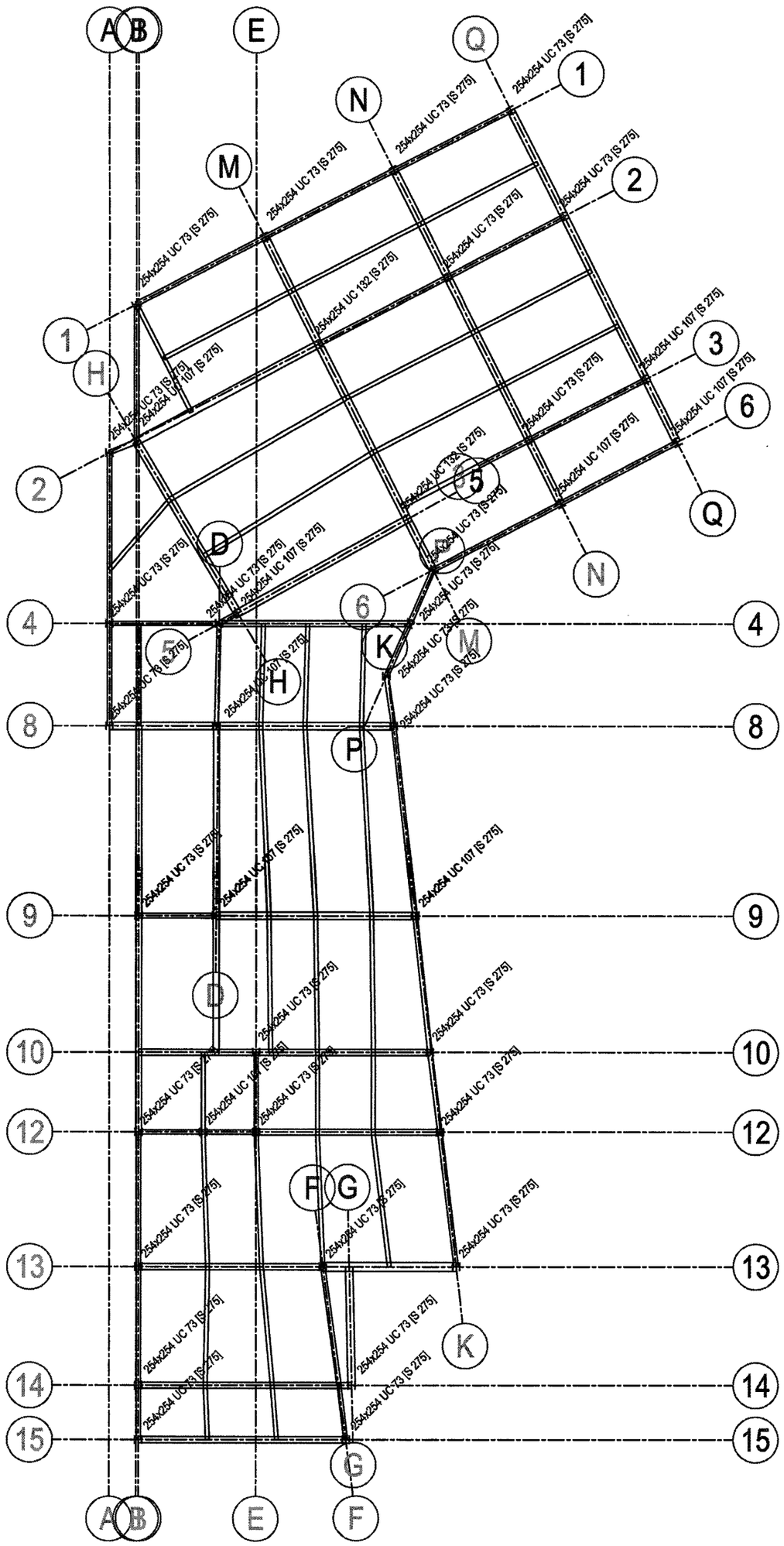

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PROJECT	Proposed office development at Orchard Street Neath	DATE Dec 2007	INITIALS CRFG	REVISION
STRUCTURE	Layout of columns at level 2	Slowikowski, Blackshaw & Partners CIVIL AND STRUCTURAL CONSULTING ENGINEERS		DRAWING NO. GOA/A/1511/602
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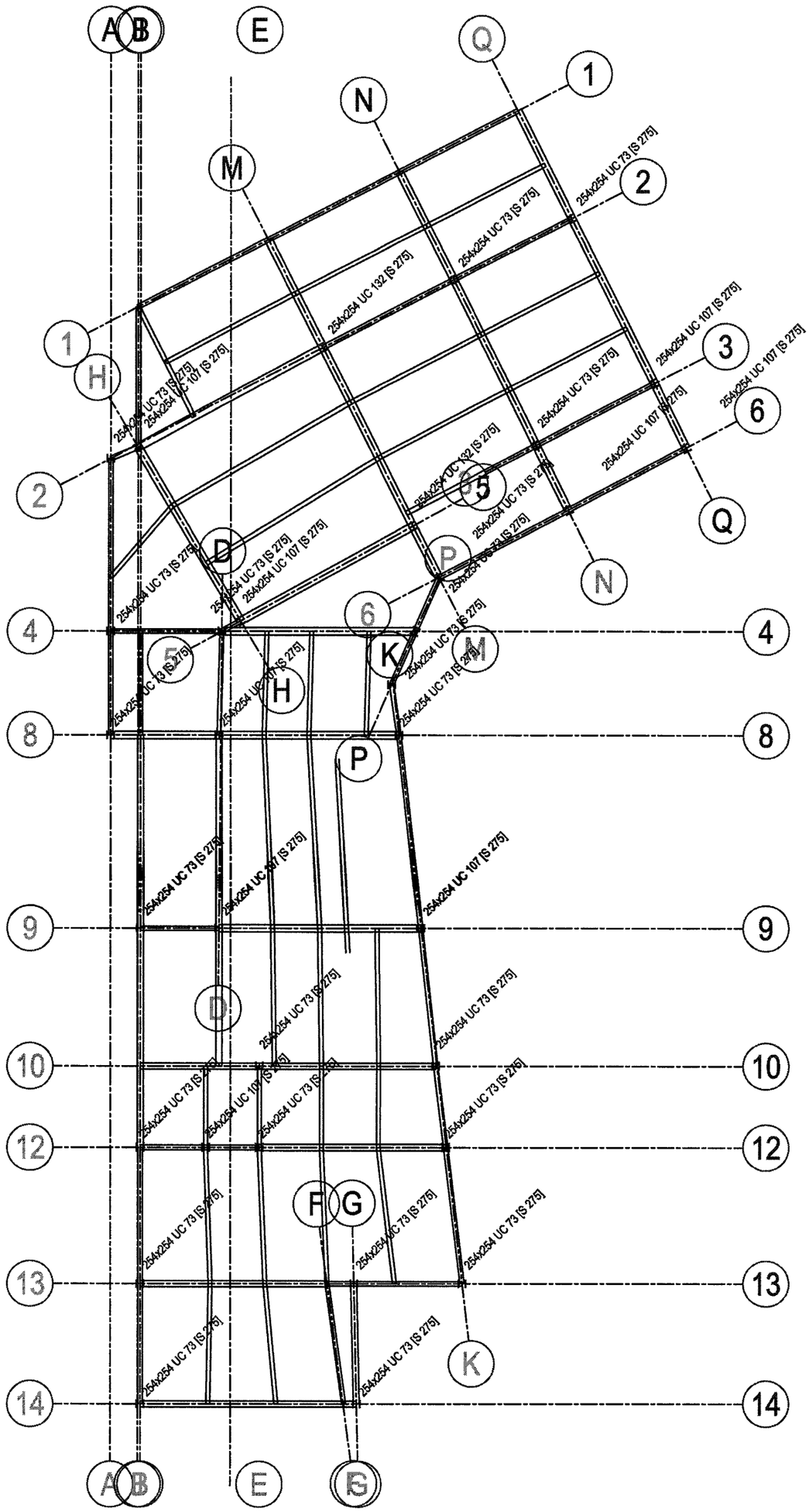

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STRUCTURE	Layout of columns at level 3	Slowikowski, Blackshaw & Partners		DRAWING NO.
CLIENT	Ginex Ltd	CIVIL AND STRUCTURAL CONSULTING ENGINEERS		GOA/A/1511/603

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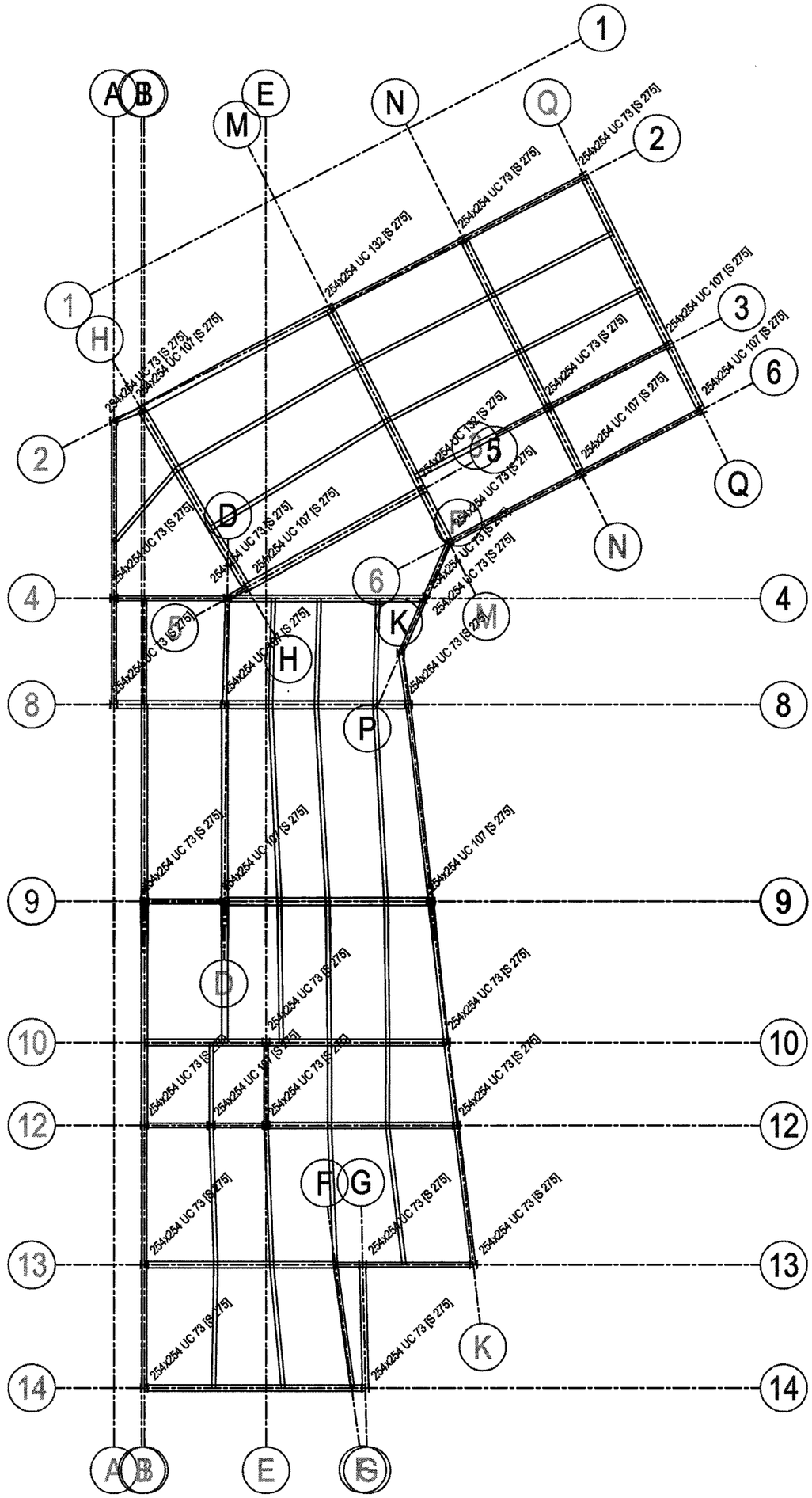

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PROJECT	Proposed office development at Orchard Street Neath	DATE Dec 2007	INITIALS CRFG	REVISION
STRUCTURE	Layout of columns at leve 4	Slowikowski, Blackshaw & Partners CIVIL AND STRUCTURAL CONSULTING ENGINEERS		DRAWING NO. GOA/A/1511/604
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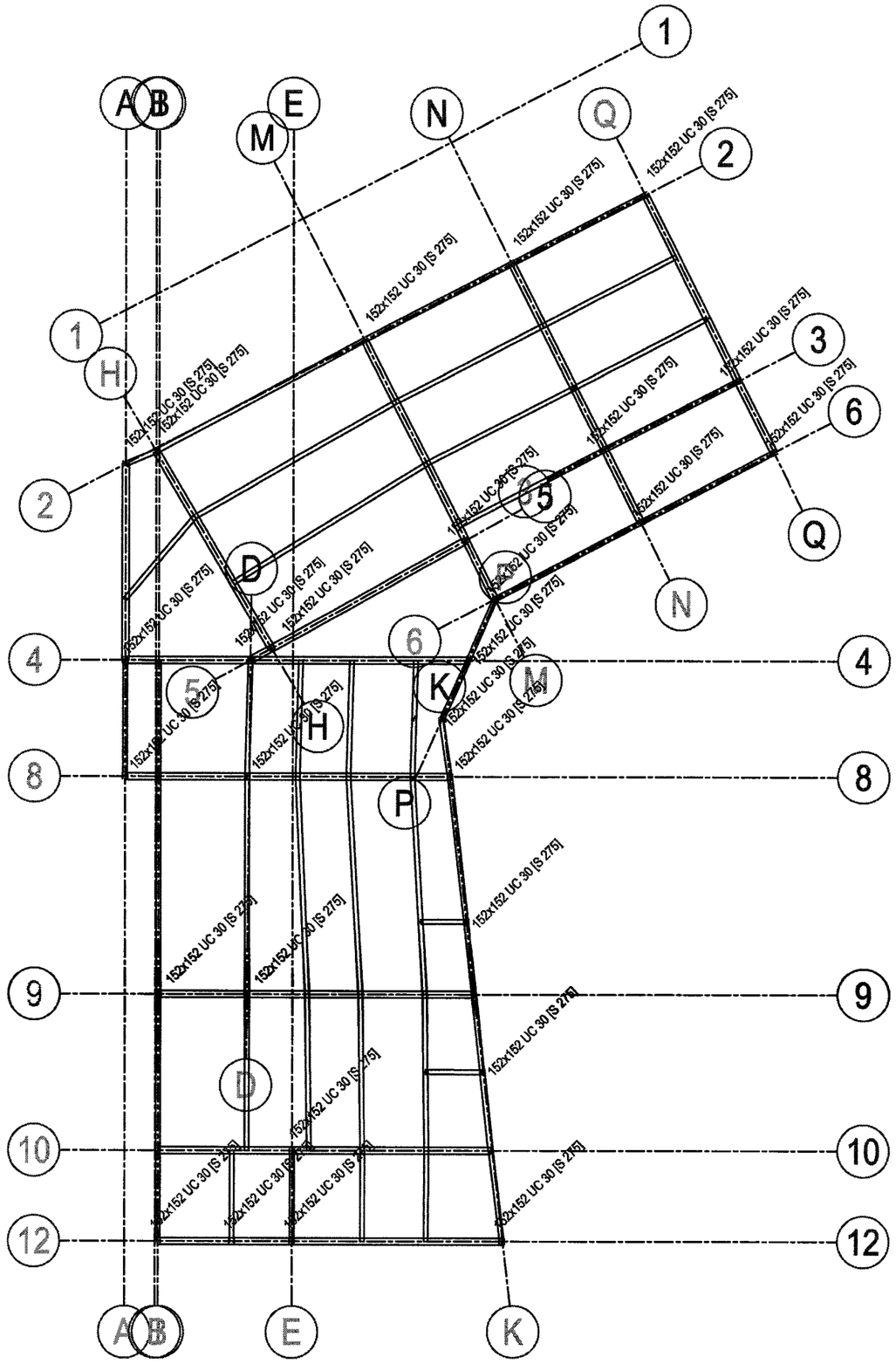

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PROJECT	Proposed office development at Orchard Street Neath	DATE Dec 2007	INITIALS CRFG	REVISION	
STRUCTURE	Layout of columns at roof level	Slowikowski, Blackshaw & Partners CIVIL AND STRUCTURAL CONSULTING ENGINEERS		DRAWING NO.	
CLIENT	Ginex Ltd	The Maltings, East Tyndall Street, Cardiff Bay, Cardiff CF1 5EA. Tel: (02920 451331) Fax: (02920 451344)		GOA/A/1511/606	

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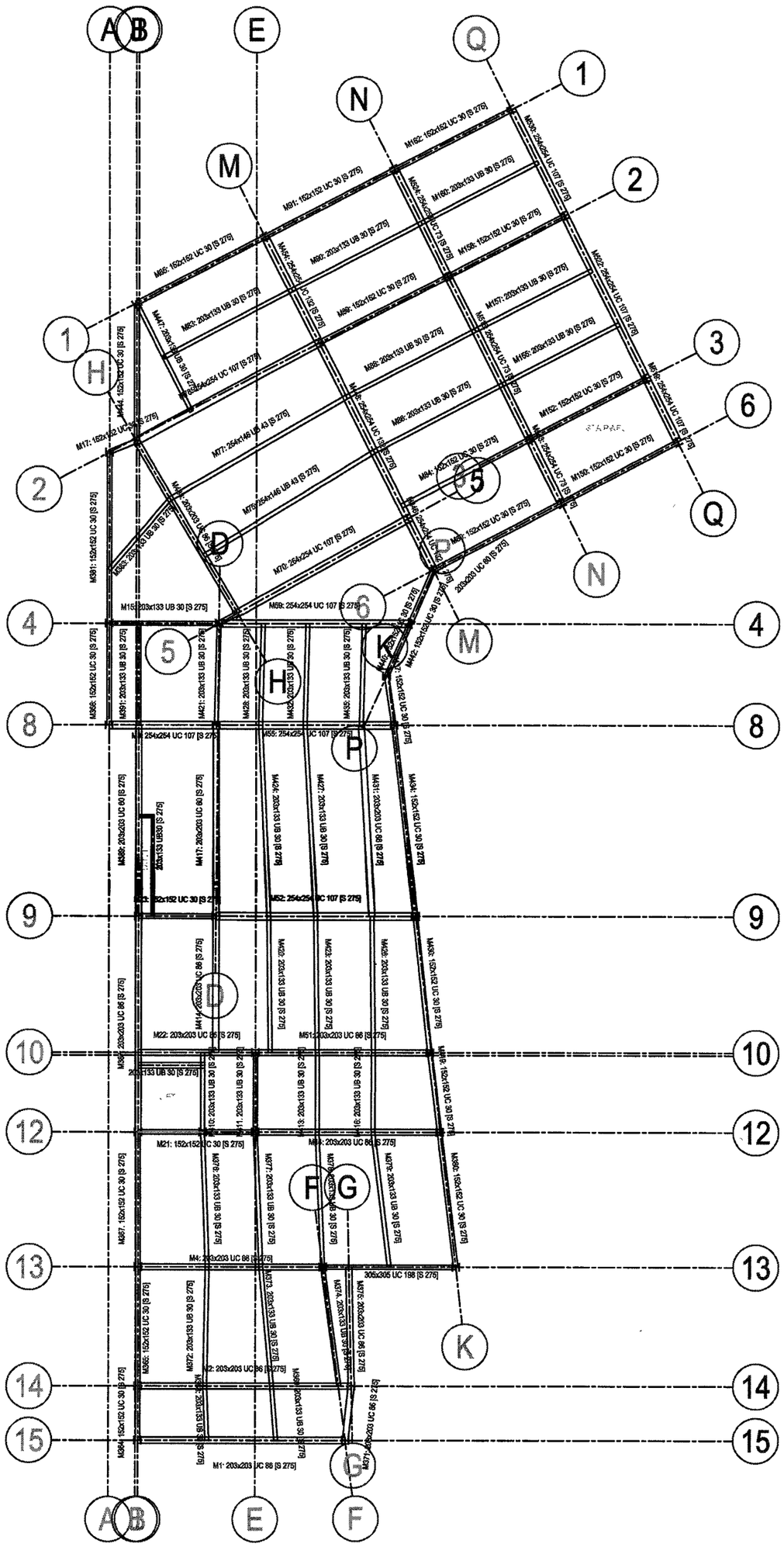

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PROJECT	Proposed development at Orchard St. Neath	DATE dec 2007	INITIALS CRFG	REVISION
STRUCTURE	Layout of steel beams at level 1	Slowikowski, Blackshaw & Partners		DRAWING NO.
CLIENT	Ginex Ltd	CIVIL AND STRUCTURAL CONSULTING ENGINEERS		GOA/A/1511/607

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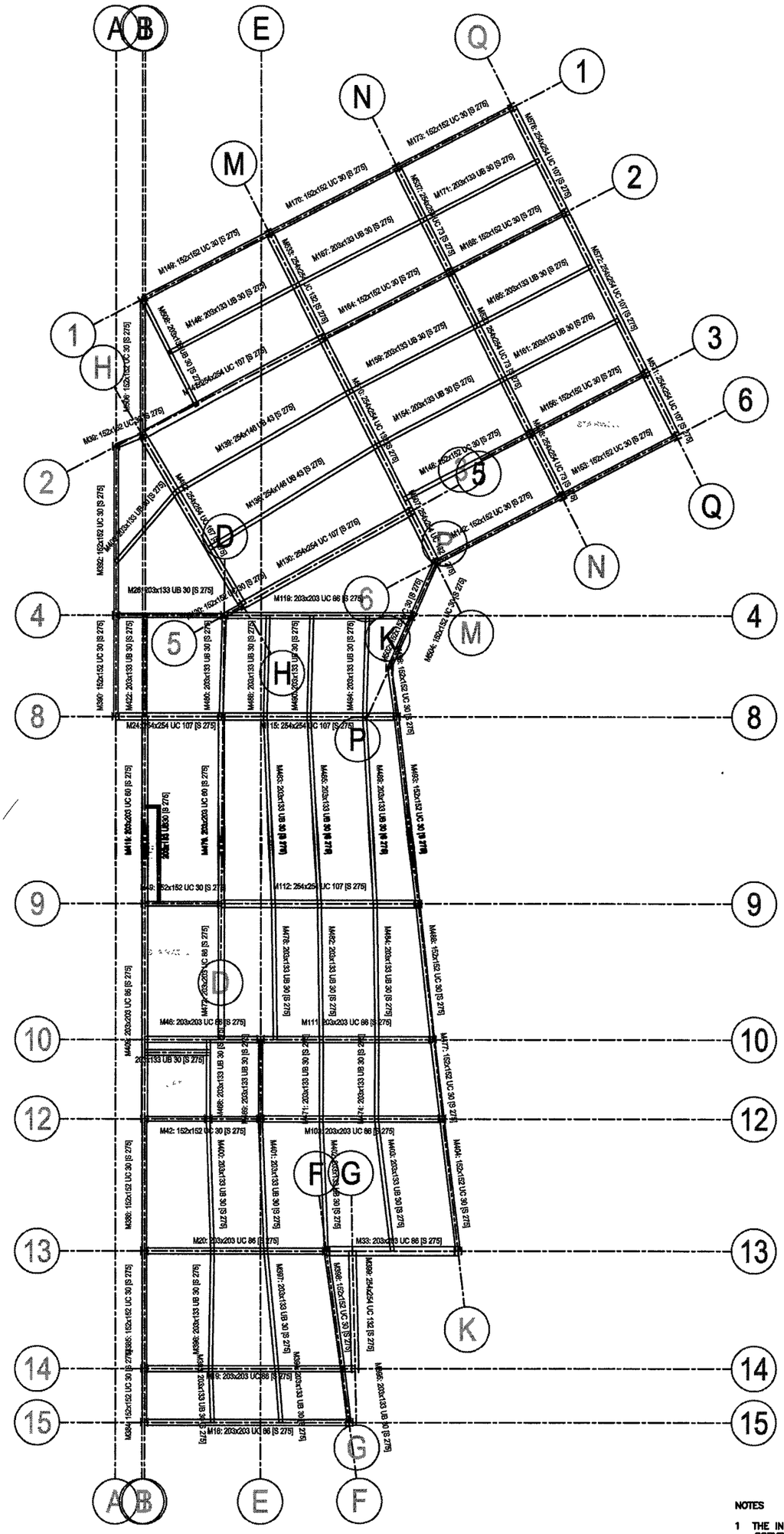

Plan at Level 2 Scale 1:175

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PROJECT	Proposed development at Orchard St. Neath	DATE dec 2007	INITIALS CRFG	REVISION
STRUCTURE	Layout of steel beams at level 2	Slowikowski, Blackshaw & Partners CIVIL AND STRUCTURAL CONSULTING ENGINEERS		DRAWING NO. GOA/A/1511/608
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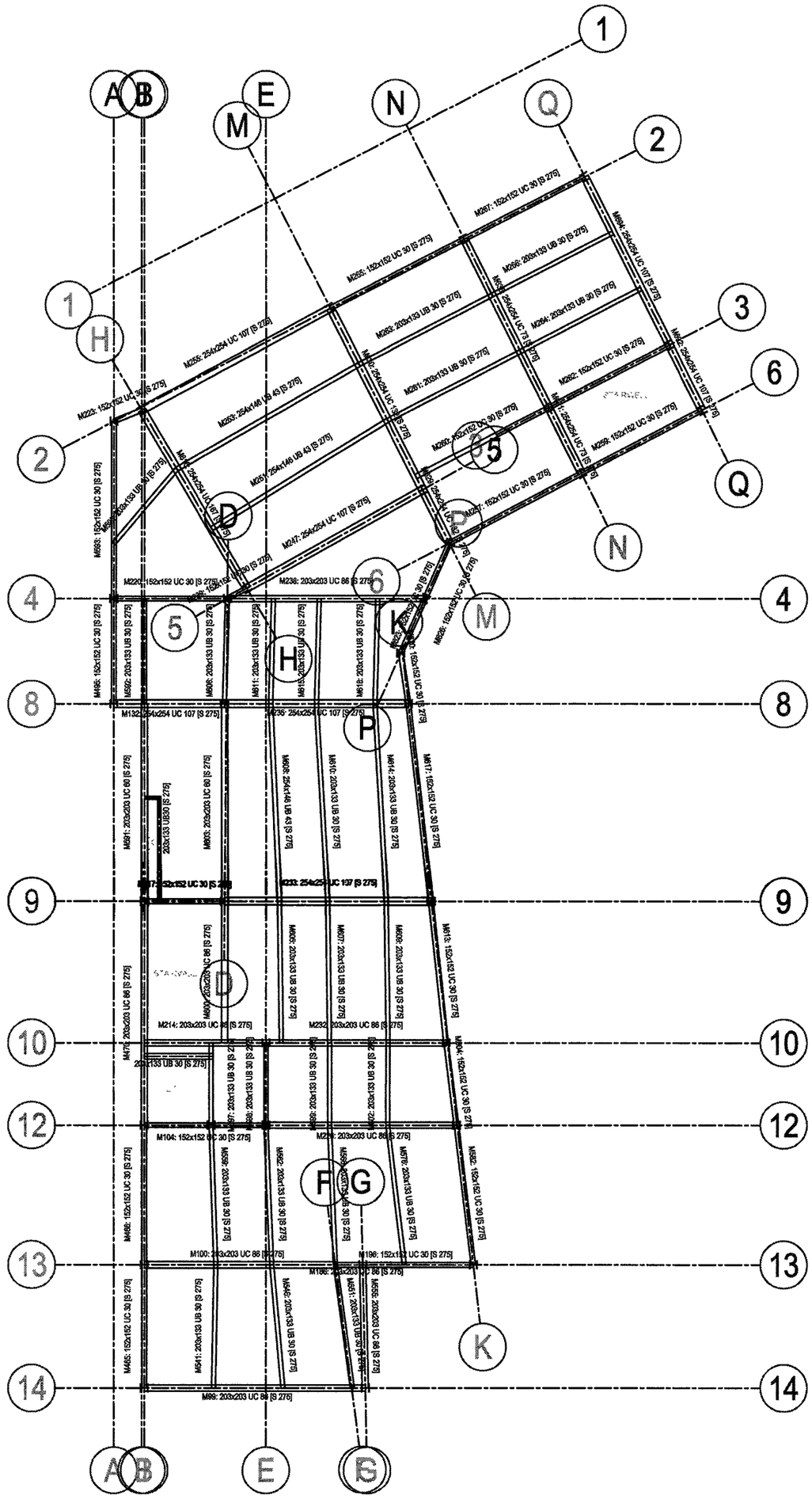

Plan at Level 4 Scale 1:175

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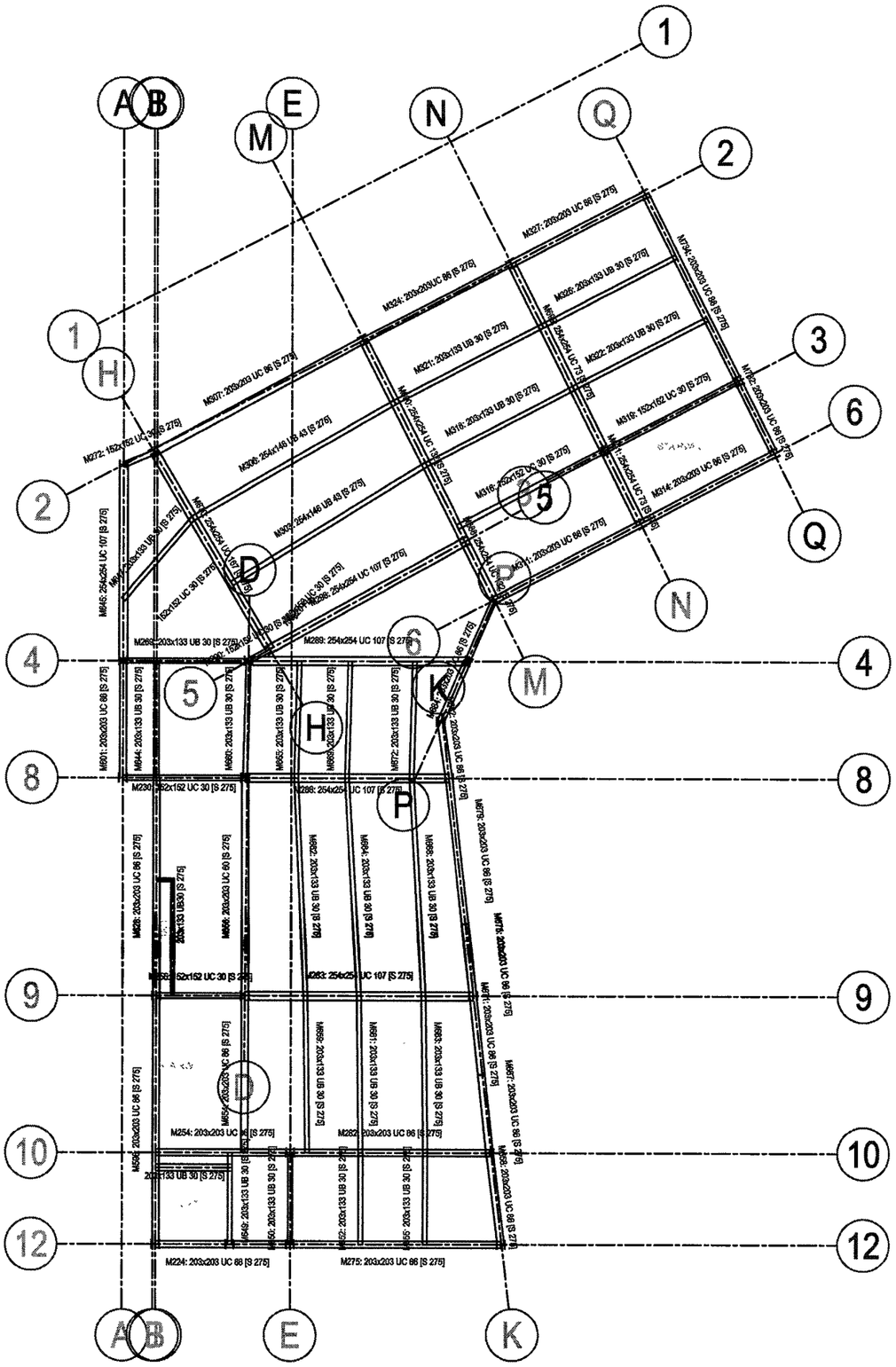
PROJECT	Proposed development at Orchard St. Neath	DATE dec 2007	INITIALS CRFG	REVISION
STRUCTURE	Layout of steel beams at level 4			
CLIENT	Ginex Ltd			

Slowikowski, Blackshaw & Partners
CIVIL AND STRUCTURAL CONSULTING ENGINEERS
The Maltings, East Tyndall Street, Cardiff Bay, Cardiff CF1 5EA.
Tel: (02920 451331)
Fax: (02920 451344)

DRAWING NO. GOA/A/1511/610

270 X 373



Plan at Level 5 Scale 1:175

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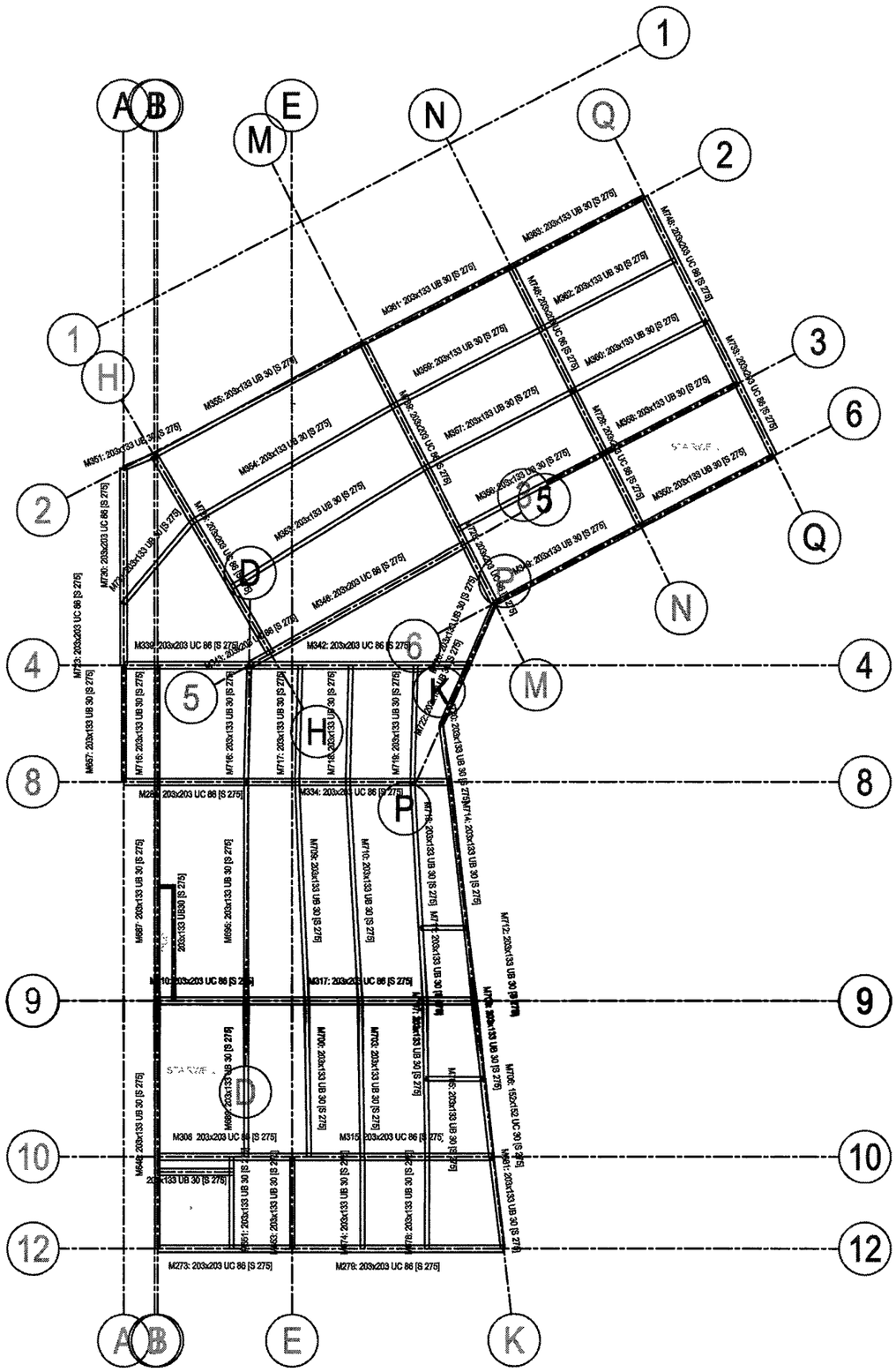
PROJECT	Proposed development at Orchard St. Neath	DATE dec 2007	INITIALS CRFG	REVISION
STRUCTURE	Layout of steel beams at level 5			
CLIENT	Ginex Ltd			

Slowikowski, Blackshaw & Partners
CIVIL AND STRUCTURAL CONSULTING ENGINEERS
The Maltings, East Tyndall Street, Cardiff Bay, Cardiff CF1 5EA.
Tel: (02920 451[illegible])
Fax: (02920 451344)

DRAWING NO. GOA/A/1511/611

270 X 373



Roof Plan Scale 1:175

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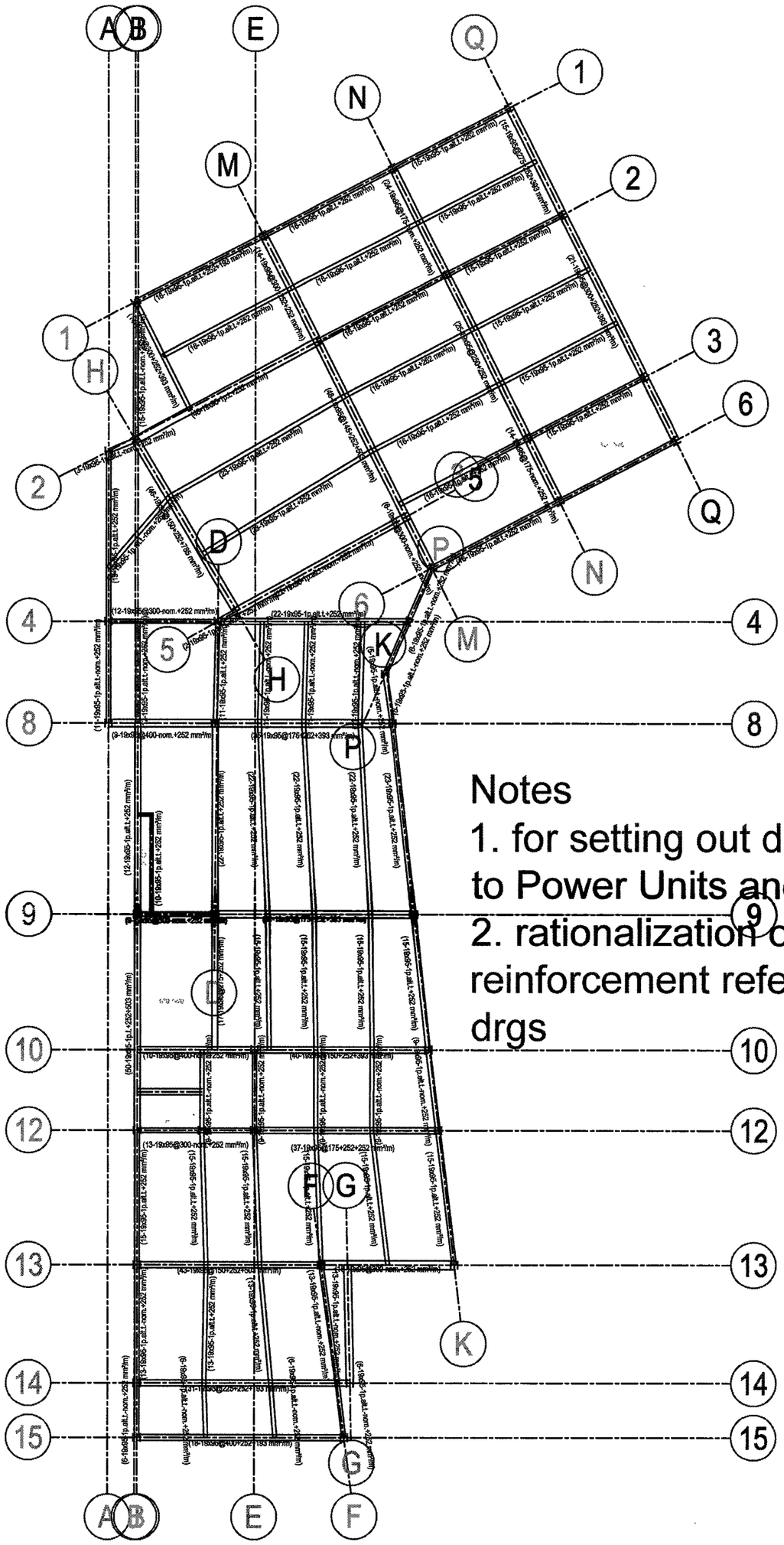
PROJECT	Proposed development at Orchard St. Neath	DATE dec 2007	INITIALS CRFG	REVISION
STRUCTURE	Layout of steel beams at roof level	Slowikowski, Blackshaw & Partners CIVIL AND STRUCTURAL CONSULTING ENGINEERS		DRAWING NO.
CLIENT	Ginex Ltd	The Maltings, East Tyndall Street, Cardiff Bay, Cardiff CF1 5EA. Tel: (02920 451344) Fax: (02920 451344)		GOA/A/1511/612

270 X 373



Notes

1. for setting out details refer to Power Units and Architects drgs
2. rationalization of studs and reinforcement refer to Richard Lees drgs

Plan at Level 2 Scale 1:175

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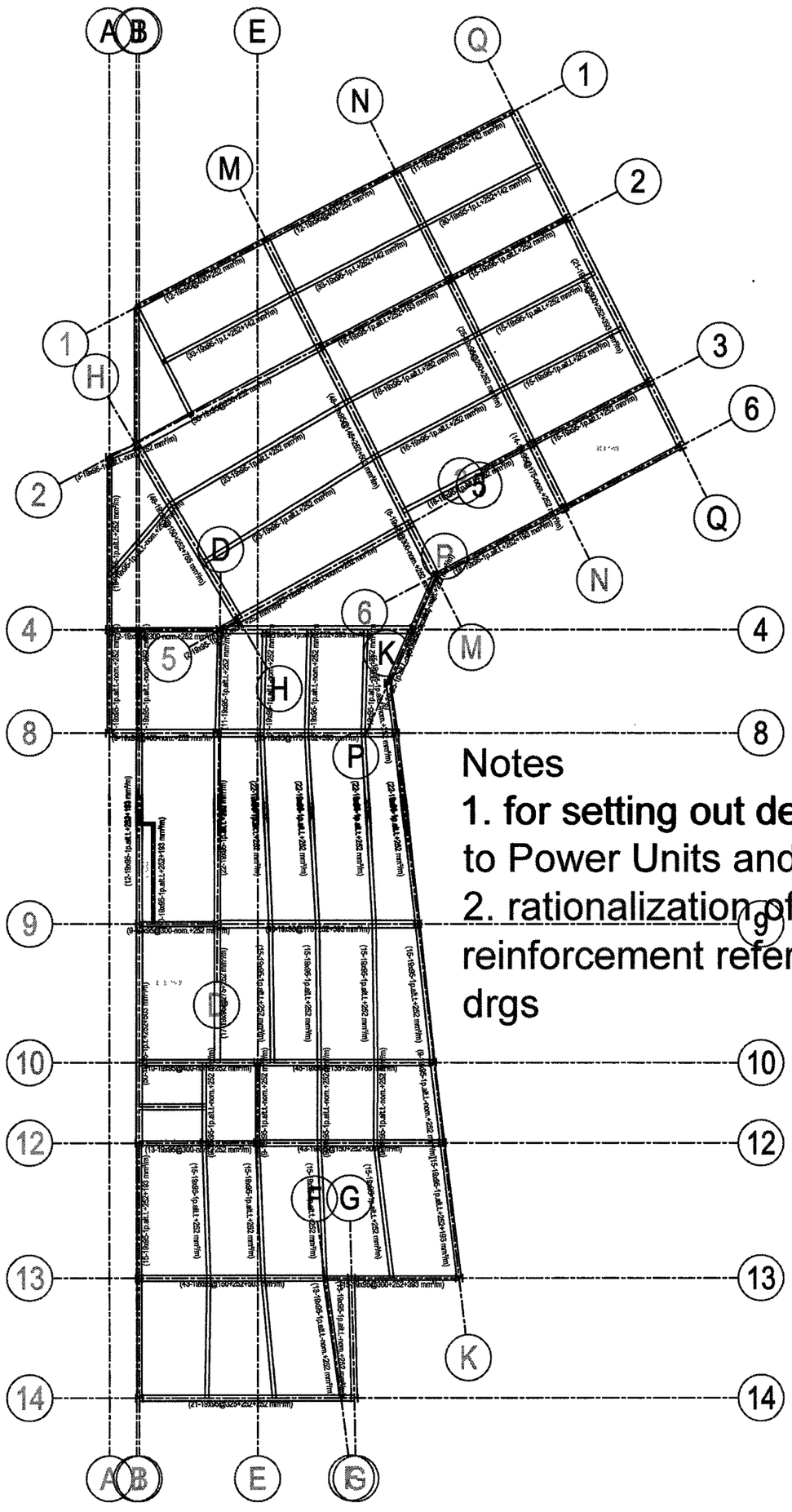
PROJECT	Proposed development at Orchard Street Neath	DATE	INITIALS	REVISION
		Dec 2007	CRFG	
STRUCTURE	Layout of shear studs and reinforcement - Level 2	Slowikowski, Blackshaw & Partners		DRAWING NO
CLIENT	Ginex Ltd	CIVIL AND STRUCTURAL CONSULTING ENGINEERS		GOA/A/1511/614

The Maltings, East Tyndall Street, Cardiff Bay, Cardiff CF1 5EA. Tel: (02920 451331) Fax: (02920 451344)

270 X 373



Notes

1. for setting out details refer to Power Units and Architects drgs
2. rationalization of studs and reinforcement refer to Richard Lees drgs

Plan at Level 3 Scale 1:175

NOTES

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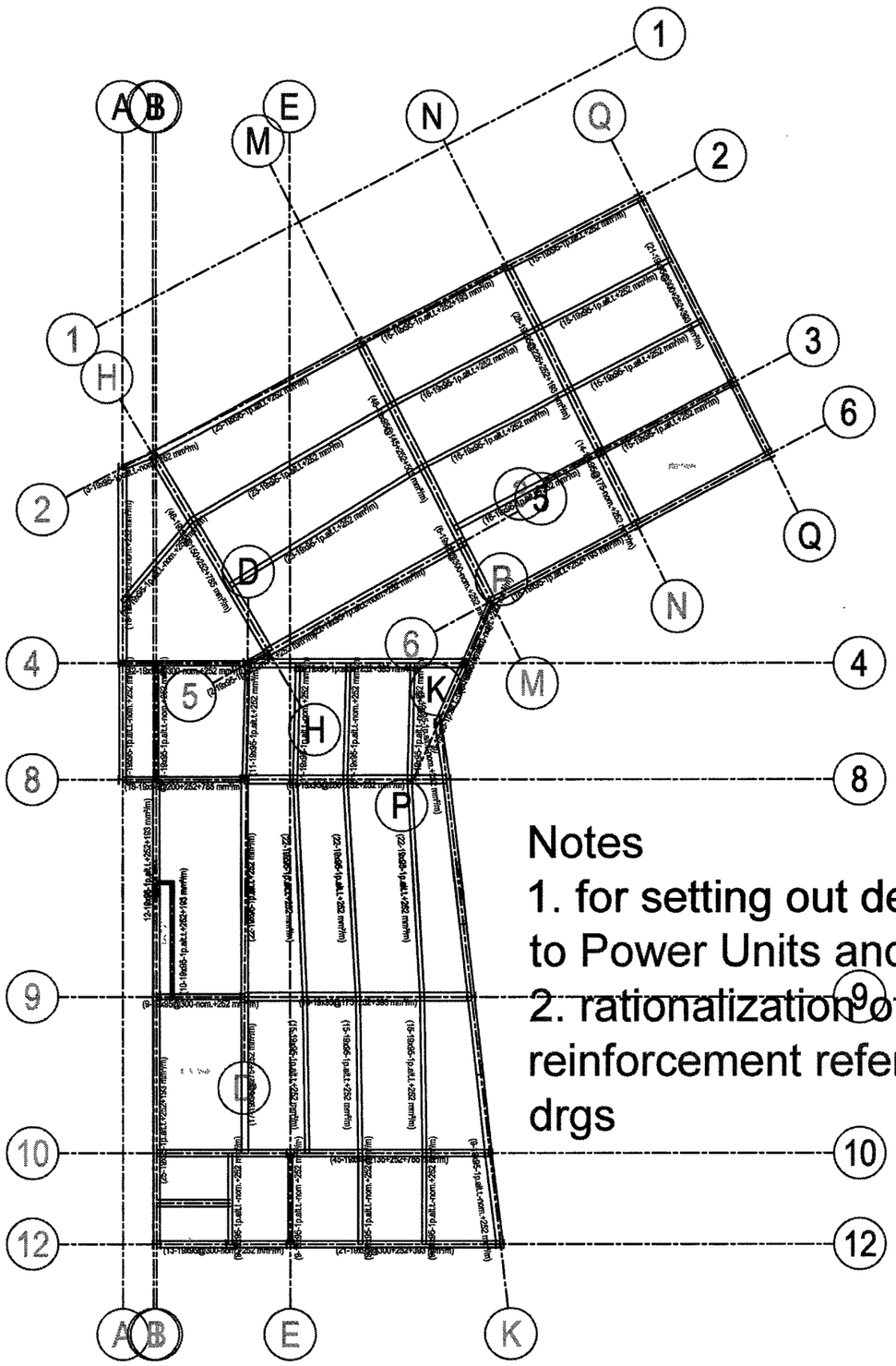
PROJECT	Proposed development at Orchard Street Neath	DATE Dec 2007	INITIALS CRFG	REVISION
STRUCTUR	Layout of shear studs and reinforcement - Level 3	Slowikowski, Blackshaw & Partners CIVIL AND STRUCTURAL CONSULTING ENGINEERS		DRAWING NO GOA/A/1511/615
CLIENT	Ginex Ltd	The Maltings, East Tyndall Street, Cardiff Bay, Cardiff CF1 5EA. Tel: (02920 451[illegible]) Fax: (02920 451347)		

270 X 373



Notes

1. for setting out details refer to Power Units and Architects drgs
2. rationalization of studs and reinforcement refer to Richard Lees drgs

Plan at Level 5 Scale 1:175

NOTES

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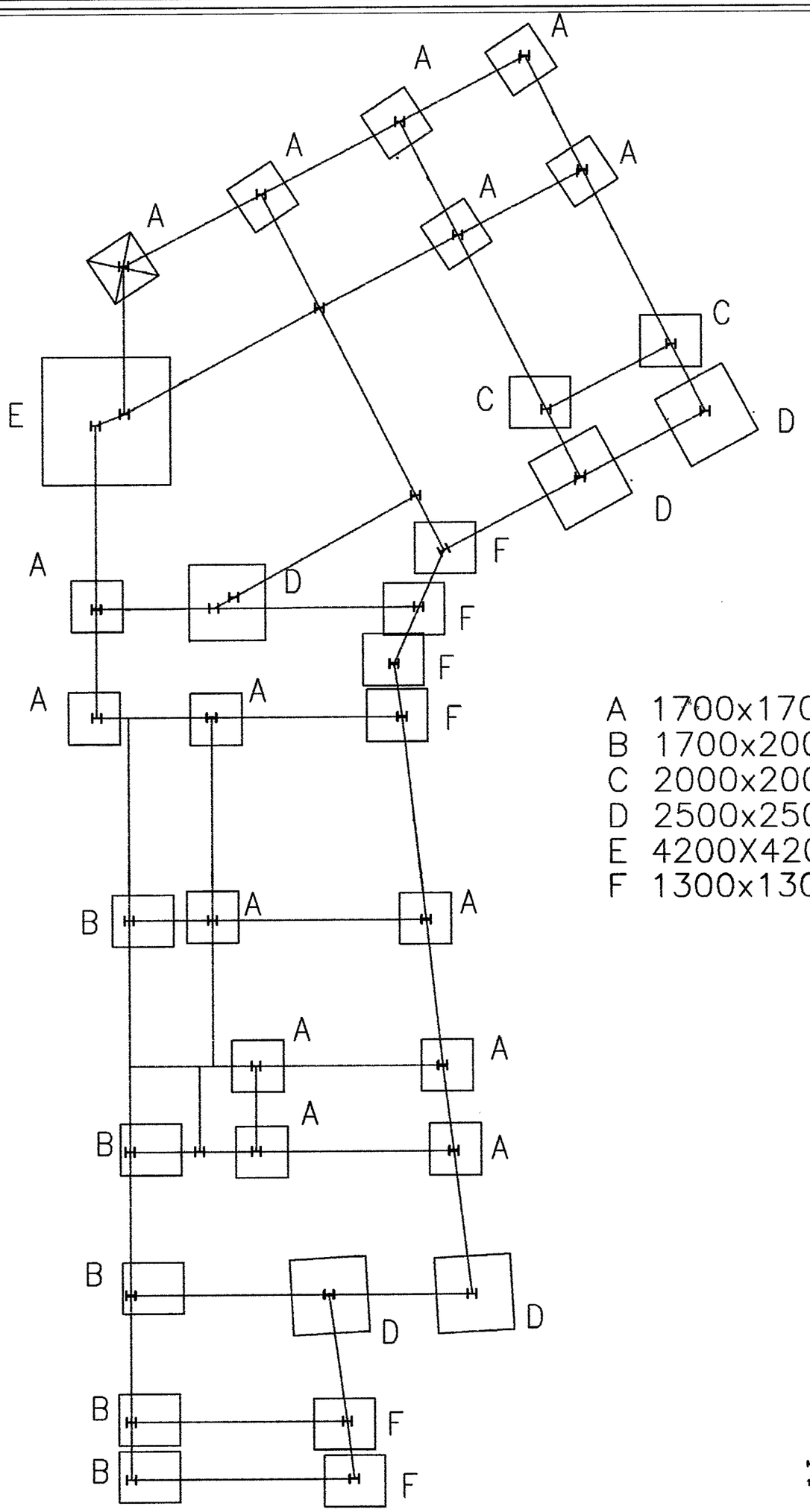
PROJECT	Proposed development at Orchard Street Neath		DATE Dec 2007	INITIALS CRFG	REVISION
STRUCTURE	Layout of shear studs and reinforcement - Level 5	Slowikowski, Blackshaw & Partners CIVIL AND STRUCTURAL CONSULTING ENGINEERS			DRAWING NO.
CLIENT	Ginex Ltd	The Maltings, East Tyndall Street, Cardiff Bay, Cardiff CF1 5EA. Tel: (02920 451[illegible] Fax: (02920 451344)			GOA/A/1511/617

270 X 373



07/0849

A 1700x1700x700 Deep
B 1700x2000x700 Deep
C 2000x2000x1000 Deep
D 2500x2500x1000 Deep
E 4200X4200x1000 Deep
F 1300x1300x500 Deep

NOTES

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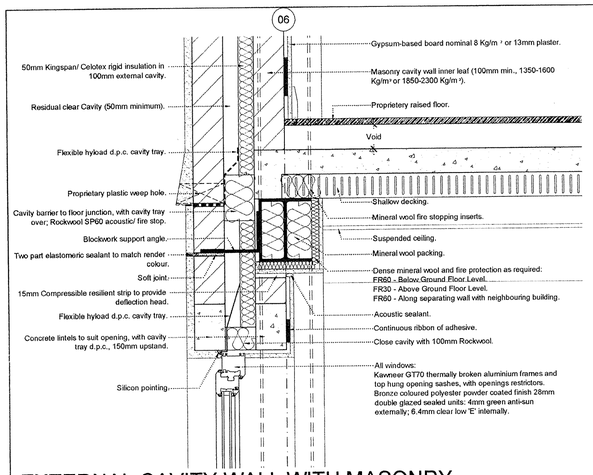
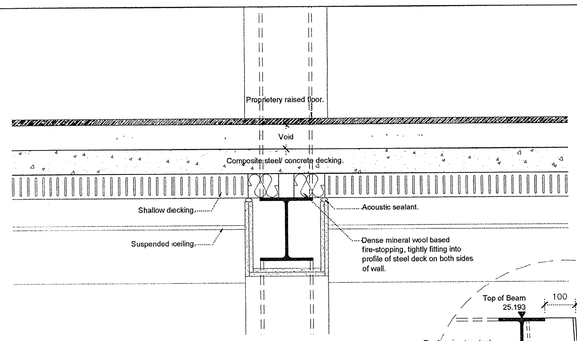
PROJECT	Proposed Office Development at 18 Orchard St. Neath	DATE JULY2007	INITIALS CRFG	REVISION
STRUCTURE	Foundation details	Slowikowski, Blackshaw & Partners CIVIL AND STRUCTURAL CONSULTING ENGINEERS		DRAWING NO. GOA/A/1511/05
CLIENT	Ginex Ltd	The Maltings, East Tyndall Street, Cardiff Bay, Cardiff CF1 5EA. Tel: (02920 451331) Fax: (02920 451344)		

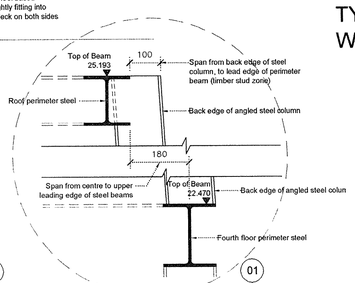
270 X 373



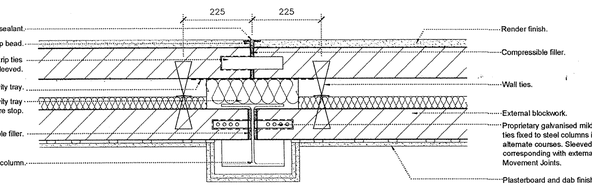
EXTERNAL CAVITY WALL WITH MASONRY INTERNAL LEAF AND SHALLOW DECK COMPOSITE FLOOR (WITH DOWNSTAND BEAM) (TYPICAL DETAIL 1) scale 1:10



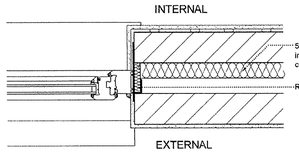
TYPICAL DETAIL 3 SCALE 1:10



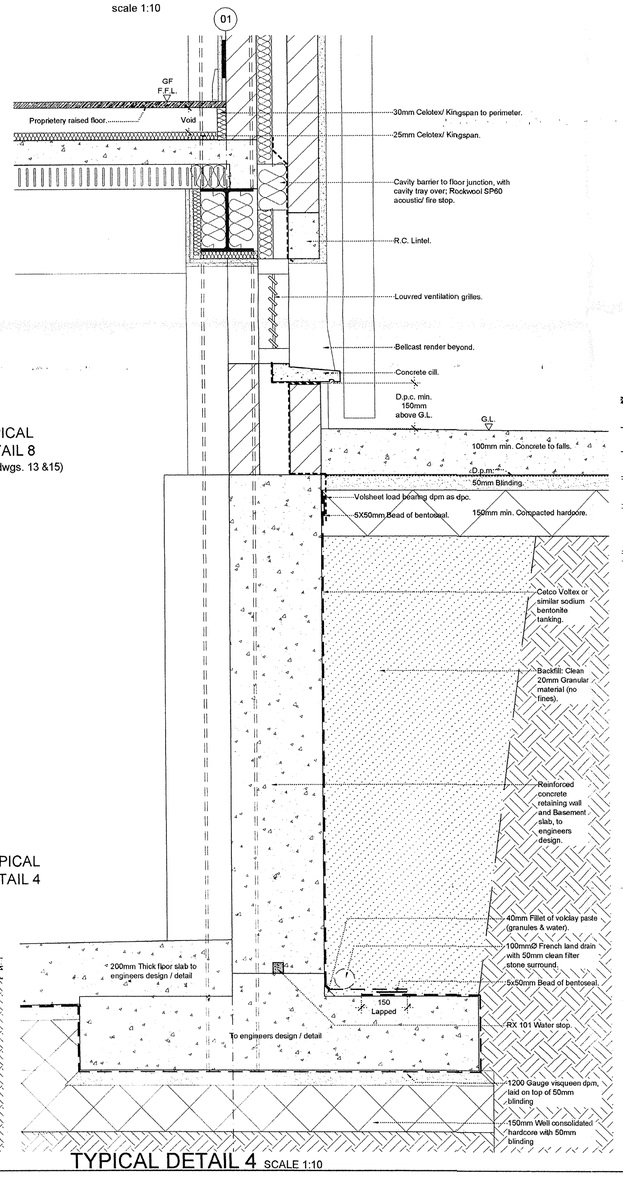
Off-set of roof perimeter beam
SCALE 1:10



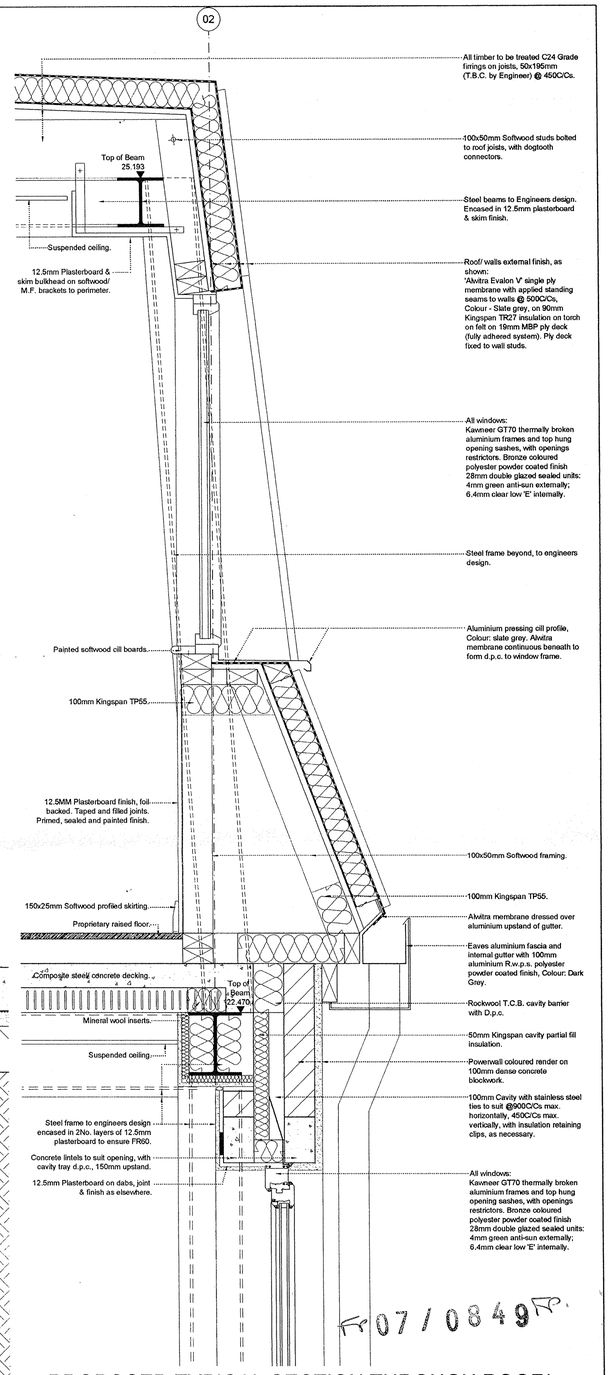
TYPICAL PLAN DETAIL THROUGH EXTERNAL WALL SHOWING MOVEMENT JOINT SCALE 1:10



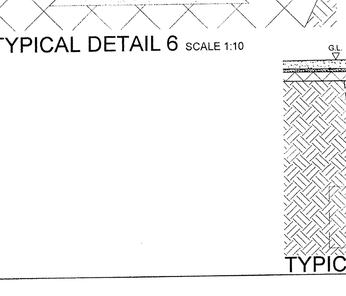
PLAN DETAIL OF ROCKREVEAL CAVITY CLOSER AT WINDOW & DOOR REVEALS
scale 1:10



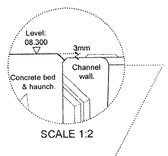
TYPICAL DETAIL 4 SCALE 1:10



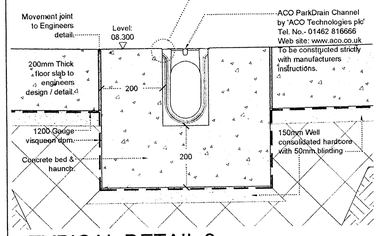
PROPOSED TYPICAL SECTION THROUGH ROOF/ TOP FLOOR PERIMETER (TYPICAL DETAIL 5) scale 1:10



TYPICAL DETAIL 2 SCALE 1:10



SCALE 1:2



TYPICAL DETAIL 6 SCALE 1:10

TYPICAL SECTION THROUGH REAR EXTENSION (SECTION A-A') SCALE 1:50

F07/0849

JOB: PROPOSED OFFICE DEVELOPMENT		CLIENT: GINEX LTD	
ADDRESS: 18,ORCHARD ST,NEATH			
TITLE: PROPOSED SECTION		DRW-No. 6	Rev K
SYSTEM No: N-S/02-331-details		DATE: 29.03.07	
JOB No: SW/2002/331		Checked by:	
SCALES: A1 @ 1:10 / 1:50		DRAWN BY: D.J.ELLIS	

REVISIONS DESCRIPTION:
A Details added. D.J.E. 04.04.07
B Notes added. D.J.E. 16.04.07
C Minor revisions. D.J.E. 18.04.07
D Section revised to suit amended plans. D.J.E. 06.08.07
E Basement updated. D.J.E. 15.08.07
F Drainage channel shown, ret. wall kicker. D.J.E. 22.08.07
G Blockwork support angles added. D.J.E. 12.09.07
H Roof perimeter beam setting out & found pad level added. N.D. 21.09.07
J Balcony added, Structural levels added. D.J.E. 09.10.07
K Grid lines added. D.J.E. 11.10.07

ALL DIMENSIONS TO BE CHECKED ON SITE: Contractor to check and verify all building and site dimensions. The contractor is to comply in all respects with the current Building Regulations whether specifically stated on this drawing or not. This drawing must be read and checked against any other specialist drawing provided.

thomas parry
DESIGN PARTNERSHIP
The Old Sketty Coach House,
21 Gower Road, Sketty
Swansea, SA2 9BX
TEL: 01792 290755
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Email: design@thomasparry.co.uk
Website: thomasparry.co.uk

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APPENDIX E

Laboratory Report

2788

GEO Site & Testing Services Ltd

Contract Number: 50781

Client Ref:
Client PO:

Report Date: **03-11-2020**

Client **Grade Consulting Ltd**
Cae Hir
Pencoed
Llanelli
SA14 9RT

Contract Title: **18 Orchard St, Neath**
For the attention of: **Iwan Griffiths**

Date Received: **15-10-2020**
Date Completed: **03-11-2020**

Test Description	Qty
Compressive Strength of cored specimens in concrete structures BS EN 12504-1:2009 - * UKAS	13
Disposal of samples for job	1

Notes: **Observations and Interpretations are outside the UKAS Accreditation**
*** - denotes test included in laboratory scope of accreditation**
 # - denotes test carried out by approved contractor
@ - denotes non accredited tests

This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

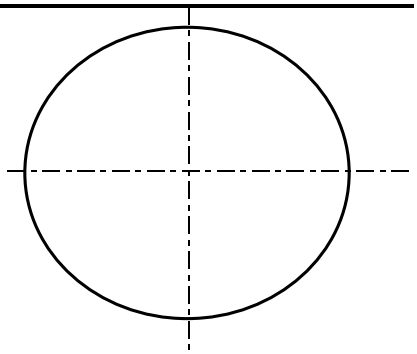
Approved Signatories:
Emma Sharp (Office Manager/Director) - Paul Evans (Quality/Technical Manager) - Richard John (Advanced Testing Manager)
Sean Penn (Administrative/Accounts Assistant) - Shaun Jones (Laboratory manager) - Wayne Honey (Administrative/Quality Assistant)

GEO Site & Testing Services Ltd
Unit 3-4, Heol Aur, Dafen Ind Estate, Dafen, Llanelli, Carmarthenshire SA14 8QN
Tel: 01554 784040 Fax: 01554 784041 info@gstl.co.uk gstl.co.uk

Test Report: **Testing concrete in structures. Cored specimens. Taking, examining and testing in compression BS EN 12504-1:2009 & BS EN 12390-3: 2009**

Client:	**Grade Consulting Ltd**
Client Ref:	
Contract Number:	**50781**
Location	**18 Orchard St, Neath**

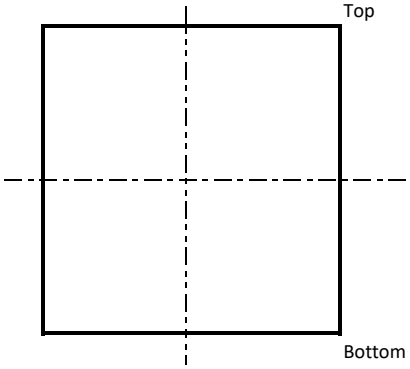
Core Description	**Concrete Core**
Sample Number	**Basement Pad 1**
Maximum aggregate Size (mm)	**33**
Direction of coring	**Vertical**
Date cored	**Unknown**
Date of Test	**02/11/2020**
Method used for Preparation	**Cutting**
Condition On Test	**Surface Dry**
Core Density (kg/m^3)	**2381**
Density Condition	**As received**



Vertical re-bar
From Centre (mm) n/a
Horizontal Rebar
From Top (mm) n/a
From Centre (mm) n/a
Re-bar Diameter (mm) n/a

Measurement Dimensions: BS EN 12390-1: 2012

Size of sample Received in Lab (mm)	Diameter	**93.0**
	Length	**221.0**
Size of sample tested (mm)	Diameter	**93.3**
	Length	**95.1**
Length Diameter ratio of prepared specimen:		**1.02**



Compression: BS EN 12390-3:2009

Compressive Strength N/mm2	**19.5**
Appearance of concrete and Type of Fracture	**Satisfactory**
Compaction of concrete, classification of void %	**1.5**
Any Deviations from the standard Method of Testing [(1)]	**n/a**

Remarks:

[(1)] All the testing was carried out in accordance with BS EN 12390-3: 2009 except as detailed

Technician Responsible
Kyle Simmonite

For and behalf of GEO Site & Testing Services Ltd

Checked by:
Wayne Honey Administrative/Quality Assistant

W. Honey

GSTL
GEO SITE & TESTING SERVICES LTD

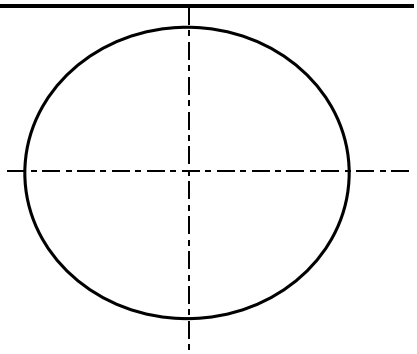
Date: 3.11.20

UKAS TESTING
2788

Test Report: **Testing concrete in structures. Cored specimens. Taking, examining and testing in compression BS EN 12504-1:2009 & BS EN 12390-3: 2009**

Client:	**Grade Consulting Ltd**
Client Ref:	
Contract Number:	**50781**
Location	**18 Orchard St, Neath**

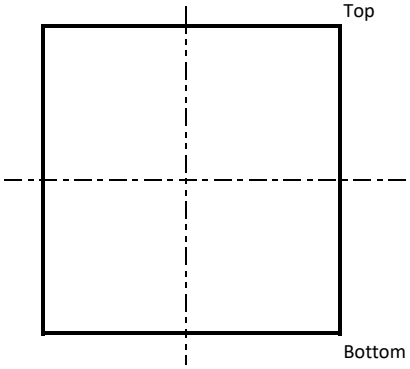
Core Description	**Concrete Core**
Sample Number	**Basement Pad 2**
Maximum aggregate Size (mm)	**23**
Direction of coring	**Vertical**
Date cored	**Unknown**
Date of Test	**02/11/2020**
Method used for Preparation	**Cutting**
Condition On Test	**Surface Dry**
Core Density (kg/m^3)	**2351**
Density Condition	**As received**



Vertical re-bar
From Centre (mm) n/a
Horizontal Rebar
From Top (mm) n/a
From Centre (mm) n/a
Re-bar Diameter (mm) n/a

Measurement Dimensions: BS EN 12390-1: 2012

Size of sample Received in Lab (mm)	Diameter	**93.0**
	Length	**250.0**
Size of sample tested (mm)	Diameter	**92.8**
	Length	**97.8**
Length Diameter ratio of prepared specimen:		**1.05**



Compression: BS EN 12390-3:2009

Compressive Strength N/mm2	**25.6**
Appearance of concrete and Type of Fracture	**Satisfactory**
Compaction of concrete, classification of void %	**0.5**
Any Deviations from the standard Method of Testing [1]	**n/a**

Remarks:

[1] All the testing was carried out in accordance with BS EN 12390-3: 2009 except as detailed

Technician Responsible
Kyle Simmonite

For and behalf of GEO Site & Testing Services Ltd

Checked by:
Wayne Honey Administrative/Quality Assistant

W. Honey

GSTL
GEO SITE & TESTING SERVICES LTD

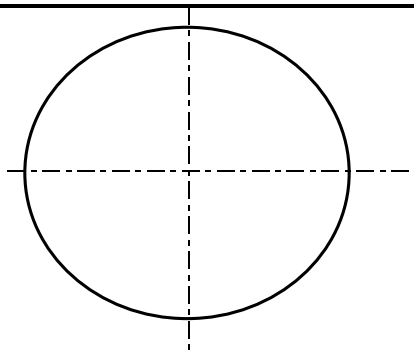
Date: 3.11.20

UKAS TESTING
2788

Test Report: **Testing concrete in structures. Cored specimens. Taking, examining and testing in compression BS EN 12504-1:2009 & BS EN 12390-3: 2009**

Client: **Grade Consulting Ltd**
Client Ref:
Contract Number: **50781**
Location **18 Orchard St, Neath**

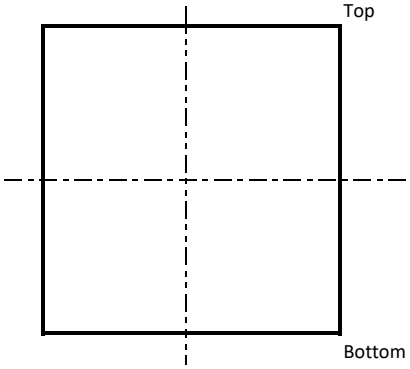
Core Description	**Concrete Core**
Sample Number	**Floor 1 - Front**
Maximum aggregate Size (mm)	**17**
Direction of coring	**Vertical**
Date cored	**Unknown**
Date of Test	**02/11/2020**
Method used for Preparation	**Cutting**
Condition On Test	**Surface Dry**
Core Density (kg/m^3)	**2307**
Density Condition	**As received**



Vertical re-bar
From Centre (mm) n/a
Horizontal Rebar
From Top (mm) n/a
From Centre (mm) n/a
Re-bar Diameter (mm) n/a

Measurement Dimensions: BS EN 12390-1: 2012

Size of sample Received in Lab (mm)	Diameter	**94.0**
	Length	**124.0**
Size of sample tested (mm)	Diameter	**93.9**
	Length	**95.9**
Length Diameter ratio of prepared specimen:		**1.02**



Compression: BS EN 12390-3:2009

Compressive Strength N/mm2	**12.0**
Appearance of concrete and Type of Fracture	**Satisfactory**
Compaction of concrete, classification of void %	**0.5**
Any Deviations from the standard Method of Testing [1]	**n/a**

Remarks:

[1] All the testing was carried out in accordance with BS EN 12390-3: 2009 except as detailed

Technician Responsible
Kyle Simmonite

For and behalf of GEO Site & Testing Services Ltd

Checked by:
Wayne Honey Administrative/Quality Assistant

W. Honey

GSTL
GEO SITE & TESTING SERVICES LTD

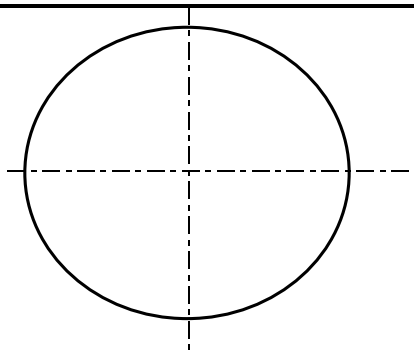
Date: 3.11.20

UKAS TESTING
2788

Test Report: **Testing concrete in structures. Cored specimens. Taking, examining and testing in compression BS EN 12504-1:2009 & BS EN 12390-3: 2009**

Client:	**Grade Consulting Ltd**
Client Ref:	
Contract Number:	**50781**
Location	**18 Orchard St, Neath**

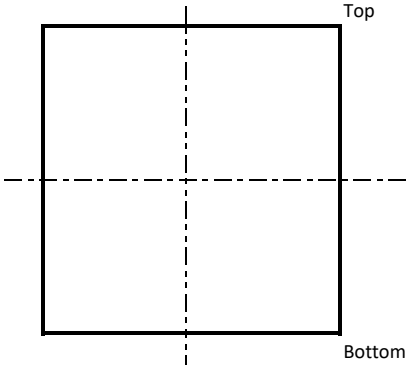
Core Description	**Concrete Core**
Sample Number	**Floor 1 - Middle**
Maximum aggregate Size (mm)	**25**
Direction of coring	**Vertical**
Date cored	**Unknown**
Date of Test	**02/11/2020**
Method used for Preparation	**Cutting**
Condition On Test	**Surface Dry**
Core Density (kg/m^3)	**2296**
Density Condition	**As received**



Vertical re-bar
From Centre (mm) n/a
Horizontal Rebar
From Top (mm) n/a
From Centre (mm) n/a
Re-bar Diameter (mm) n/a

Measurement Dimensions: BS EN 12390-1: 2012

Size of sample Received in Lab (mm)	Diameter	**94.0**
	Length	**120.0**
Size of sample tested (mm)	Diameter	**94.0**
	Length	**95.0**
Length Diameter ratio of prepared specimen:		**1.01**



Compression: BS EN 12390-3:2009

Compressive Strength N/mm2	**47.3**
Appearance of concrete and Type of Fracture	**Satisfactory**
Compaction of concrete, classification of void %	**0.5**
Any Deviations from the standard Method of Testing [1]	**n/a**

Remarks:

[1] All the testing was carried out in accordance with BS EN 12390-3: 2009 except as detailed

Technician Responsible
Kyle Simmonite

For and behalf of GEO Site & Testing Services Ltd

Checked by:
Wayne Honey Administrative/Quality Assistant

W. Honey

GSTL
GEO SITE & TESTING SERVICES LTD

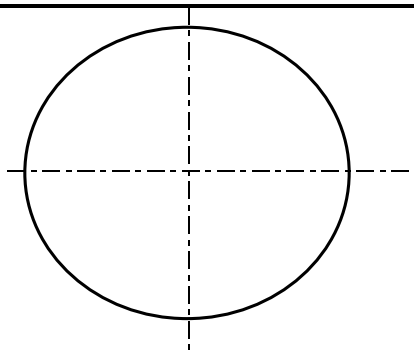
Date: 3.11.20

UKAS TESTING
2788

Test Report: **Testing concrete in structures. Cored specimens. Taking, examining and testing in compression BS EN 12504-1:2009 & BS EN 12390-3: 2009**

Client:	**Grade Consulting Ltd**
Client Ref:	
Contract Number:	**50781**
Location	**18 Orchard St, Neath**

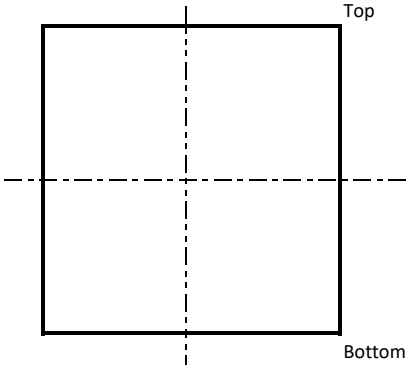
Core Description	**Concrete Core**
Sample Number	**Floor 1 - Rear**
Maximum aggregate Size (mm)	**19**
Direction of coring	**Vertical**
Date cored	**Unknown**
Date of Test	**02/11/2020**
Method used for Preparation	**Cutting**
Condition On Test	**Surface Dry**
Core Density (kg/m^3)	**2319**
Density Condition	**As received**



Vertical re-bar
From Centre (mm) n/a
Horizontal Rebar
From Top (mm) n/a
From Centre (mm) n/a
Re-bar Diameter (mm) n/a

Measurement Dimensions: BS EN 12390-1: 2012

Size of sample Received in Lab (mm)	Diameter	**94.0**
	Length	**127.0**
Size of sample tested (mm)	Diameter	**93.9**
	Length	**99.8**
Length Diameter ratio of prepared specimen:		**1.06**



Compression: BS EN 12390-3:2009

Compressive Strength N/mm2	**34.6**
Appearance of concrete and Type of Fracture	**Satisfactory**
Compaction of concrete, classification of void %	**0.5**
Any Deviations from the standard Method of Testing [1]	**n/a**

Remarks:

[1] All the testing was carried out in accordance with BS EN 12390-3: 2009 except as detailed

Technician Responsible
Kyle Simmonite

For and behalf of GEO Site & Testing Services Ltd

Checked by:
Wayne Honey Administrative/Quality Assistant

W. Honey

GSTL
GEO SITE & TESTING SERVICES LTD

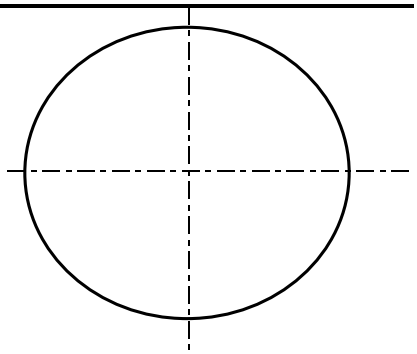
Date: 3.11.20

UKAS TESTING
2788

Test Report: **Testing concrete in structures. Cored specimens. Taking, examining and testing in compression BS EN 12504-1:2009 & BS EN 12390-3: 2009**

Client:	**Grade Consulting Ltd**
Client Ref:	
Contract Number:	**50781**
Location	**18 Orchard St, Neath**

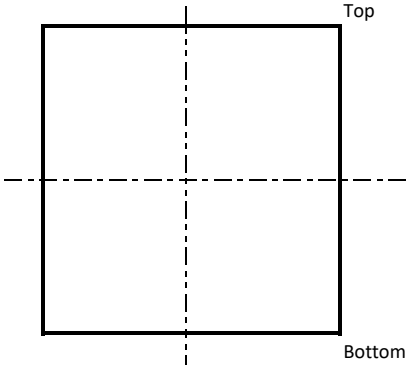
Core Description	**Concrete Core**
Sample Number	**Floor 2 - Front**
Maximum aggregate Size (mm)	**27**
Direction of coring	**Vertical**
Date cored	**Unknown**
Date of Test	**02/11/2020**
Method used for Preparation	**Cutting**
Condition On Test	**Surface Dry**
Core Density (kg/m^3)	**2298**
Density Condition	**As received**



Vertical re-bar
From Centre (mm) n/a
Horizontal Rebar
From Top (mm) n/a
From Centre (mm) n/a
Re-bar Diameter (mm) n/a

Measurement Dimensions: BS EN 12390-1: 2012

Size of sample Received in Lab (mm)	Diameter	**94.0**
	Length	**117.0**
Size of sample tested (mm)	Diameter	**93.8**
	Length	**98.2**
Length Diameter ratio of prepared specimen:		**1.05**



Compression: BS EN 12390-3:2009

Compressive Strength N/mm2	**36.1**
Appearance of concrete and Type of Fracture	**Satisfactory**
Compaction of concrete, classification of void %	**0.5**
Any Deviations from the standard Method of Testing [1]	**n/a**

Remarks:

[1] All the testing was carried out in accordance with BS EN 12390-3: 2009 except as detailed

Technician Responsible
Kyle Simmonite

For and behalf of GEO Site & Testing Services Ltd

Checked by:
Wayne Honey Administrative/Quality Assistant

W. Honey

GSTL
GEO SITE & TESTING SERVICES LTD

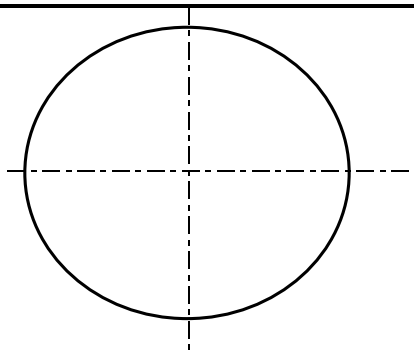
Date: 3.11.20

UKAS TESTING
2788

Test Report: **Testing concrete in structures. Cored specimens. Taking, examining and testing in compression BS EN 12504-1:2009 & BS EN 12390-3: 2009**

Client:	**Grade Consulting Ltd**
Client Ref:	
Contract Number:	**50781**
Location	**18 Orchard St, Neath**

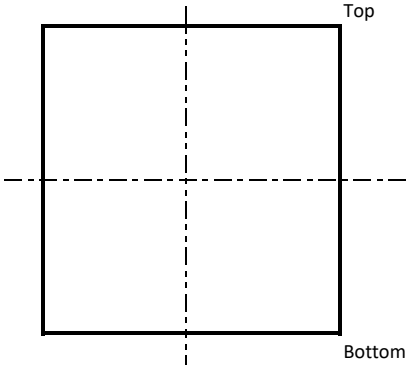
Core Description	**Concrete Core**
Sample Number	**Floor 2 - Middle**
Maximum aggregate Size (mm)	**21**
Direction of coring	**Vertical**
Date cored	**Unknown**
Date of Test	**02/11/2020**
Method used for Preparation	**Cutting**
Condition On Test	**Surface Dry**
Core Density (kg/m^3)	**2285**
Density Condition	**As received**



Vertical re-bar
From Centre (mm) n/a
Horizontal Rebar
From Top (mm) n/a
From Centre (mm) n/a
Re-bar Diameter (mm) n/a

Measurement Dimensions: BS EN 12390-1: 2012

Size of sample Received in Lab (mm)	Diameter	**94.0**
	Length	**120.0**
Size of sample tested (mm)	Diameter	**93.8**
	Length	**99.5**
Length Diameter ratio of prepared specimen:		**1.06**



Compression: BS EN 12390-3:2009

Compressive Strength N/mm2	**34.2**
Appearance of concrete and Type of Fracture	**Satisfactory**
Compaction of concrete, classification of void %	**0.5**
Any Deviations from the standard Method of Testing [1]	**n/a**

Remarks:

[1] All the testing was carried out in accordance with BS EN 12390-3: 2009 except as detailed

Technician Responsible
Kyle Simmonite

For and behalf of GEO Site & Testing Services Ltd

Checked by:
Wayne Honey Administrative/Quality Assistant

W. Honey

GSTL
GEO SITE & TESTING SERVICES LTD

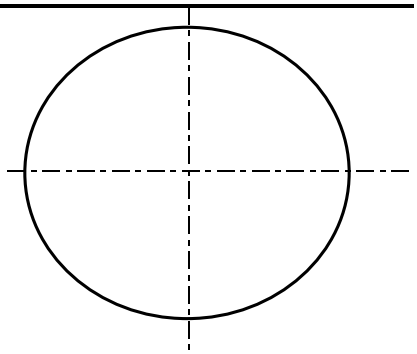
Date: 3.11.20

UKAS TESTING
2788

Test Report: **Testing concrete in structures. Cored specimens. Taking, examining and testing in compression BS EN 12504-1:2009 & BS EN 12390-3: 2009**

Client:	**Grade Consulting Ltd**
Client Ref:	
Contract Number:	**50781**
Location	**18 Orchard St, Neath**

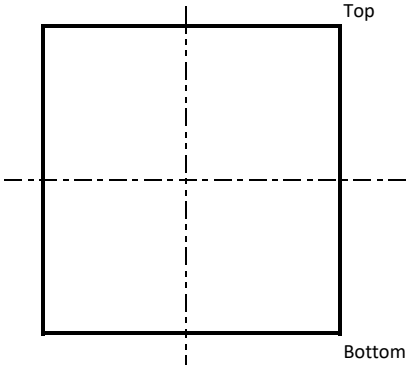
Core Description	**Concrete Core**
Sample Number	**Floor 2 - Rear**
Maximum aggregate Size (mm)	**25**
Direction of coring	**Vertical**
Date cored	**Unknown**
Date of Test	**02/11/2020**
Method used for Preparation	**Cutting**
Condition On Test	**Surface Dry**
Core Density (kg/m^3)	**2348**
Density Condition	**As received**



Vertical re-bar
From Centre (mm) n/a
Horizontal Rebar
From Top (mm) n/a
From Centre (mm) n/a
Re-bar Diameter (mm) n/a

Measurement Dimensions: BS EN 12390-1: 2012

Size of sample Received in Lab (mm)	Diameter	**94.0**
	Length	**121.0**
Size of sample tested (mm)	Diameter	**93.8**
	Length	**98.3**
Length Diameter ratio of prepared specimen:		**1.05**



Compression: BS EN 12390-3:2009

Compressive Strength N/mm2	**33.7**
Appearance of concrete and Type of Fracture	**Satisfactory**
Compaction of concrete, classification of void %	**0.5**
Any Deviations from the standard Method of Testing [1]	**n/a**

Remarks:

[1] All the testing was carried out in accordance with BS EN 12390-3: 2009 except as detailed

Technician Responsible
Kyle Simmonite

For and behalf of GEO Site & Testing Services Ltd

Checked by:
Wayne Honey Administrative/Quality Assistant

W. Honey

GSTL
GEO SITE & TESTING SERVICES LTD

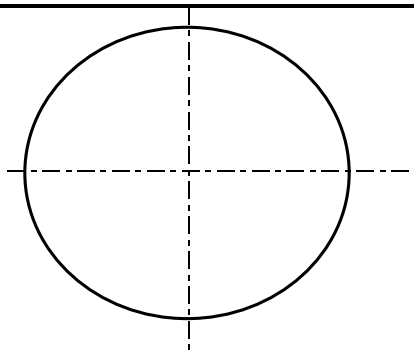
Date: 3.11.20

UKAS TESTING
2788

Test Report: **Testing concrete in structures. Cored specimens. Taking, examining and testing in compression BS EN 12504-1:2009 & BS EN 12390-3: 2009**

Client:	**Grade Consulting Ltd**
Client Ref:	
Contract Number:	**50781**
Location	**18 Orchard St, Neath**

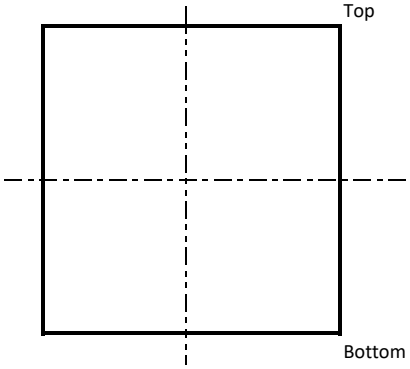
Core Description	**Concrete Core**
Sample Number	**Floor 3 - Front**
Maximum aggregate Size (mm)	**28**
Direction of coring	**Vertical**
Date cored	**Unknown**
Date of Test	**02/11/2020**
Method used for Preparation	**Cutting**
Condition On Test	**Surface Dry**
Core Density (kg/m^3)	**2324**
Density Condition	**As received**



Vertical re-bar
From Centre (mm) n/a
Horizontal Rebar
From Top (mm) n/a
From Centre (mm) n/a
Re-bar Diameter (mm) n/a

Measurement Dimensions: BS EN 12390-1: 2012

Size of sample Received in Lab (mm)	Diameter	**94.0**
	Length	**110.0**
Size of sample tested (mm)	Diameter	**93.9**
	Length	**97.0**
Length Diameter ratio of prepared specimen:		**1.03**



Compression: BS EN 12390-3:2009

Compressive Strength N/mm2	**23.7**
Appearance of concrete and Type of Fracture	**Satisfactory**
Compaction of concrete, classification of void %	**0.5**
Any Deviations from the standard Method of Testing [1]	**n/a**

Remarks:

[1] All the testing was carried out in accordance with BS EN 12390-3: 2009 except as detailed

Technician Responsible
Kyle Simmonite

For and behalf of GEO Site & Testing Services Ltd

Checked by:
Wayne Honey Administrative/Quality Assistant

W. Honey

GSTL
GEO SITE & TESTING SERVICES LTD

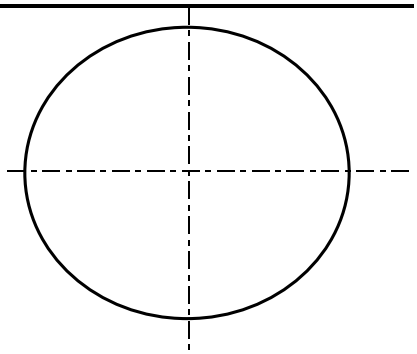
Date: 3.11.20

UKAS TESTING
2788

Test Report: **Testing concrete in structures. Cored specimens. Taking, examining and testing in compression BS EN 12504-1:2009 & BS EN 12390-3: 2009**

Client:	**Grade Consulting Ltd**
Client Ref:	
Contract Number:	**50781**
Location	**18 Orchard St, Neath**

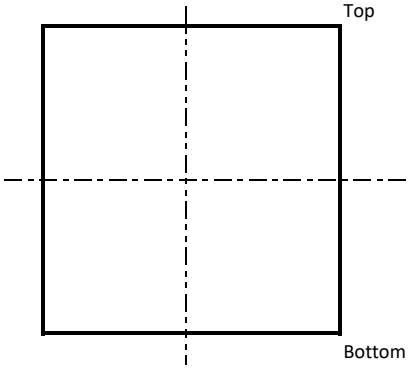
Core Description	**Concrete Core**
Sample Number	**Floor 3 - Middle**
Maximum aggregate Size (mm)	**22**
Direction of coring	**Vertical**
Date cored	**Unknown**
Date of Test	**02/11/2020**
Method used for Preparation	**Cutting**
Condition On Test	**Surface Dry**
Core Density (kg/m^3)	**2251**
Density Condition	**As received**



Vertical re-bar
From Centre (mm) n/a
Horizontal Rebar
From Top (mm) n/a
From Centre (mm) n/a
Re-bar Diameter (mm) n/a

Measurement Dimensions: BS EN 12390-1: 2012

Size of sample Received in Lab (mm)	Diameter	**94.0**
	Length	**106.0**
Size of sample tested (mm)	Diameter	**94.0**
	Length	**97.4**
Length Diameter ratio of prepared specimen:		**1.04**



Compression: BS EN 12390-3:2009

Compressive Strength N/mm2	**22.4**
Appearance of concrete and Type of Fracture	**Satisfactory**
Compaction of concrete, classification of void %	**0.5**
Any Deviations from the standard Method of Testing [1]	**n/a**

Remarks:

[1] All the testing was carried out in accordance with BS EN 12390-3: 2009 except as detailed

Technician Responsible
Kyle Simmonite

For and behalf of GEO Site & Testing Services Ltd

Checked by:
Wayne Honey Administrative/Quality Assistant

W. Honey

GSTL
GEO SITE & TESTING SERVICES LTD

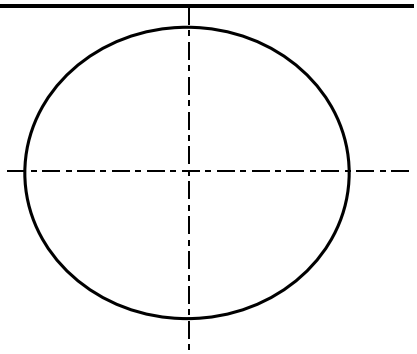
Date: 3.11.20

UKAS TESTING
2788

Test Report: **Testing concrete in structures. Cored specimens. Taking, examining and testing in compression BS EN 12504-1:2009 & BS EN 12390-3: 2009**

Client:	**Grade Consulting Ltd**
Client Ref:	
Contract Number:	**50781**
Location	**18 Orchard St, Neath**

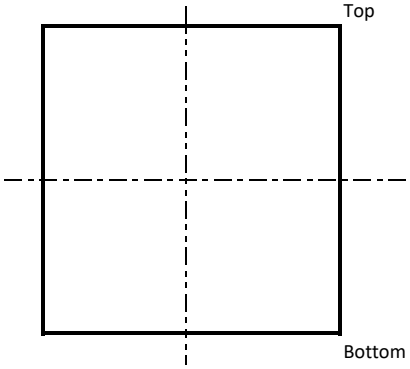
Core Description	**Concrete Core**
Sample Number	**Floor 4 - Front**
Maximum aggregate Size (mm)	**26**
Direction of coring	**Vertical**
Date cored	**Unknown**
Date of Test	**02/11/2020**
Method used for Preparation	**Cutting**
Condition On Test	**Surface Dry**
Core Density (kg/m^3)	**2282**
Density Condition	**As received**



Vertical re-bar
From Centre (mm) n/a
Horizontal Rebar
From Top (mm) n/a
From Centre (mm) n/a
Re-bar Diameter (mm) n/a

Measurement Dimensions: BS EN 12390-1: 2012

Size of sample Received in Lab (mm)	Diameter	**94.0**
	Length	**115.0**
Size of sample tested (mm)	Diameter	**93.9**
	Length	**97.6**
Length Diameter ratio of prepared specimen:		**1.04**



Compression: BS EN 12390-3:2009

Compressive Strength N/mm2	**13.6**
Appearance of concrete and Type of Fracture	**Satisfactory**
Compaction of concrete, classification of void %	**0.5**
Any Deviations from the standard Method of Testing [1]	**n/a**

Remarks:

[1] All the testing was carried out in accordance with BS EN 12390-3: 2009 except as detailed

Technician Responsible
Kyle Simmonite

For and behalf of GEO Site & Testing Services Ltd

Checked by:
Wayne Honey Administrative/Quality Assistant

W. Honey

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GEO SITE & TESTING SERVICES LTD

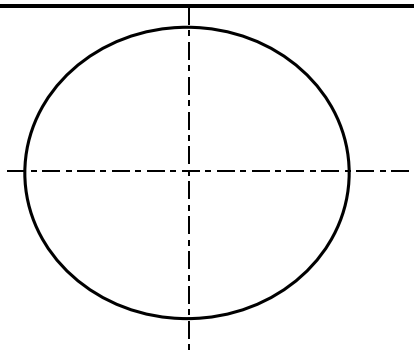
Date: 3.11.20

UKAS TESTING
2788

Test Report: **Testing concrete in structures. Cored specimens. Taking, examining and testing in compression BS EN 12504-1:2009 & BS EN 12390-3: 2009**

Client:	**Grade Consulting Ltd**
Client Ref:	
Contract Number:	**50781**
Location	**18 Orchard St, Neath**

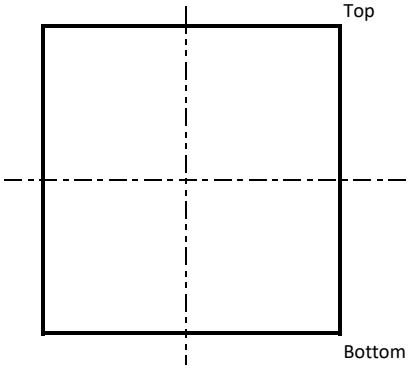
Core Description	**Concrete Core**
Sample Number	**Floor 4 - Middle**
Maximum aggregate Size (mm)	**29**
Direction of coring	**Vertical**
Date cored	**Unknown**
Date of Test	**02/11/2020**
Method used for Preparation	**Cutting**
Condition On Test	**Surface Dry**
Core Density (kg/m^3)	**2248**
Density Condition	**As received**



Vertical re-bar
From Centre (mm) n/a
Horizontal Rebar
From Top (mm) n/a
From Centre (mm) n/a
Re-bar Diameter (mm) n/a

Measurement Dimensions: BS EN 12390-1: 2012

Size of sample Received in Lab (mm)	Diameter	**94.0**
	Length	**114.0**
Size of sample tested (mm)	Diameter	**93.9**
	Length	**99.0**
Length Diameter ratio of prepared specimen:		**1.05**



Compression: BS EN 12390-3:2009

Compressive Strength N/mm2	**36.7**
Appearance of concrete and Type of Fracture	**Satisfactory**
Compaction of concrete, classification of void %	**0.5**
Any Deviations from the standard Method of Testing [1]	**n/a**

Remarks:

[1] All the testing was carried out in accordance with BS EN 12390-3: 2009 except as detailed

Technician Responsible
Kyle Simmonite

For and behalf of GEO Site & Testing Services Ltd

Checked by:
Wayne Honey Administrative/Quality Assistant

W. Honey

GSTL
GEO SITE & TESTING SERVICES LTD

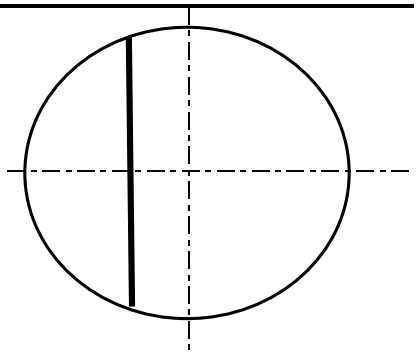
Date: 3.11.20

UKAS TESTING
2788

Test Report: **Testing concrete in structures. Cored specimens. Taking, examining and testing in compression BS EN 12504-1:2009 & BS EN 12390-3: 2009**

Client:	**Grade Consulting Ltd**
Client Ref:	
Contract Number:	**50781**
Location	**18 Orchard St, Neath**

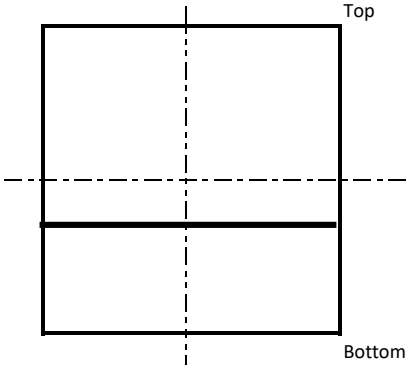
Core Description	**Concrete Core**
Sample Number	**Floor 5 - Middle**
Maximum aggregate Size (mm)	**28**
Direction of coring	**Vertical**
Date cored	**Unknown**
Date of Test	**02/11/2020**
Method used for Preparation	**Cutting**
Condition On Test	**Surface Dry**
Core Density (kg/m^3)	**2334**
Density Condition	**As received**



Vertical re-bar
From Centre (mm) n/a
Horizontal Rebar
From Top (mm) 55
From Centre (mm) 10
Re-bar Diameter (mm) 10

Measurement Dimensions: BS EN 12390-1: 2012

Size of sample Received in Lab (mm)	Diameter	**94.0**
	Length	**120.0**
Size of sample tested (mm)	Diameter	**93.9**
	Length	**97.7**
Length Diameter ratio of prepared specimen:		**1.04**



Compression: BS EN 12390-3:2009

Compressive Strength N/mm2	**35.6**
Appearance of concrete and Type of Fracture	**Satisfactory**
Compaction of concrete, classification of void %	**0.5**
Any Deviations from the standard Method of Testing [1]	**n/a**

Remarks:

[1] All the testing was carried out in accordance with BS EN 12390-3: 2009 except as detailed

Technician Responsible
Kyle Simmonite

For and behalf of GEO Site & Testing Services Ltd

Checked by:
Wayne Honey Administrative/Quality Assistant

W. Honey

GSTL
GEO SITE & TESTING SERVICES LTD

Date: 3.11.20

UKAS TESTING
2788

APPENDIX F

Subject: RE: The Old Liberal Club, 18 Orchard Street, Neath
Date: Friday, 18 December 2020 at 10:53:48 Greenwich Mean Time
From: Robyn Thomas
To: Iwan Griffiths
CC: Paul Davis
Attachments: image001.jpg, image002.jpg, image003.jpg, image004.jpg, image005.jpg, image006.jpg, image007.jpg, image008.png

Iwan

Further to our recent correspondence and conversations I write to confirm that you have been provided with a copy of structural design and calculations for the building. With regards to your request for further information on the build, I have copied below a list of issues that were present during our visit to the site on 17/10/2008 that was sent in writing to Ginex.

1. Cavity ties dirty in part.
2. Inappropriate vertical fire barriers used in cavity.
3. Inappropriately installed vertical DPC in part [rippled]
4. Perp joints not filled with full compo in part.
5. DPC tray above openings incorrectly installed
6. Vertical movement joints have no appropriate seal installed.
7. Horizontal and vertical joints between blockwork and structural steel have no appropriate seals installed.
8. Structural steelwork facing cavity not treated in part.
9. Cavity insulation batts badly fitting in part.
10. No horizontal fire barriers visible at cavity at compartment floor intersection.
11. Insulation batts missing in part.
12. Revised structural calculations for the poured floor slab due to an alternative fibre being used in the mix.

In addition to the above it is worth noting that the building has now been open and exposed to the elements for a number of years which has had an undocumented adverse affect on the integrity of the building fabric. Furthermore we are informed that the building has been damaged by a fire incident that required the attendance of Mid & West Wales Fire & Rescue Service, again structural damage being undocumented.

Given the above I would strongly recommend that before progressing with the development a full structural survey of the building superstructure be carried out, and any remedial works identified be carried out.

If I can be of any further assistance please contact me at your convenience.

Regards,

Robyn Thomas
Senior Building Control Team Leader
Neath Port Talbot County Borough Council/ Cyngor Bwrdeistref Sirol Castell-nedd Port Talbot Tel/Ffôn: 01639 686954

We welcome correspondence in Welsh and will deal with Welsh and English correspondence to the same standards and timescales.
Croesewir gohebiaeth yn y Gymraeg a byddwn yn ymdrin â gohebiaeth Gymraeg a Saesneg i'r un safonau ac amserlenni.

If you would like to use Welsh when dealing with the Council please click here
Os hoffech ddefnyddio'r Gymraeg wrth ddelio â'r Cyngor os gwelwch yn dda cliciwch yma

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