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STRUCTURAL CALCULATIONS

Basement and Ground Floor Slab Design at 20 Kings Mews

Project No: L15/286/12

Revision	Date	Changes

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Date	**: April 2016**
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General Construction Notes and Guidance on using these Calculations

1. Calculations are not to be used for the purpose of ordering materials and should only be used for Building Regulations submissions. All dimensions should be checked by the contractor on site.

2. All steelwork to be mechanically wire brushed and painted two coats of red oxide. Steelwork located in the cavity or below DPC to be suitably protected with 2 coats of bituminous paint.

3. All steelwork connections to use grade 8.8 bolts unless stated otherwise. These are to be spanner tightened using the appropriate podger spanner (min length 460mm) or suitable power tools in accordance with BS2583. If a torque wrench is used the torque applied should be around 90Nm for M16 bolts, 110Nm for M20 & 130Nm for M24.

4. All timber to be grade C24 (SC4), unless stated otherwise. Preservative treated to Architects details.

5. To be read in conjunction with Architects drawings, any inconsistencies between the drawings should be reported. If any site conditions or existing details are found that may affect the structural design, JMS Consulting Engineers are to be notified immediately.

6. For details of fire protection to steelwork, see Architects drawings.

7. The Contractor is to ensure that all existing construction is adequately supported, using needles and props as required. Where a new beam supports the existing construction, adequate pre-load is to be applied and suitable packs such as driven dry-slate introduced, then pointed up with mortar.

8. All blockwork to be 7.3 N/mm^2 in class III mortar below DPC in accordance with BS 5628 : Part 3 : 2005 or suitable 7.0 N/mm^2 foundation quality blocks in class II mortar in accordance with the manufacturer's instructions. All brickwork below DPC to be Engineering Bricks DPC in accordance with BS 5628 : Part 3 : 2005.

9. The project requires the introduction of heavy structural elements such as steel beams or concrete lintels. Although the Construction (Design and Management) Regulation 1994 would not normally apply to this type of construction, the designer still has an obligation to foresee risks and bring to the attention of the builder such risks. In consequence, the builder is to take into consideration the placement of all structural elements, ensuring that the method of lifting and placement is safely carried out. Responsibility for this element lies with the Contractor. As the existing walls need to be propped in order to introduce some of the lintels, this should also be considered in relationship to the risk assessment of the Contractor. Safe working procedures must be adopted. Responsibility for this element lies with the Contractor. Splice details for long-span beams can often be accommodated if required.

10. All construction products should be CE marked in accordance current legislation. This includes all fabricated structural steelwork in accordance with BS EN 1090-1 and BS EN 1090-2. The consequence class is CC2 unless noted otherwise. The service class is SC1 for all buildings, SC2 for all lifting beams, sculptures & fall arrest systems. Production category will be PC1 unless noted otherwise. All site welded items, S355 steelwork & CHS lattice girders will be PC2. As such the execution class for buildings will be EXC2.

11. CLIMATE CHANGE: The Building Research establishment have produced a document CBG 63 "Climate Change: impact on building design and construction". Part of their recommendations are that designers and builders should give consideration to:
    a. Increased wind loading by providing additional laps and fixings to roof coverings

    b. Consider foundation depth on shrinkable clays and to avoid future problems, increase the depth above standard requirements if there is a risk. This should be in accordance with the NHBC Standards, Chapter 4.2 Guidance on Building near Trees. If the calculations do not specifically design the depths of the foundations to take into account any local trees, then this should be checked and agreed with the Building Inspector on site.

Party Wall etc. Act 1996

If part of the work is adjacent to the boundary, the adjacent neighbours right to support could be affected; the issues associated with Party Wall Act may need to be considered. This may include providing information to the adjoining owner, giving sufficient notice of works in compliance with the Act. If the following list applies to this project then the Party Wall Act will apply. JMS Engineers can act as Party Wall Surveyors in this instance and should be contacted accordingly.

- Installing a new beam into the shared wall between properties
- Demolishing, building or under-pinning an existing shared wall
- Building a new wall at or on the boundary or junction of two properties
- Damp-proofing all the way through a party wall
- Digging foundations that are within 3m of a Party Wall, where the new foundations are deeper than the existing ones
- Where the new foundations are within 6m and lower than a 45° line from the bottom of the existing foundations

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JMS Underpinning Specification

1.Codes of Practice

All continuous underpinning is to be carried out strictly in accordance with the requirements of B.S.8004, 1985. The Code of Practice for Foundations. All materials used in the works shall comply with the relevant Codes of Practice.

2. Shoring and propping

It is the Contractor's responsibility to take all necessary steps to ensure that the structure is adequately propped, shored and braced to ensure that during the progress of the works excessive deflections and deformations of the structure do not occur. The Contractor shall discuss with the Engineer any proposals for temporary works. This does not in any way relieve the contractor of his responsibility to ensure that the structure is adequately supported at all times during the progress of the works. It is frequently necessary for the Contractor to brace of prop existing openings so that isolated load bearing piers may be underpinned. The Contracor is to allow in his tender price for all propping, shoring and bracing required to ensure that the works may be safely undertaken with no undue disruption to the structure.

3. Sequence of working

The sequence of working is to be submitted to the Engineer and approved by the Local Authority. This shall be based on a maximum leg length of approximately 1.2m. The agreed sequence of operations shall be strictly adhered to. The Contractor may wish to alter the excavation and concreting sequence but this must be discussed with the Engineer/Local Authority Representative, and no deviation from the sequence of operations shall be permitted unless the Engineer/Local Authority Representative confirms otherwise in writing.

4. Excavation and approval

During excavations the Contractor shall take all necessary steps to prevent softening of the excavation base by ground water. Where necessary the Contractor shall keep excavations free from ground water by pumping. The Contractor shall also ensure that the base of the excavation shall not become contaminated by loose material falling into the excavation. The Contractor shall take steps to ensure that the size of the excavation closely matches the required size agreed with the Engineer/Local Authority Representative. Excessive overbreak will not be permitted, and the Contractor shall provide all necessary trench sheeting and strutting to prevent overbreak. The Contractor may be required to provide sheeting and strutting to prevent any ingress of loose material beneath the existing slab. All underpinning excavations shall be approved by the Local Authority Representative before any concrete is placed.

5. Linking of adjacent legs

Prior to concreting the Contractor shall incorporate shear keys to permit shear transfer between adjacent underpinning legs. Where necessary projecting dowel bars should be cleaned of all loose dirt prior to concreting.

6. Cleaning of existing footings

The underside of all existing footings (where exposed by excavation in preparation for underpinning) shall be cleaned of all loose soil and fragments. Any major projections or inclusions such as bricks broken conrete or boulders shall be broken away from the underside of the existing footing. Prior to concreting the underpinning leg the existing footing should be clean firm and level so the dry packing may be accomplished satisfactorily.

7. Concreting

All concrete shall be strength grade C20 and mixed, delivered, placed and vibrated strictly in accordance with the concrete specification contained in B.S.8110:Part 1:1985. Sulphate resisting cement to be used should site conditions dictate or as directed by Local Building Control Officer. It should be noted that the concrete should be adequately compacted with a vibratory poker to ensure adequate density. The concrete for the underpinning legs should be brought up to 75mm from the underside of the existing footings.

8. Dry packing

Once the concrete in the underpinning legs has set (at least 3 days after concrete placement) the gap between the underside of the exisiting footing and the top of the new footing is to be packed with dry mortar. Mix proportions for the dry mortar are to be by weight 1:3 (cement:zone 2 sharp sand) with Combex non-shrink admixture added in accordance with Manufacturers recommendations. The constituents are to be mixed dry and a small volume of water is to be added such that when compressed, a small bar of the mixture retains its shape. The dry packing concrete is then to be rammed solid into the gap between the underside if the existing footing and the top of the new footing using a steel bar.

9. Curing time

A sufficient time should elapse between the completion of dry packing and the excavation of any underpinning legs in the vicinity. The curing time shall be 24 hours, this being dependent upon the prevailing weather conditions. Vicinity in this context shall be deemed to include all legs adjacent to, or next but one to the leg in question.

10. Provision for existing services

Underpinning legs may be punctured by the services entering the building. The means of "sleeving" these services shall be agreed with the Engineer during the progress of the works. Where existing services interfere with or affect the underpinning excavation these services should be temporarily diverted.

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BASEMENT DESIGN PHILOSOPHY

The proposed basement is designed to take the vertical loads from the new structure and the horizontal loads from the retained soils, surcharge and water through RC retaining walls supported off a piled foundation. Neighbouring foundations are to be underpinned (and temporarily) propped to facilitate in the construction of the basement and it is the intention that the existing buildings retain their foundation arrangement (albeit at a lower level) and the new basement and super structure is wholly independent.

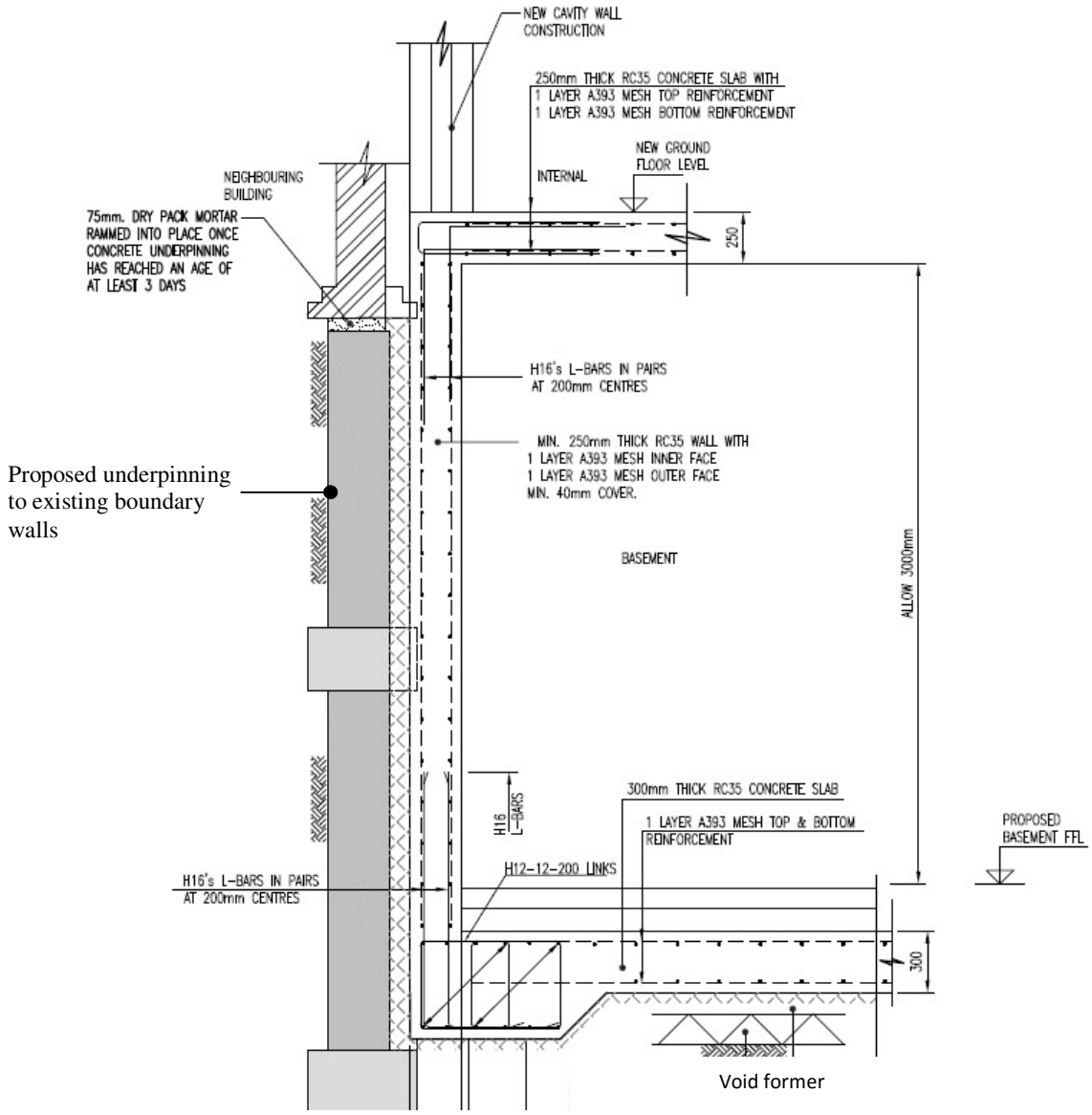

Figure 1: Basement Design Philosophy

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Parameters:

Materials	
Concrete	**C30/37**
Reinforcement	**B500b**
Projects Parameters	
H t (m)	**3.25**
Soil Parameters	
γs (kN/m3)	**20**
ko	**0.50**
Using ko, the earth pressures are considered 'at rest' Active pressure (ka) will be mobilised if the wall moves 0.25-1% of the wall height, while passive pressures (kp) will require movements of 2-4% in dense sand or 10-15% in loose sand Typical ko values: 0.50-0.60 for normally consolidated clay, 0.35 for dense sand, 0.6 for loose sand 1.0-2.8 for overconsolidated clays such as London clay. *(source: Structural Engineer's Pocket Book, Eurocodes by Fionna Cobb, page 336)*	
Piles Capacity (kN)	**300**
Water Parameters	
γw (kN/m3)	**10**
Load Parameters	
Dead surcharge load from adjacent building or road Ds (kN/m2)	**12.00 / 20.00 kN/m on the top of rear (lightwell) wall**
Live surcharge load from adjacent building or road Ls (kN/m2)	**3.00 / 20.00**
Dead load from superstructure Dsp (kN/m)	**As calculated (see p.28)**
Live load from superstructure Lsp (kN/m)	**As calculated (see p.28)**
Dead load on basement & ground floor slab (kN/m2)	**2.10**
Live load on basement & ground floor slab (kN/m2)	**2.50**

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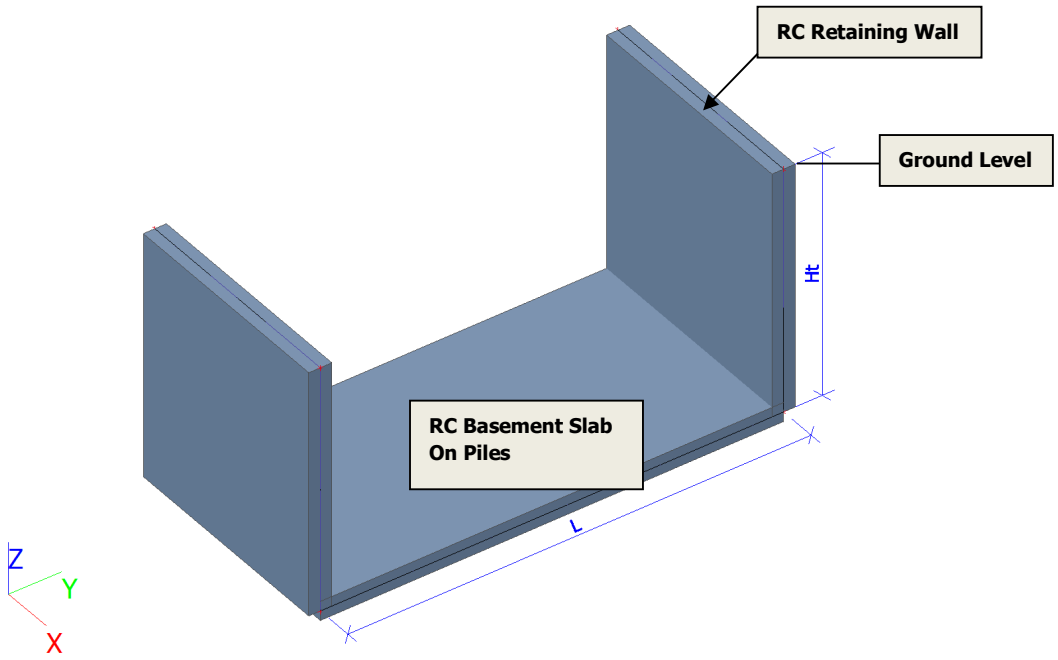
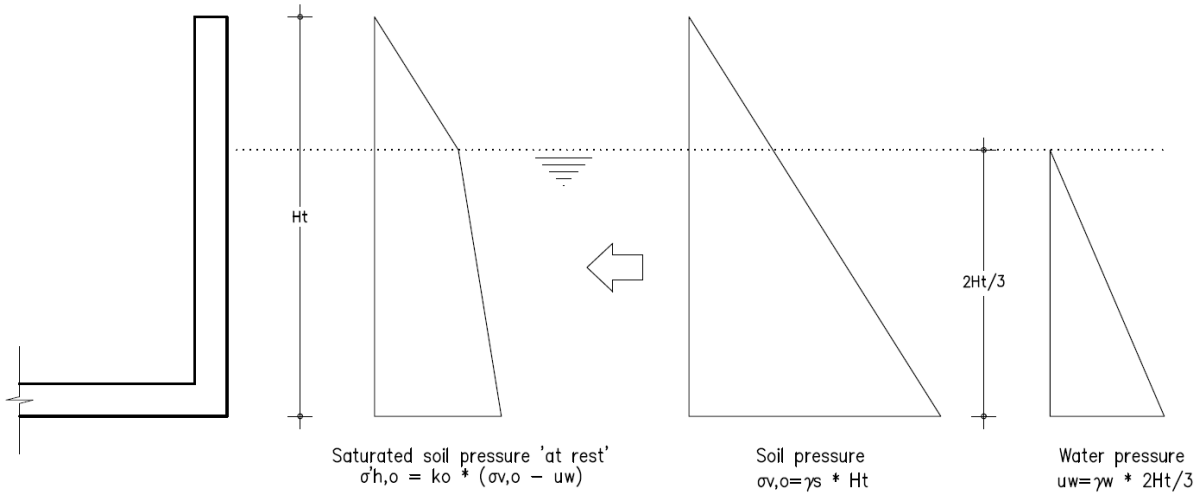


Figure 2: Section of the Basement



Total pressure at wall: $P = \sigma'_{h,o} + u_w =$

$= k_o*(\sigma_{v,o} - u_w) + u_w$

$= k_o*\sigma_{v,o} + (1-k_o)*u_w$

$= k_o*\gamma_s*H_t + (1-k_o)*\gamma_w*2H_t/3$

Figure 3: Soil and HydroStatic Pressure at wall

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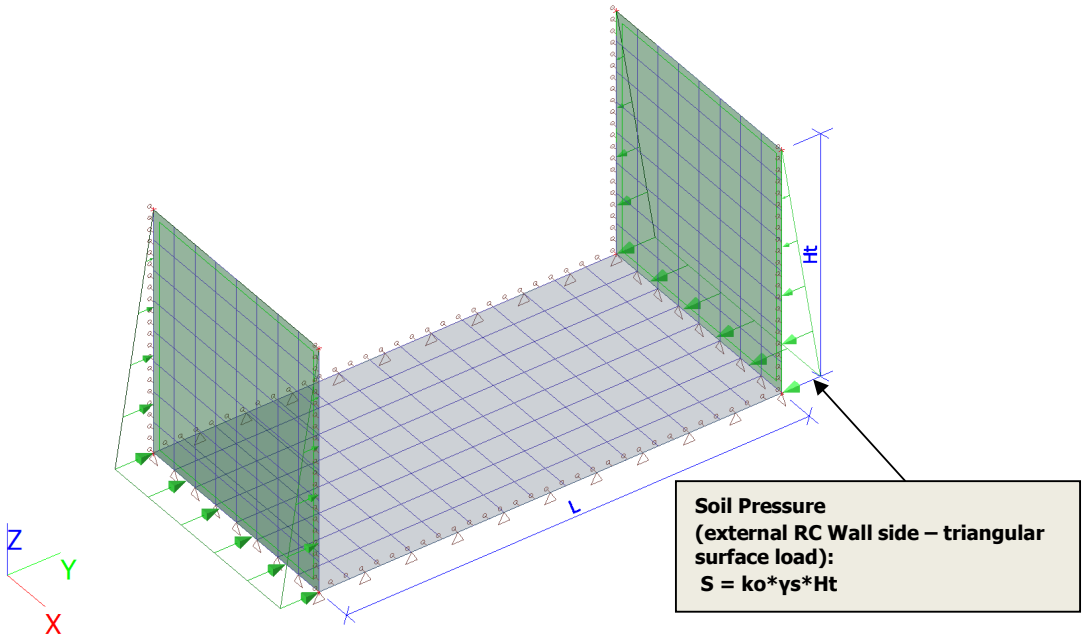

Figure 3a: Soil Pressure

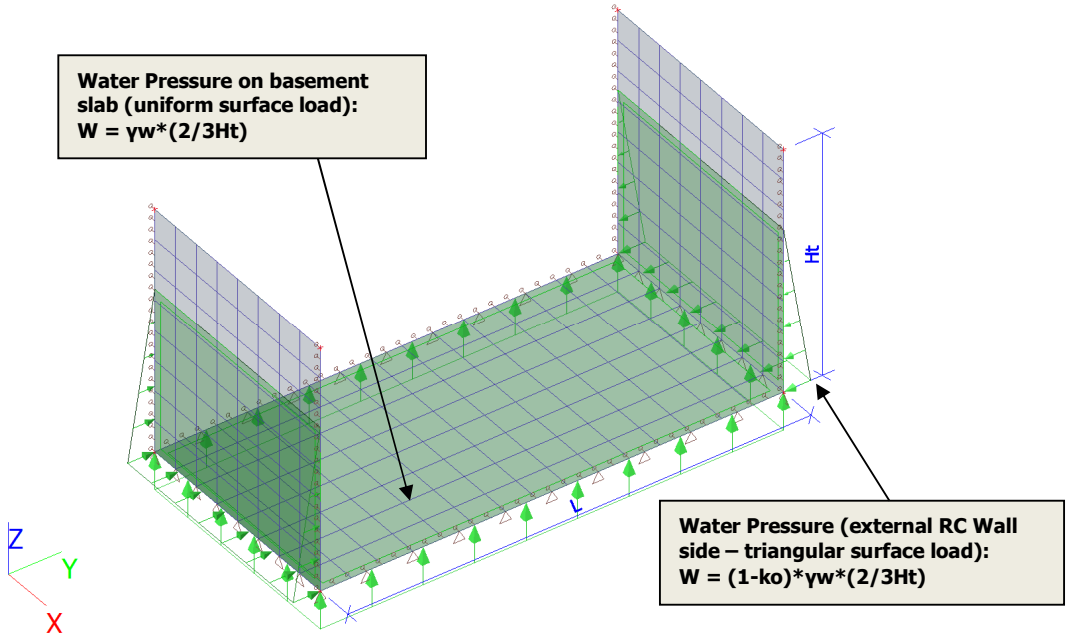

Figure 3b: Water Pressure
Pressumed to apply to the 2/3 of the depth of the basement

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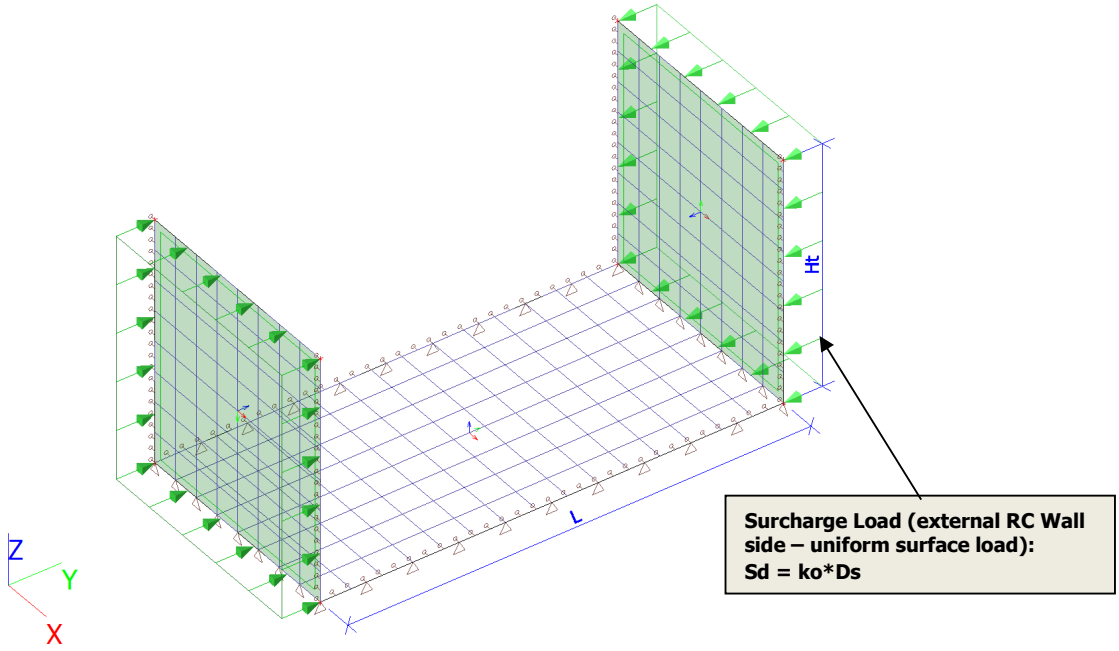

Figure 4: Dead surcharge load from adjacent building or road

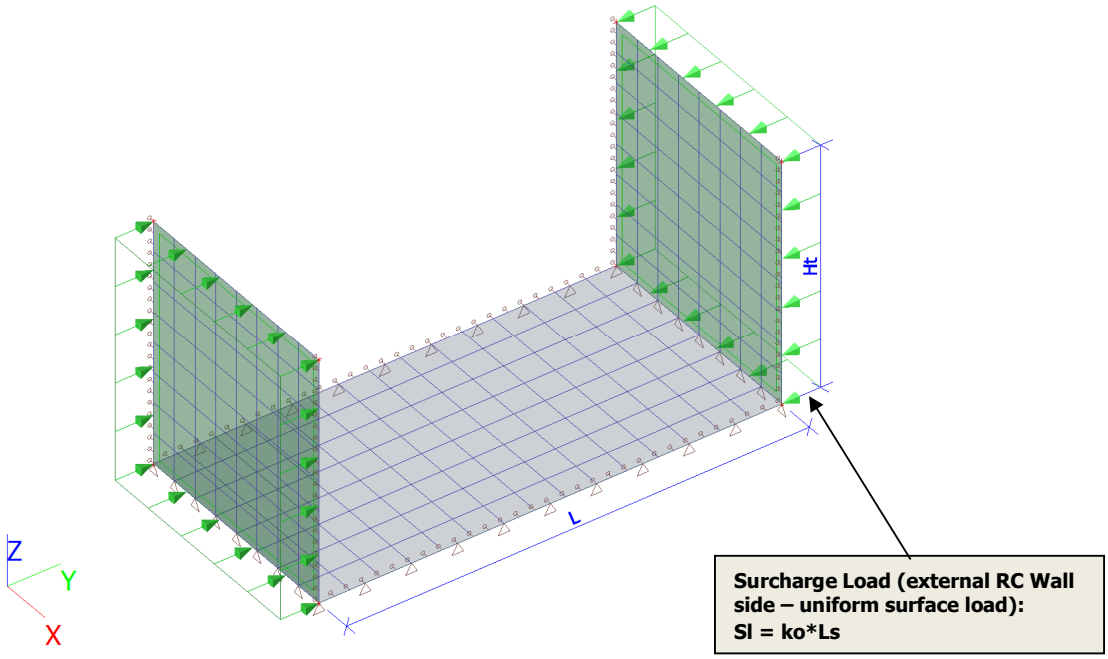

Figure 5: Live surcharge load from adjacent building or road

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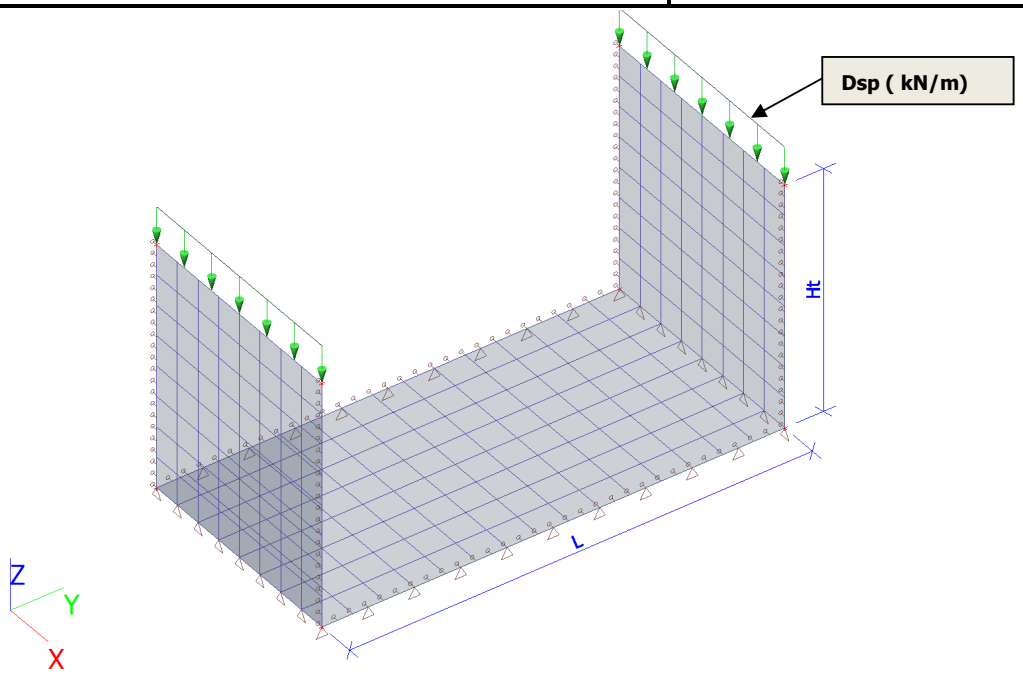

Figure 6: Dead Load from superstructure

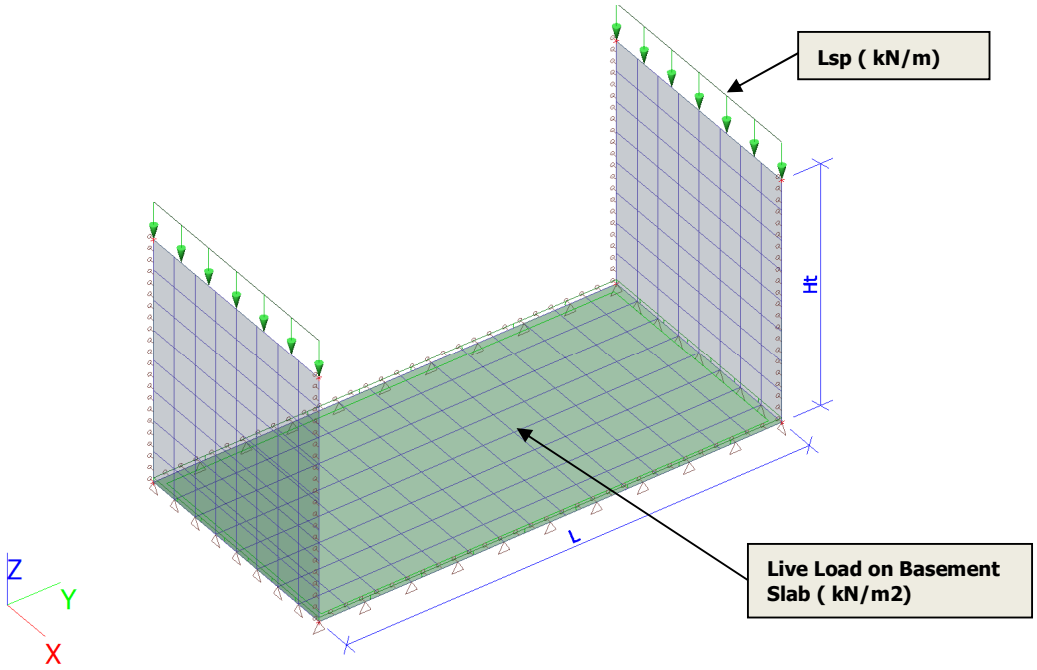

Figure 7: Live Load from superstructure

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The design takes into consideration the following load cases:

Name	Description	Action type
LC1	Self-Weight	Permanent
LC2	Soil Pressure	Permanent
LC3	Water Pressure	Variable
LC4	Surcharge (D)	Permanent
LC5	Surcharge (L)	Variable
LC6	Dead (superstructure)	Permanent
LC7	Live (Superstructure)	Variable

The load cases are combined according to the **EN 1990** combination setup:

ψ factors

Load	ψ0	ψ1	ψ2
CategoryA	0.7	0.5	0.3

Load combination factors

Permanent action - unfavorable	1.35
Permanent action - favorable	1.00
Leading variable action	1.50
Accompanying variable action	1.50
Reduction factor ksi	0.85
Permanent action - unfavorable	1.00
Permanent action - favorable	1.00
Leading variable action	1.30
Accompanying variable action	1.30

EN - ULS (STR/GEO) Set B combinations:

Name	Description	Type	Load cases	Coeff. [-]
ULS1		Linear - ultimate	LC1 - Self-Weight	1.35
			LC2 - Soil Pressure	1.35
			LC4 - Surcharge (D)	1.35
			LC6 - Dead (superstructure)	1.35
ULS2		Linear - ultimate	LC1 - Self-Weight	1.00
			LC2 - Soil Pressure	1.00
			LC4 - Surcharge (D)	1.00
			LC6 - Dead (superstructure)	1.00
ULS3		Linear - ultimate	LC1 - Self-Weight	1.35
			LC7 - Live (Superstructure)	1.50
			LC2 - Soil Pressure	1.35
			LC4 - Surcharge (D)	1.35
			LC6 - Dead (superstructure)	1.35
ULS4		Linear - ultimate	LC1 - Self-Weight	1.35
			LC2 - Soil Pressure	1.35
			LC3 - Water Pressure	1.50

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Name	Description	Type	Load cases	Coeff. [-]
			LC4 - Surcharge (D)	1.35
			LC6 - Dead (superstructure)	1.35
ULS5		Linear - ultimate	LC1 - Self-Weight	1.35
			LC2 - Soil Pressure	1.35
			LC5 - Surcharge (L)	1.50
			LC4 - Surcharge (D)	1.35
			LC6 - Dead (superstructure)	1.35
ULS6		Linear - ultimate	LC1 - Self-Weight	1.35
			LC7 - Live (Superstructure)	1.50
			LC2 - Soil Pressure	1.35
			LC3 - Water Pressure	1.50
			LC4 - Surcharge (D)	1.35
			LC6 - Dead (superstructure)	1.35
ULS7		Linear - ultimate	LC1 - Self-Weight	1.35
			LC7 - Live (Superstructure)	1.50
			LC2 - Soil Pressure	1.35
			LC5 - Surcharge (L)	1.50
			LC4 - Surcharge (D)	1.35
			LC6 - Dead (superstructure)	1.35
ULS8		Linear - ultimate	LC1 - Self-Weight	1.35
			LC2 - Soil Pressure	1.35
			LC3 - Water Pressure	1.50
			LC5 - Surcharge (L)	1.50
			LC4 - Surcharge (D)	1.35
			LC6 - Dead (superstructure)	1.35
ULS9		Linear - ultimate	LC1 - Self-Weight	1.35
			LC7 - Live (Superstructure)	1.50
			LC2 - Soil Pressure	1.35
			LC3 - Water Pressure	1.50
			LC5 - Surcharge (L)	1.50
			LC4 - Surcharge (D)	1.35
			LC6 - Dead (superstructure)	1.35
ULS10		Linear - ultimate	LC1 - Self-Weight	1.00
			LC7 - Live (Superstructure)	1.50
			LC2 - Soil Pressure	1.00
			LC4 - Surcharge (D)	1.00
			LC6 - Dead (superstructure)	1.00
ULS11		Linear - ultimate	LC1 - Self-Weight	1.00
			LC2 - Soil Pressure	1.00
			LC3 - Water Pressure	1.50
			LC4 - Surcharge (D)	1.00
			LC6 - Dead (superstructure)	1.00
ULS12		Linear - ultimate	LC1 - Self-Weight	1.00
			LC2 - Soil Pressure	1.00
			LC5 - Surcharge (L)	1.50
			LC4 - Surcharge (D)	1.00
			LC6 - Dead (superstructure)	1.00
ULS13		Linear - ultimate	LC1 - Self-Weight	1.00
			LC7 - Live (Superstructure)	1.50
			LC2 - Soil Pressure	1.00
			LC3 - Water Pressure	1.50
			LC4 - Surcharge (D)	1.00
			LC6 - Dead (superstructure)	1.00
ULS14		Linear - ultimate	LC1 - Self-Weight	1.00
			LC7 - Live (Superstructure)	1.50
			LC2 - Soil Pressure	1.00
			LC5 - Surcharge (L)	1.50
			LC4 - Surcharge (D)	1.00
			LC6 - Dead (superstructure)	1.00
ULS15		Linear - ultimate	LC1 - Self-Weight	1.00

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Name	Description	Type	Load cases	Coeff. [-]
			LC2 - Soil Pressure	1.00
			LC3 - Water Pressure	1.50
			LC5 - Surcharge (L)	1.50
			LC4 - Surcharge (D)	1.00
			LC6 - Dead (superstructure)	1.00
ULS16		Linear - ultimate	LC1 - Self-Weight	1.00
			LC7 - Live (Superstructure)	1.50
			LC2 - Soil Pressure	1.00
			LC3 - Water Pressure	1.50
			LC5 - Surcharge (L)	1.50
			LC4 - Surcharge (D)	1.00
			LC6 - Dead (superstructure)	1.00

EN- SLS Characteristic, Frequent, Quasi-Permanent combinations:

Name	Description	Type	Load cases	Coeff. [-]
SLS-Ch1		Linear - serviceability	LC1 - Self-Weight	1.00
			LC2 - Soil Pressure	1.00
			LC4 - Surcharge (D)	1.00
			LC6 - Dead (superstructure)	1.00
SLS-Ch2		Linear - serviceability	LC1 - Self-Weight	1.00
			LC7 - Live (Superstructure)	1.00
			LC2 - Soil Pressure	1.00
			LC4 - Surcharge (D)	1.00
			LC6 - Dead (superstructure)	1.00
SLS-Ch3		Linear - serviceability	LC1 - Self-Weight	1.00
			LC2 - Soil Pressure	1.00
			LC3 - Water Pressure	1.00
			LC4 - Surcharge (D)	1.00
			LC6 - Dead (superstructure)	1.00
SLS-Ch4		Linear - serviceability	LC1 - Self-Weight	1.00
			LC2 - Soil Pressure	1.00
			LC5 - Surcharge (L)	1.00
			LC4 - Surcharge (D)	1.00
			LC6 - Dead (superstructure)	1.00
SLS-Ch5		Linear - serviceability	LC1 - Self-Weight	1.00
			LC7 - Live (Superstructure)	1.00
			LC2 - Soil Pressure	1.00
			LC3 - Water Pressure	1.00
			LC4 - Surcharge (D)	1.00
			LC6 - Dead (superstructure)	1.00
SLS-Ch6		Linear - serviceability	LC1 - Self-Weight	1.00
			LC7 - Live (Superstructure)	1.00
			LC2 - Soil Pressure	1.00
			LC5 - Surcharge (L)	1.00
			LC4 - Surcharge (D)	1.00
			LC6 - Dead (superstructure)	1.00
SLS-Ch7		Linear - serviceability	LC1 - Self-Weight	1.00
			LC2 - Soil Pressure	1.00
			LC3 - Water Pressure	1.00
			LC5 - Surcharge (L)	1.00
			LC4 - Surcharge (D)	1.00
			LC6 - Dead (superstructure)	1.00
SLS-Ch8		Linear - serviceability	LC1 - Self-Weight	1.00
			LC7 - Live (Superstructure)	1.00
			LC2 - Soil Pressure	1.00
			LC3 - Water Pressure	1.00
			LC5 - Surcharge (L)	1.00
			LC4 - Surcharge (D)	1.00

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Name	Description	Type	Load cases	Coeff. [-]
			LC6 - Dead (superstructure)	1.00
SLS-Fr1		Linear - serviceability	LC1 - Self-Weight	1.00
			LC7 - Live (Superstructure)	0.50
			LC2 - Soil Pressure	1.00
			LC4 - Surcharge (D)	1.00
			LC6 - Dead (superstructure)	1.00
SLS-Fr2		Linear - serviceability	LC1 - Self-Weight	1.00
			LC2 - Soil Pressure	1.00
			LC3 - Water Pressure	0.50
			LC4 - Surcharge (D)	1.00
			LC6 - Dead (superstructure)	1.00
SLS-Fr3		Linear - serviceability	LC1 - Self-Weight	1.00
			LC2 - Soil Pressure	1.00
			LC5 - Surcharge (L)	0.50
			LC4 - Surcharge (D)	1.00
			LC6 - Dead (superstructure)	1.00
SLS-Fr4		Linear - serviceability	LC1 - Self-Weight	1.00
			LC7 - Live (Superstructure)	0.50
			LC2 - Soil Pressure	1.00
			LC3 - Water Pressure	0.50
			LC4 - Surcharge (D)	1.00
			LC6 - Dead (superstructure)	1.00
SLS-Fr5		Linear - serviceability	LC1 - Self-Weight	1.00
			LC7 - Live (Superstructure)	0.50
			LC2 - Soil Pressure	1.00
			LC5 - Surcharge (L)	0.50
			LC4 - Surcharge (D)	1.00
			LC6 - Dead (superstructure)	1.00
SLS-Fr6		Linear - serviceability	LC1 - Self-Weight	1.00
			LC2 - Soil Pressure	1.00
			LC3 - Water Pressure	0.50
			LC5 - Surcharge (L)	0.50
			LC4 - Surcharge (D)	1.00
			LC6 - Dead (superstructure)	1.00
SLS-Fr7		Linear - serviceability	LC1 - Self-Weight	1.00
			LC7 - Live (Superstructure)	0.50
			LC2 - Soil Pressure	1.00
			LC3 - Water Pressure	0.50
			LC5 - Surcharge (L)	0.50
			LC4 - Surcharge (D)	1.00
			LC6 - Dead (superstructure)	1.00
SLS-Qp1		Linear - serviceability	LC1 - Self-Weight	1.00
			LC7 - Live (Superstructure)	0.30
			LC2 - Soil Pressure	1.00
			LC4 - Surcharge (D)	1.00
			LC6 - Dead (superstructure)	1.00
SLS-Qp2		Linear - serviceability	LC1 - Self-Weight	1.00
			LC2 - Soil Pressure	1.00
			LC3 - Water Pressure	0.30
			LC4 - Surcharge (D)	1.00
			LC6 - Dead (superstructure)	1.00
SLS-Qp3		Linear - serviceability	LC1 - Self-Weight	1.00
			LC2 - Soil Pressure	1.00
			LC5 - Surcharge (L)	0.30
			LC4 - Surcharge (D)	1.00
			LC6 - Dead (superstructure)	1.00
SLS-Qp4		Linear - serviceability	LC1 - Self-Weight	1.00
			LC7 - Live (Superstructure)	0.30
			LC2 - Soil Pressure	1.00
			LC3 - Water Pressure	0.30

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Name	Description	Type	Load cases	Coeff. [-]
			LC4 - Surcharge (D)	1.00
			LC6 - Dead (superstructure)	1.00
SLS-Qp5		Linear - serviceability	LC1 - Self-Weight	1.00
			LC7 - Live (Superstructure)	0.30
			LC2 - Soil Pressure	1.00
			LC5 - Surcharge (L)	0.30
			LC4 - Surcharge (D)	1.00
			LC6 - Dead (superstructure)	1.00
SLS-Qp6		Linear - serviceability	LC1 - Self-Weight	1.00
			LC2 - Soil Pressure	1.00
			LC3 - Water Pressure	0.30
			LC5 - Surcharge (L)	0.30
			LC4 - Surcharge (D)	1.00
			LC6 - Dead (superstructure)	1.00
SLS-Qp7		Linear - serviceability	LC1 - Self-Weight	1.00
			LC7 - Live (Superstructure)	0.30
			LC2 - Soil Pressure	1.00
			LC3 - Water Pressure	0.30
			LC5 - Surcharge (L)	0.30
			LC4 - Surcharge (D)	1.00
			LC6 - Dead (superstructure)	1.00

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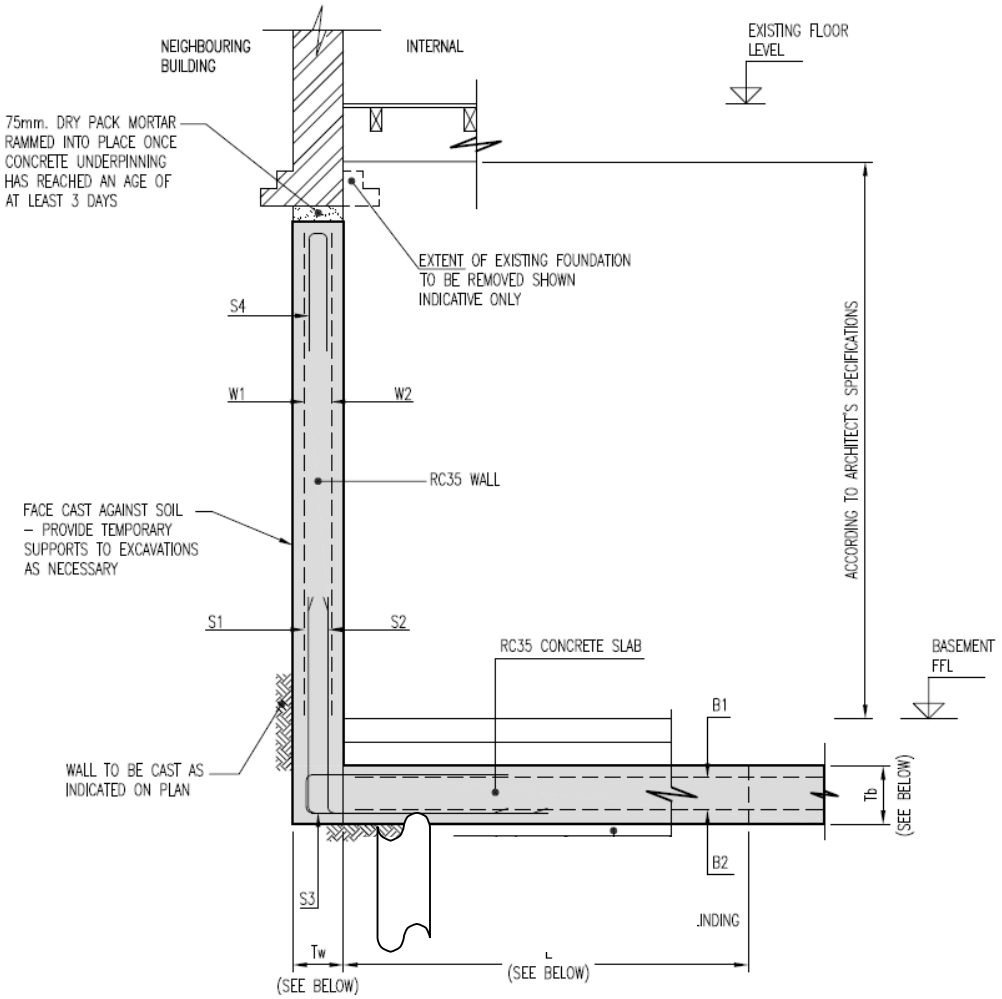
Results:



Geometry	
Tb - Base thickness (mm)	**300**
Tw -Wall thickness (mm)	**250 (Type 1) / 300 (Type 2)**
L (mm)	**2000**
Reinforcement - Base bars*	
B1 (top)	**1 Layer A393 (Basement Slab) / H16-200 each way (ligthwell)**
B2 (bottom)	**1 Layer A393 (Basement Slab) / H16-200 each way (ligthwell)**
Reinforcement - Wall bars	
W1 (outer face)	**1 Layer A393 (Type 1) / H12-200 each way (Type 2)**
W2 (inner face)	**1 Layer A393 (Type 1) / H12-200 each way (Type 2)**
Reinforcement - Starter bars	
S1 (wall outer face)	**H16-200 L-bars**
S2 (wall inner face)	**H16-200 L-bars**
S3 (base edge)	**H12-200 U-bars**
S4 (wall top)	**H12-200 U-bars**
Reinforcement - Ground Floor Slab*	
Top & Bottom	**1 Layer A393**
Slab Perimeter & around Openings	**H12-200 U-bars**

Additional reinforcement as noted on drawings

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BASEMENT AND GROUND FLOOR SLAB DESIGN WITH LOADS FROM SUPERSTRUCTURE

1. Table of contents

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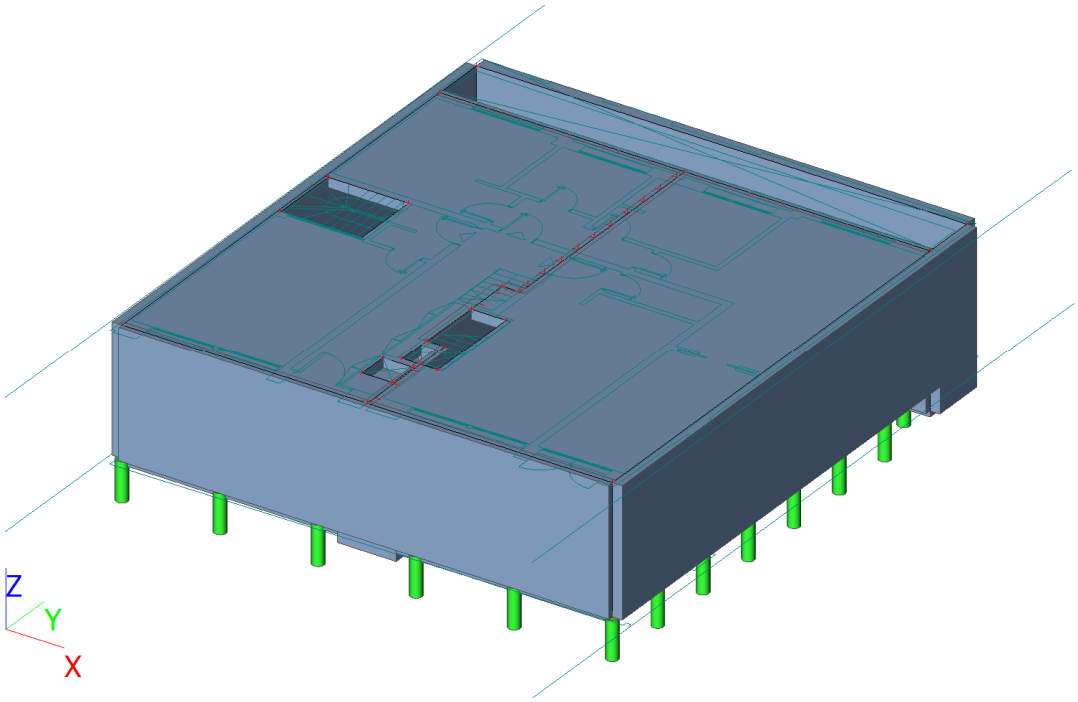
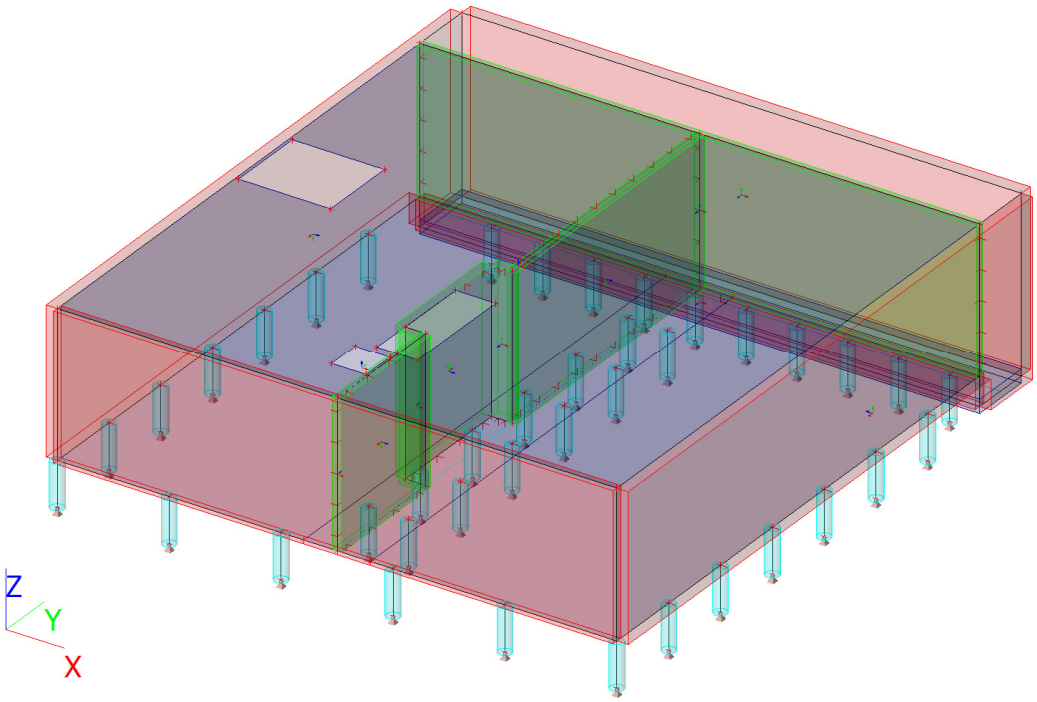
2. Model

2.1. 3D Model



2.2. Analysis model



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3. Libraries

3.1. Setup manager

Combination setup

Annex - Category H loading not to be combined with snow or wind	
Category H loading not to be combined with snow or wind	Yes

Psi factors

Load	Psi0	Psi1	Psi2
CategoryA	0.7	0.5	0.3
CategoryB	0.7	0.5	0.3
CategoryC	0.7	0.7	0.6
CategoryD	0.7	0.7	0.6
CategoryE	1	0.9	0.8
CategoryF	0.7	0.7	0.6
CategoryG	0.7	0.5	0.3
CategoryH	0	0	0
Snow	0.5	0.2	0
Wind	0.6	0.2	0
Temperature	0.6	0.5	0

Load combination factors

Permanent action - unfavorable	1.35
Permanent action - favorable	1.00
Leading variable action	1.50
Accompanying variable action	1.50
Reduction factor ksi	0.85
Permanent action - unfavorable	1.00
Permanent action - favorable	1.00
Leading variable action	1.30
Accompanying variable action	1.30

3.2. Materials

Concrete EC2

Name	Type	Unit mass [kg/m^3]	E mod [kN/m^2]	Poisson - nu	Thermal exp [m/mK]	Characteristic compressive cylinder strength fck(28) [MPa]
C30/37	Concrete	2500.0	32800000.0	0.2	0.00	30.00
C30/37-Weightless	Concrete	0.0	32800000.0	0.2	0.00	30.00

Reinforcement EC2

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Name	Type	Unit mass [kg/m³]	E mod [kN/m²]	G mod [kN/m²]	Thermal exp [m/mK]	Characteristic yield strength fyk [MPa]
B 500B	Reinforcement steel	7850.0	200000000.0	83333333.3	0.00	500.0

Masonry

Name	Type	Unit mass [kg/m³]	E mod [kN/m²]	Poisson - nu	G mod [kN/m²]	Thermal exp [m/mK]	Characteristic compressive strength (fk) [kN/m²]
Masonry	Masonry	2000.0	3100000.0	0.25	1240000.0	0.00	3100.0

4. Structure

4.1. Nodes

Name	Coord X [m]	Coord Y [m]	Coord Z [m]
N1	-0.100	0.000	0.000
N5	-0.124	13.600	3.250
N8	12.376	13.622	3.250
N12	12.400	0.022	0.000
N13	-0.121	12.194	0.000
N14	12.379	12.216	0.000
N17	6.138	5.891	0.000
N18	6.129	12.205	0.000
N19	6.129	12.205	3.250
N20	6.138	5.891	3.250
N21	5.682	5.891	0.000
N22	5.682	5.891	3.250
N24	5.681	3.004	0.000
N25	5.681	3.004	3.250
N27	6.137	3.004	0.000
N28	6.137	3.004	3.250
N29	6.150	0.011	0.000
N30	6.150	0.011	3.250
N31	5.676	2.061	3.250
N32	6.576	2.061	3.250
N33	6.576	4.693	3.250
N34	5.682	4.693	3.250
N35	2.011	5.996	3.250
N36	2.011	7.806	3.250
N39	-0.100	0.000	3.250
N40	12.400	0.022	3.250
N41	12.379	12.216	3.250
N42	-0.121	12.194	3.250
N43	-0.046	7.806	3.250
N44	-0.046	5.996	3.250
N46	12.400	0.022	-1.000
N48	-0.100	0.000	-1.000
N139	2.400	0.004	-1.000
N140	2.400	0.004	0.000
N141	4.900	0.009	-1.000
N142	4.900	0.009	0.000
N143	7.400	0.013	-1.000
N144	7.400	0.013	0.000
N145	9.900	0.018	-1.000
N146	9.900	0.018	0.000
N147	6.141	2.061	3.250
N265	-0.121	12.194	-0.650
N266	12.379	12.216	-0.650
N286	-0.124	13.600	-0.650
N287	12.376	13.622	-0.650

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Name	Coord X [m]	Coord Y [m]	Coord Z [m]
N306	11.241	12.917	-1.650
N307	11.241	12.917	-0.650
N308	10.105	12.915	-1.650
N309	10.105	12.915	-0.650
N310	8.968	12.913	-1.650
N311	8.968	12.913	-0.650
N312	7.832	12.911	-1.650
N313	7.832	12.911	-0.650
N314	6.696	12.909	-1.650
N315	6.696	12.909	-0.650
N316	5.559	12.907	-1.650
N317	5.559	12.907	-0.650
N318	4.423	12.905	-1.650
N319	4.423	12.905	-0.650
N320	3.286	12.903	-1.650
N321	3.286	12.903	-0.650
N322	2.150	12.901	-1.650
N323	2.150	12.901	-0.650
N324	1.014	12.899	-1.650
N325	1.014	12.899	-0.650
N326	6.890	0.012	0.000
N327	5.400	0.010	0.000
N328	5.379	12.204	0.000
N329	6.869	12.207	0.000
N330	-0.118	10.452	-1.000
N331	-0.118	10.452	0.000
N332	-0.115	8.710	-1.000
N333	-0.115	8.710	0.000
N334	-0.112	6.968	-1.000
N335	-0.112	6.968	0.000
N336	-0.109	5.226	-1.000
N337	-0.109	5.226	0.000
N338	-0.106	3.484	-1.000
N339	-0.106	3.484	0.000
N340	-0.103	1.742	-1.000
N341	-0.103	1.742	0.000
N407	12.382	10.474	-1.000
N408	12.385	8.732	-1.000
N409	12.388	6.990	-1.000
N410	12.391	5.248	-1.000
N411	12.394	3.506	-1.000
N412	12.397	1.764	-1.000
N413	12.382	10.474	0.000
N414	12.385	8.732	0.000
N415	12.388	6.990	0.000
N416	12.391	5.248	0.000
N417	12.394	3.506	0.000
N418	12.397	1.764	0.000
N443	5.682	10.463	-1.000
N444	5.685	8.721	-1.000
N445	5.688	6.978	-1.000
N446	5.691	5.236	-1.000
N447	5.694	3.494	-1.000
N448	5.697	1.752	-1.000
N449	5.682	10.463	0.000
N450	5.685	8.721	0.000
N451	5.688	6.978	0.000
N452	5.691	5.236	0.000
N453	5.694	3.494	0.000
N454	5.697	1.752	0.000

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Name	Coord X [m]	Coord Y [m]	Coord Z [m]
N455	6.572	10.464	-1.000
N456	6.575	8.722	-1.000
N457	6.578	6.980	-1.000
N458	6.581	5.238	-1.000
N459	6.584	3.496	-1.000
N460	6.587	1.754	-1.000
N461	6.572	10.464	0.000
N462	6.575	8.722	0.000
N463	6.578	6.980	0.000
N464	6.581	5.238	0.000
N465	6.584	3.496	0.000
N466	6.587	1.754	0.000
N467	5.323	1.061	3.250
N468	6.101	1.061	3.250
N469	6.101	1.861	3.250
N470	5.323	1.861	3.250

4.2. 2D members

Name	Layer	Type	Analysis model	Material	Thickness type	Th. [mm]	
S1	Layer2-Concrete Slabs	plate (90)	Standard	C30/37	constant	300	
S2	Layer3-Concrete Wall	wall (80)	Standard	C30/37	constant	250	
S3	Layer3-Concrete Wall	wall (80)	Standard	C30/37	constant	250	
S4	Layer3-Concrete Wall	wall (80)	Standard	C30/37	constant	250	
S5	Layer3-Concrete Wall	wall (80)	Standard	C30/37	constant	300	
S6	Layer4-Masonry Wall	wall (80)	Standard	Masonry	constant	215	
S7	Layer4-Masonry Wall	wall (80)	Standard	Masonry	constant	215	
S8	Layer4-Masonry Wall	wall (80)	Standard	Masonry	constant	215	
S9	Layer4-Masonry Wall	wall (80)	Standard	Masonry	constant	215	
S12	Layer4-Masonry Wall	wall (80)	Standard	Masonry	constant	215	
S13	Layer4-Masonry Wall	wall (80)	Standard	Masonry	constant	215	
S14	Layer2-Concrete Slabs	plate (90)	Standard	C30/37	constant	250	
S15	Layer3-Concrete Wall	wall (80)	Standard	C30/37	constant	300	
S16	Layer2-Concrete Slabs	plate (90)	Standard	C30/37	constant	300	

4.3. Nodal supports

Name	Node	System	Type	X	Y	Z	Rx	Ry	Rz
Sn1	N46	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn3	N48	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn42	N139	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn43	N141	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn44	N143	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn45	N145	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn93	N306	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn94	N308	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn95	N310	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn96	N312	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn97	N314	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn98	N316	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn99	N318	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn100	N320	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn101	N322	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn102	N324	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn103	N330	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn104	N332	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn105	N334	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn106	N336	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn107	N338	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn108	N340	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free

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Name	Node	System	Type	X	Y	Z	Rx	Ry	Rz
Sn120	N407	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn121	N408	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn122	N409	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn123	N410	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn124	N411	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn125	N412	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn126	N443	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn127	N444	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn128	N445	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn129	N446	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn130	N447	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn131	N448	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn132	N455	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn133	N456	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn134	N457	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn135	N458	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn136	N459	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free
Sn137	N460	GCS	Standard	Rigid	Rigid	Rigid	Free	Free	Free

5. Sets

5.1. Load cases

Name	Description	Action type	LoadGroup	Direction	Duration	Master load case
	Spec	Load type				
LC1	Self-Weight	Permanent Self weight	LG1-D	-Z		
LC2	Soil Pressure	Permanent Standard	LG1-D			
LC3	Water Pressure Standard	Variable Static	LG2-L		Short	None
LC4	Surcharge (D)	Permanent Standard	LG1-D			
LC5	Surcharge (L) Standard	Variable Static	LG2-L		Short	None
LC6	Dead (superstructure)	Permanent Standard	LG1-D			
LC7	Live (Superstructure) Standard	Variable Static	LG2-L		Short	None

5.2. Load groups

Name	Load	Relation	Type
LG1-D	Permanent		
LG2-L	Variable	Standard	Cat A : Domestic

5.3. Combinations

Name	Description	Type	Load cases	Coeff. [-]
ULS.1		Envelope - ultimate	LC1 - Self-Weight	1.35
			LC2 - Soil Pressure	1.35
			LC4 - Surcharge (D)	1.35
			LC6 - Dead (superstructure)	1.35
ULS.2		Envelope - ultimate	LC1 - Self-Weight	1.00
			LC2 - Soil Pressure	1.00
			LC4 - Surcharge (D)	1.00
			LC6 - Dead (superstructure)	1.00
ULS.3		Envelope - ultimate	LC1 - Self-Weight	1.35
			LC7 - Live (Superstructure)	1.50
			LC2 - Soil Pressure	1.35
			LC3 - Water Pressure	1.50

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Name	Description	Type	Load cases	Coeff. [-]
			LC5 - Surcharge (L)	1.50
			LC4 - Surcharge (D)	1.35
			LC6 - Dead (superstructure)	1.35
ULS.4		Envelope - ultimate	LC1 - Self-Weight	1.00
			LC7 - Live (Superstructure)	1.50
			LC2 - Soil Pressure	1.00
			LC3 - Water Pressure	1.50
			LC5 - Surcharge (L)	1.50
			LC4 - Surcharge (D)	1.00
			LC6 - Dead (superstructure)	1.00
SLS-Ch.1		Envelope - serviceability	LC1 - Self-Weight	1.00
			LC2 - Soil Pressure	1.00
			LC4 - Surcharge (D)	1.00
			LC6 - Dead (superstructure)	1.00
SLS-Ch.2		Envelope - serviceability	LC1 - Self-Weight	1.00
			LC7 - Live (Superstructure)	1.00
			LC2 - Soil Pressure	1.00
			LC3 - Water Pressure	1.00
			LC5 - Surcharge (L)	1.00
			LC4 - Surcharge (D)	1.00
			LC6 - Dead (superstructure)	1.00
SLS-Fr.1		Envelope - serviceability	LC1 - Self-Weight	1.00
			LC2 - Soil Pressure	1.00
			LC4 - Surcharge (D)	1.00
			LC6 - Dead (superstructure)	1.00
SLS-Fr.2		Envelope - serviceability	LC1 - Self-Weight	1.00
			LC7 - Live (Superstructure)	0.50
			LC2 - Soil Pressure	1.00
			LC3 - Water Pressure	0.50
			LC5 - Surcharge (L)	0.50
			LC4 - Surcharge (D)	1.00
			LC6 - Dead (superstructure)	1.00
SLS-Qp.1		Envelope - serviceability	LC1 - Self-Weight	1.00
			LC2 - Soil Pressure	1.00
			LC4 - Surcharge (D)	1.00
			LC6 - Dead (superstructure)	1.00
SLS-Qp.2		Envelope - serviceability	LC1 - Self-Weight	1.00
			LC7 - Live (Superstructure)	0.30
			LC2 - Soil Pressure	1.00
			LC3 - Water Pressure	0.30
			LC5 - Surcharge (L)	0.30
			LC4 - Surcharge (D)	1.00
			LC6 - Dead (superstructure)	1.00

5.4. Result classes

Name	List
SLS	SLS-Ch - EN-SLS Characteristic
	SLS-Fr - EN-SLS Frequent
	SLS-Qp - EN-SLS Quasi-permanent
GEO	ULS - EN-ULS (STR/GEO) Set B

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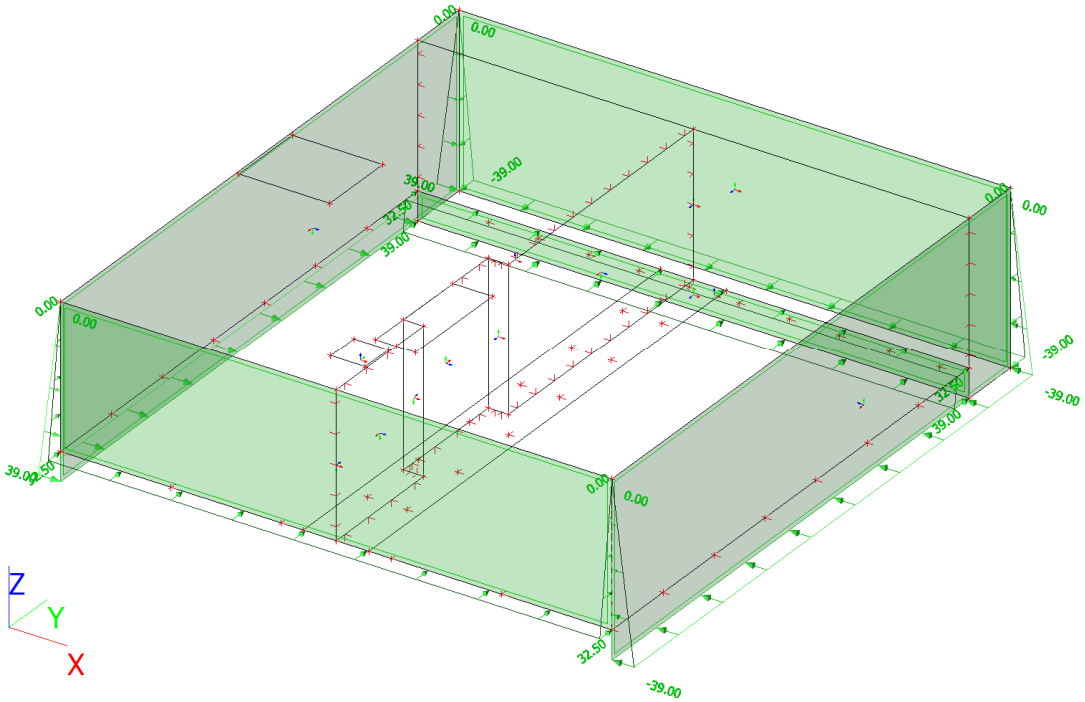
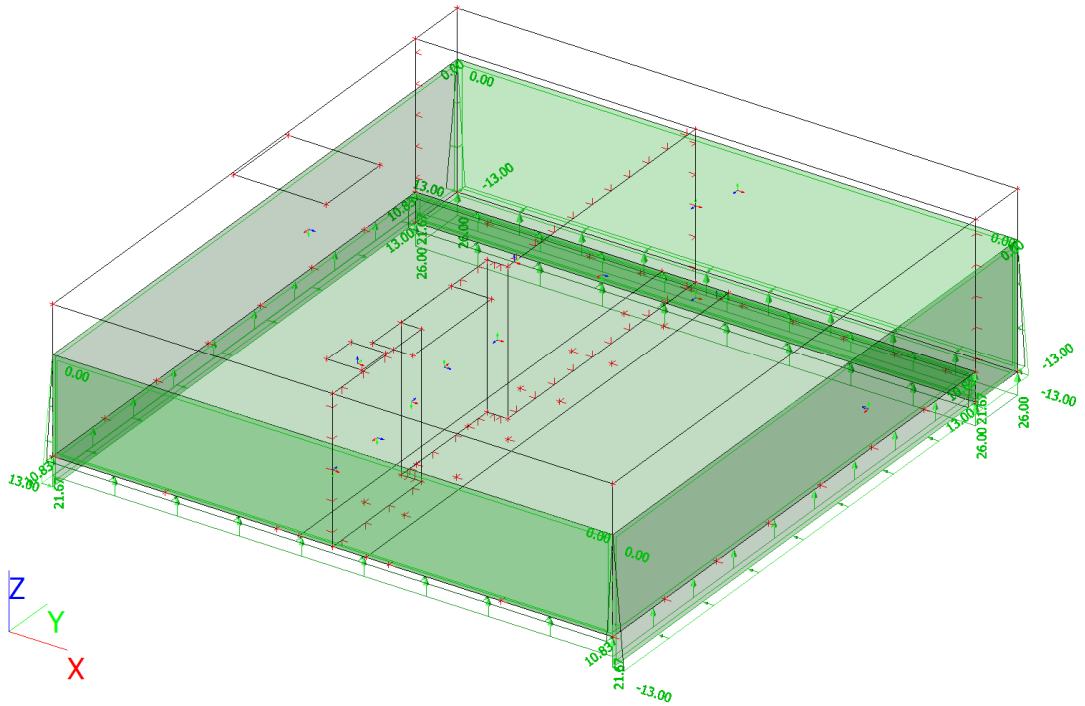
6. Loads

6.1. LC2 - Soil pressure = ko*γs*Ht



6.2. LC3 - Water Pressure = (1-ko)*γw*(2/3Ht)



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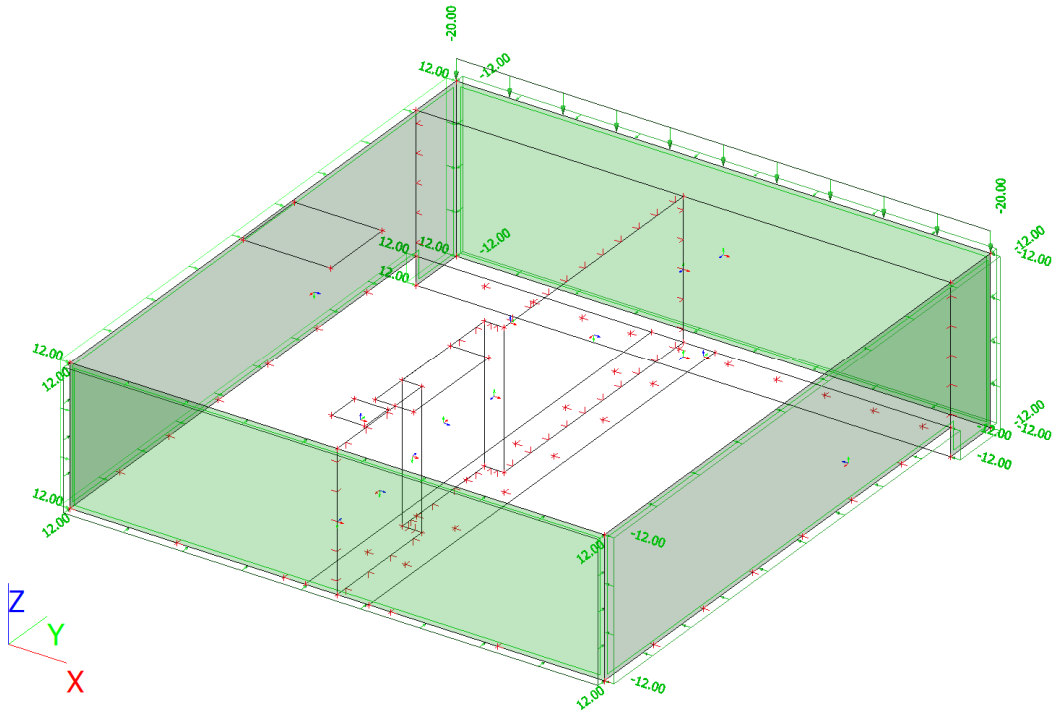
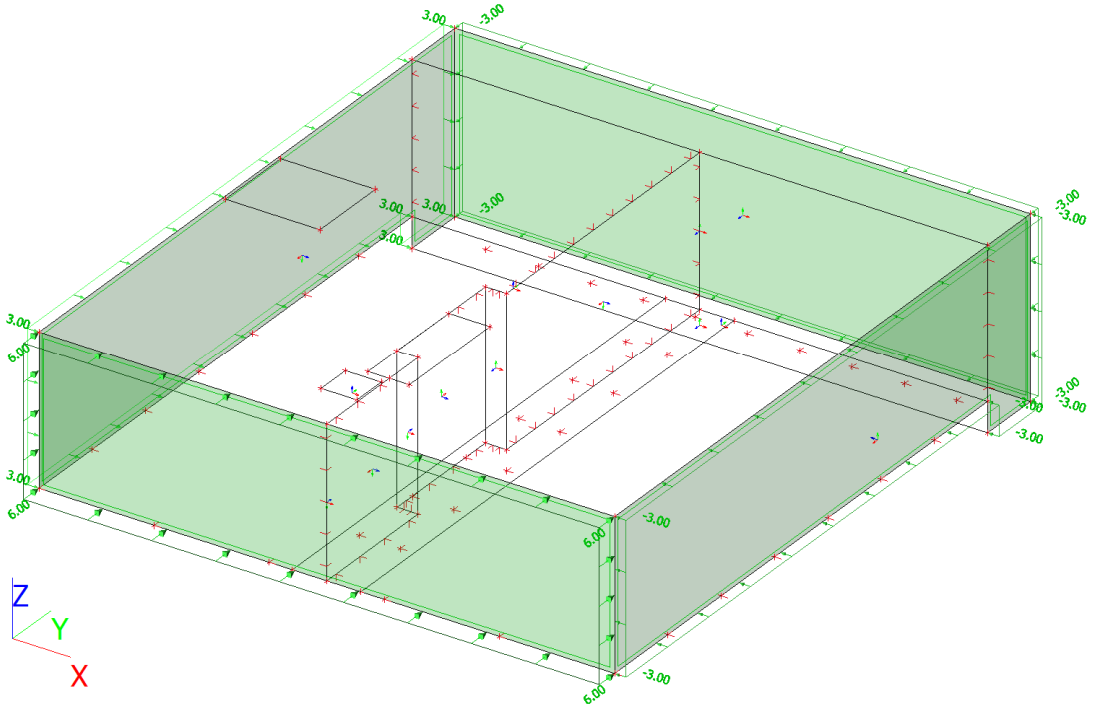
6.3. LC4 - Surcharge Dead = ko*D



6.4. LC5 - Surcharge Live = ko*L



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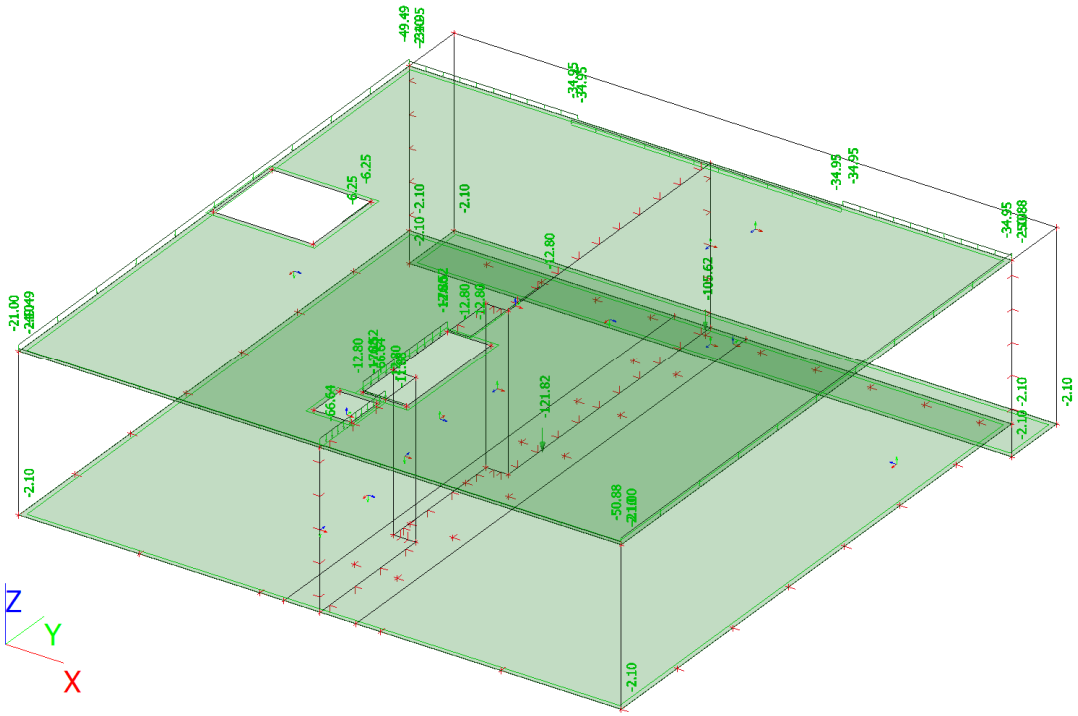
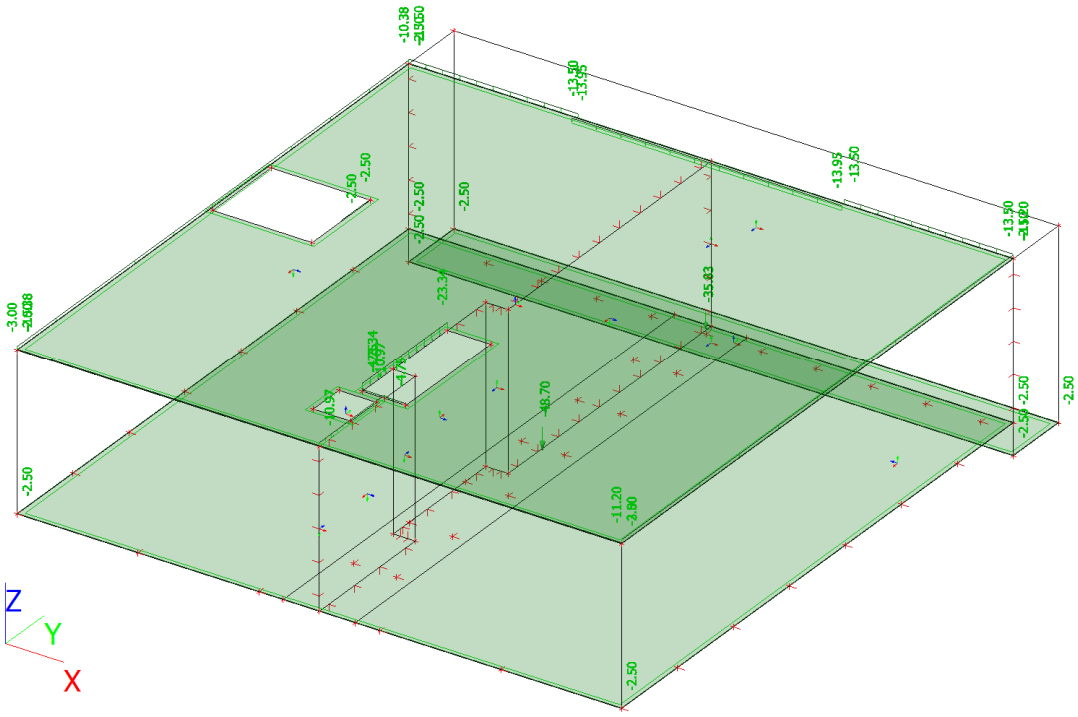
6.5. LC6 - Dead (from superstructure)



6.6. LC7 - Live (from superstructure)



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6.7. Line force on 2D member edge

Name	2D member	Type	Dir	Value - P_1 [kN/m]	Pos x_1	Loc	Edge
	Load case	System	Distribution	Value - P_2 [kN/m]	Pos x_2	Coor	Orig
LFS7	S5	Force	Z	-20.00	0.000	Length	3
	LC4 - Surcharge (D)	GCS	Uniform		1.000	Rela	From end
LFS8	S14	Force	Z	-49.49	0.000	Length	1
	LC6 - Dead (superstructure)	GCS	Uniform		1.000	Rela	From end
LFS9	S14	Force	Z	-50.88	0.000	Length	3
	LC6 - Dead (superstructure)	GCS	Uniform		1.000	Rela	From end
LFS10	S14	Force	Z	-21.00	0.000	Length	4
	LC6 - Dead (superstructure)	GCS	Uniform		1.000	Rela	From end
LFS11	S14	Force	Z	-34.95	0.000	Length	2
	LC6 - Dead (superstructure)	GCS	Uniform		3.500	Abso	From end
LFS12	S14	Force	Z	-34.95	0.000	Length	2
	LC6 - Dead (superstructure)	GCS	Uniform		3.500	Abso	From start
LFS13	S14	Force	Z	-10.38	0.000	Length	1
	LC7 - Live (Superstructure)	GCS	Uniform		1.000	Rela	From end
LFS14	S14	Force	Z	-11.20	0.000	Length	3
	LC7 - Live (Superstructure)	GCS	Uniform		1.000	Rela	From end
LFS15	S14	Force	Z	-3.00	0.000	Length	4
	LC7 - Live (Superstructure)	GCS	Uniform		1.000	Rela	From end
LFS16	S14	Force	Z	-13.50	0.000	Length	2
	LC7 - Live (Superstructure)	GCS	Uniform		3.500	Abso	From end
LFS17	S14	Force	Z	-13.50	0.000	Length	2
	LC7 - Live (Superstructure)	GCS	Uniform		3.500	Abso	From start
LFS18		Force	Z	-4.75	0.000	Length	1
	LC7 - Live (Superstructure)	GCS	Uniform		1.000	Rela	From start
LFS19		Force	Z	-2.50	0.000	Length	1
	LC7 - Live (Superstructure)	GCS	Uniform		0.500	Rela	From end
LFS20		Force	Z	-6.25	0.000	Length	1
	LC6 - Dead (superstructure)	GCS	Uniform		0.500	Rela	From end
LFS21		Force	Z	-11.88	0.000	Length	1
	LC6 - Dead (superstructure)	GCS	Uniform		1.000	Rela	From end

6.8. Surface load

Name	Dir	Type	Value [kN/m²]	2D member	Load case	System	Loc
SF1	Z	Force	21.67	S1	LC3 - Water Pressure	GCS	Length
SF2	X	Force	-12.00	S4	LC4 - Surcharge (D)	GCS	Length
SF3	Y	Force	12.00	S3	LC4 - Surcharge (D)	GCS	Length
SF4	X	Force	12.00	S2	LC4 - Surcharge (D)	GCS	Length
SF5	Y	Force	-12.00	S5	LC4 - Surcharge (D)	GCS	Length
SF6	X	Force	-3.00	S4	LC5 - Surcharge (L)	GCS	Length
SF7	X	Force	3.00	S2	LC5 - Surcharge (L)	GCS	Length
SF8	Y	Force	20.00	S3	LC5 - Surcharge (L)	GCS	Length
SF9	Y	Force	-3.00	S5	LC5 - Surcharge (L)	GCS	Length
SF10	Z	Force	-2.10	S1	LC6 - Dead (superstructure)	GCS	Length
SF12	Z	Force	-2.10	S14	LC6 - Dead (superstructure)	GCS	Length
SF13	Z	Force	-2.50	S1	LC7 - Live (Superstructure)	GCS	Length
SF14	Z	Force	-2.50	S14	LC7 - Live (Superstructure)	GCS	Length
SF15	Z	Force	26.00	S16	LC3 - Water Pressure	GCS	Length
SF16	Z	Force	-2.10	S16	LC6 - Dead (superstructure)	GCS	Length
SF17	Z	Force	-2.50	S16	LC7 - Live (Superstructure)	GCS	Length

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6.9. Free surface load

Name	Load case	Dir	Type	Distribution	q1 [kN/m²]	q2 [kN/m²]	Validity	Select	System	Location
FF8	LC3 - Water Pressure	Y	Force	Dir Y	10.83	0.00	Z=0	Auto	GCS	Length
FF9	LC3 - Water Pressure	Y	Force	Dir Y	-13.00	0.00	Z=0	Auto	GCS	Length
FF10	LC3 - Water Pressure	X	Force	Dir Y	-13.00	0.00	Z=0	Auto	GCS	Length
FF11	LC3 - Water Pressure	X	Force	Dir Y	13.00	0.00	Z=0	Auto	GCS	Length
FF12	LC2 - Soil Pressure	X	Force	Dir Y	39.00	0.00	Z=0	Auto	GCS	Length
FF13	LC2 - Soil Pressure	Y	Force	Dir Y	32.50	0.00	Z=0	Auto	GCS	Length
FF14	LC2 - Soil Pressure	X	Force	Dir Y	-39.00	0.00	Z=0	Auto	GCS	Length
FF15	LC2 - Soil Pressure	Y	Force	Dir Y	-39.00	0.00	Z=0	Auto	GCS	Length
FF16	LC3 - Water Pressure	Y	Force	Dir Y	13.00	10.83	Z=0	Auto	GCS	Length
FF17	LC2 - Soil Pressure	Y	Force	Dir Y	39.00	32.50	Z=0	Auto	GCS	Length

6.10. Free point load

Name	Load case	System	Type	Coord X [m]	Coord Y [m]	Coord Z [m]	Value - F [kN]
FF25	LC6 - Dead (superstructure)	GCS	Force	6.127	12.046	0.000	-105.62
FF26	LC7 - Live (Superstructure)	GCS	Force	6.127	12.046	0.000	-35.83
FF27	LC6 - Dead (superstructure)	GCS	Force	6.201	6.863	0.000	-121.82
FF28	LC7 - Live (Superstructure)	GCS	Force	6.201	6.863	0.000	-48.70

Explanations of symbols	
Load case	Dead (superstructure)

6.11. Free line force

Name	Load case	Dir	Type	Distribution	Value - P_1 [kN/m]	Validity	Select	System	Location
FL6	LC6 - Dead (superstructure)	Z	Force	Uniform	-66.64	From-to	Auto	GCS	Length
FL7	LC6 - Dead (superstructure)	Z	Force	Uniform	-76.52	From-to	Auto	GCS	Length
FL8	LC6 - Dead (superstructure)	Z	Force	Uniform	-12.80	From-to	Auto	GCS	Length
FL9	LC6 - Dead (superstructure)	Z	Force	Uniform	-12.80	From-to	Auto	GCS	Length
FL10	LC6 - Dead (superstructure)	Z	Force	Uniform	-12.80	From-to	Auto	GCS	Length
FL11	LC6 - Dead (superstructure)	Z	Force	Uniform	-34.95	From-to	Auto	GCS	Length
FL12	LC7 - Live (Superstructure)	Z	Force	Uniform	-10.97	From-to	Auto	GCS	Length
FL13	LC7 - Live (Superstructure)	Z	Force	Uniform	-23.34	From-to	Auto	GCS	Length
FL17	LC7 - Live (Superstructure)	Z	Force	Uniform	-13.95	From-to	Auto	GCS	Length

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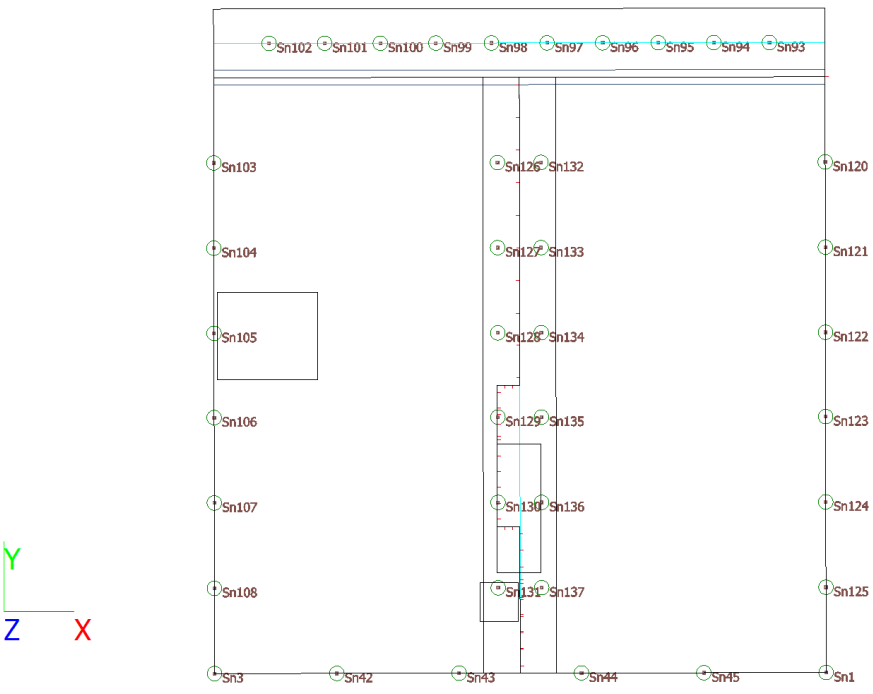
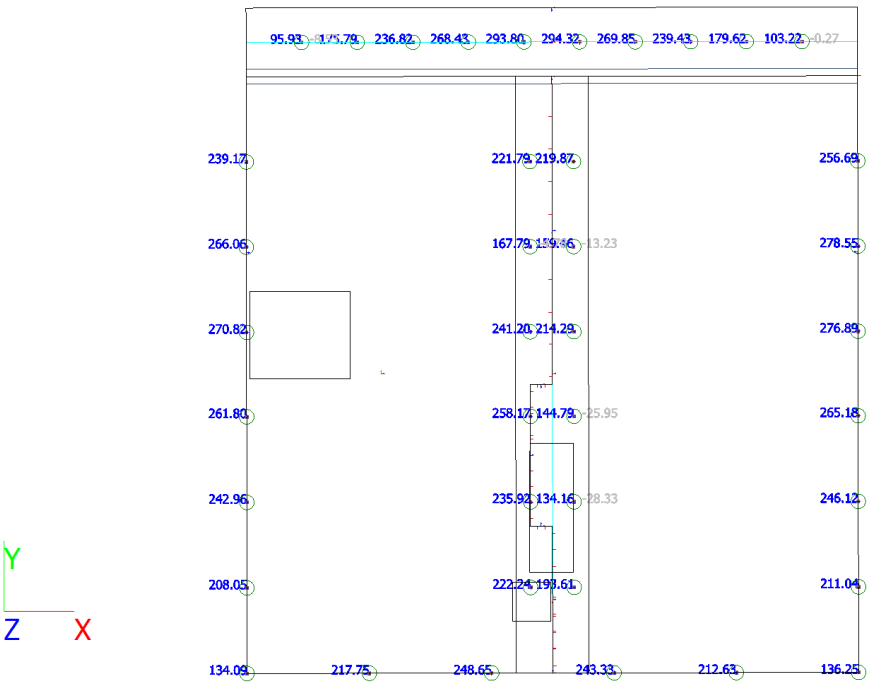
7. Results

7.1. Piles

7.1.1. Piles Layout



7.1.2. Piles Reactions; Rz (SLS)



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7.1.3. Piles Reactions (SLS)

Linear calculation, Extreme : Node
Selection : All
Class : SLS

Support	Case	Rz [kN]
Sn1/N46	SLS-Ch/1	**92.33**
Sn1/N46	SLS-Ch/2	**136.25**
Sn3/N48	SLS-Ch/1	**88.33**
Sn3/N48	SLS-Ch/2	**134.09**
Sn42/N139	SLS-Ch/1	**110.96**
Sn42/N139	SLS-Ch/2	**217.75**
Sn43/N141	SLS-Ch/1	**141.64**
Sn43/N141	SLS-Ch/2	**248.65**
Sn44/N143	SLS-Ch/1	**137.32**
Sn44/N143	SLS-Ch/2	**243.33**
Sn45/N145	SLS-Ch/1	**107.40**
Sn45/N145	SLS-Ch/2	**212.63**
Sn93/N306	SLS-Ch/1	**-0.27**
Sn93/N306	SLS-Ch/2	**103.22**
Sn94/N308	SLS-Ch/3	**82.40**
Sn94/N308	SLS-Ch/4	**179.62**
Sn95/N310	SLS-Ch/3	**138.18**
Sn95/N310	SLS-Ch/4	**239.43**
Sn96/N312	SLS-Ch/3	**178.84**
Sn96/N312	SLS-Ch/4	**269.85**
Sn97/N314	SLS-Ch/3	**211.84**
Sn97/N314	SLS-Ch/4	**294.32**
Sn98/N316	SLS-Ch/3	**211.47**
Sn98/N316	SLS-Ch/4	**293.80**
Sn99/N318	SLS-Ch/3	**177.84**
Sn99/N318	SLS-Ch/4	**268.43**
Sn100/N320	SLS-Ch/3	**136.12**
Sn100/N320	SLS-Ch/4	**236.82**
Sn101/N322	SLS-Ch/1	**78.45**
Sn101/N322	SLS-Ch/2	**175.79**
Sn102/N324	SLS-Ch/1	**-8.53**
Sn102/N324	SLS-Ch/2	**95.93**
Sn103/N330	SLS-Ch/1	**75.05**
Sn103/N330	SLS-Ch/2	**239.17**
Sn104/N332	SLS-Ch/1	**102.41**
Sn104/N332	SLS-Ch/2	**266.06**
Sn105/N334	SLS-Ch/3	**109.82**
Sn105/N334	SLS-Ch/4	**270.82**
Sn106/N336	SLS-Ch/3	**108.31**
Sn106/N336	SLS-Ch/4	**261.80**
Sn107/N338	SLS-Ch/3	**105.28**
Sn107/N338	SLS-Ch/4	**242.96**
Sn108/N340	SLS-Ch/1	**107.27**
Sn108/N340	SLS-Ch/2	**208.05**
Sn120/N407	SLS-Ch/1	**90.17**
Sn120/N407	SLS-Ch/2	**256.69**
Sn121/N408	SLS-Ch/1	**110.56**
Sn121/N408	SLS-Ch/2	**278.55**
Sn122/N409	SLS-Ch/3	**112.19**
Sn122/N409	SLS-Ch/4	**276.89**
Sn123/N410	SLS-Ch/3	**108.43**
Sn123/N410	SLS-Ch/4	**265.18**
Sn124/N411	SLS-Ch/3	**106.34**
Sn124/N411	SLS-Ch/4	**246.12**
Sn125/N412	SLS-Ch/1	**110.25**

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Support	Case	Rz [kN]
Sn125/N412	SLS-Ch/2	**211.04**
Sn126/N443	SLS-Ch/1	**24.54**
Sn126/N443	SLS-Ch/2	**221.79**
Sn127/N444	SLS-Ch/1	**-4.78**
Sn127/N444	SLS-Ch/2	**167.79**
Sn128/N445	SLS-Ch/1	**49.83**
Sn128/N445	SLS-Ch/2	**241.20**
Sn129/N446	SLS-Ch/1	**64.33**
Sn129/N446	SLS-Ch/2	**258.17**
Sn130/N447	SLS-Ch/3	**55.94**
Sn130/N447	SLS-Ch/4	**235.92**
Sn131/N448	SLS-Ch/3	**74.24**
Sn131/N448	SLS-Ch/4	**222.24**
Sn132/N455	SLS-Ch/1	**22.40**
Sn132/N455	SLS-Ch/2	**219.87**
Sn133/N456	SLS-Ch/1	**-13.23**
Sn133/N456	SLS-Ch/2	**159.46**
Sn134/N457	SLS-Ch/1	**24.99**
Sn134/N457	SLS-Ch/2	**214.29**
Sn135/N458	SLS-Ch/3	**-25.95**
Sn135/N458	SLS-Ch/4	**144.79**
Sn136/N459	SLS-Ch/3	**-28.33**
Sn136/N459	SLS-Ch/4	**134.16**
Sn137/N460	SLS-Ch/3	**49.62**
Sn137/N460	SLS-Ch/4	**193.61**

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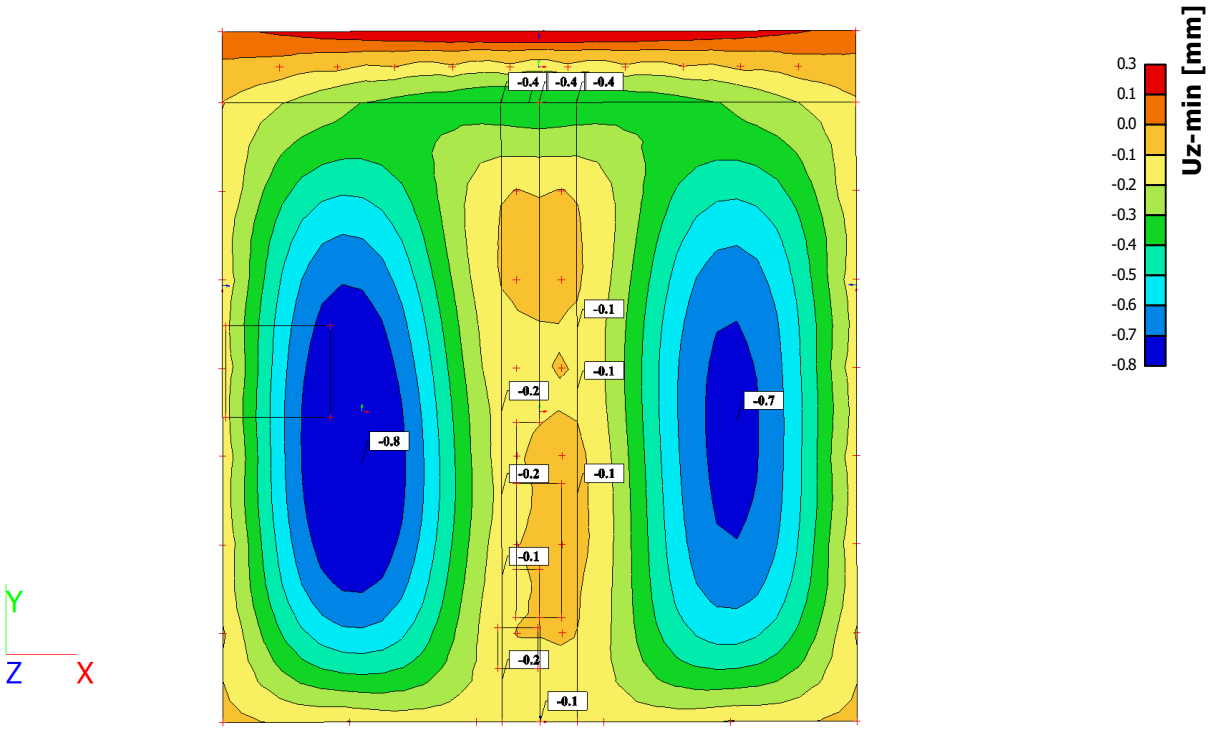
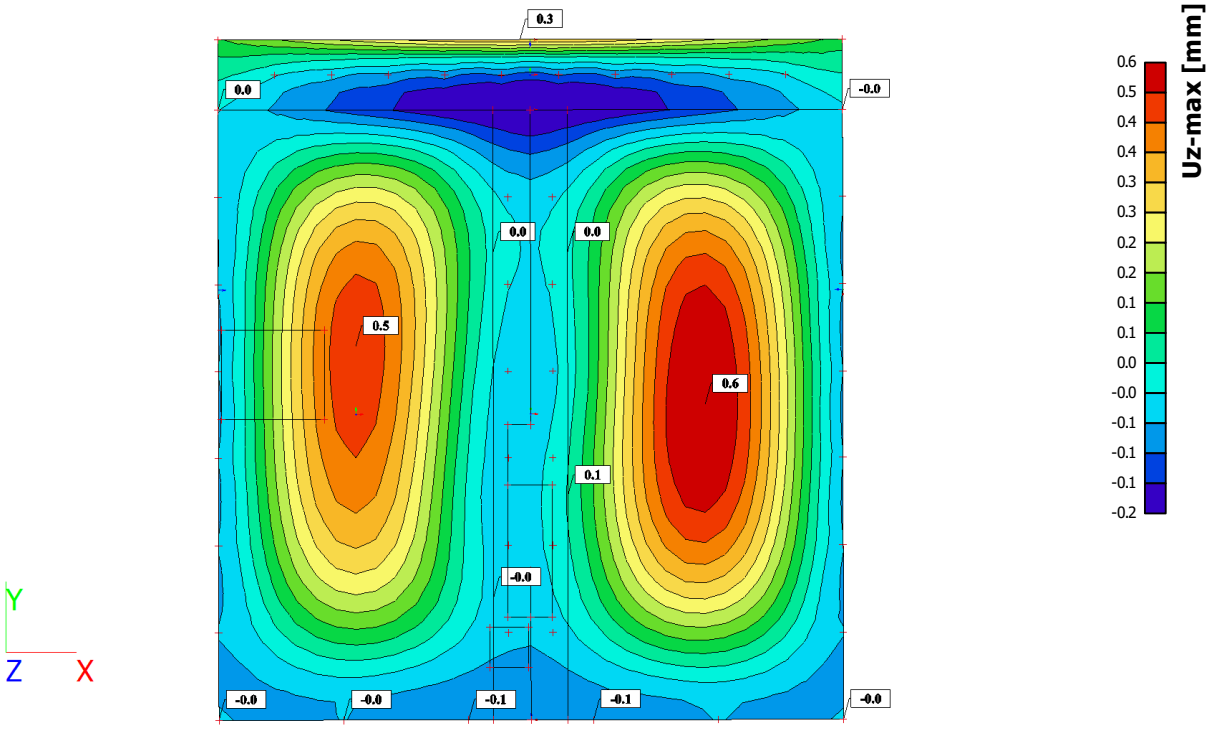
7.2. Displacements

7.2.1. Displacement of nodes; Uz (SLS) - Basement Slab (min)



7.2.2. Displacement of nodes; Uz (SLS) - Basement Slab (max)



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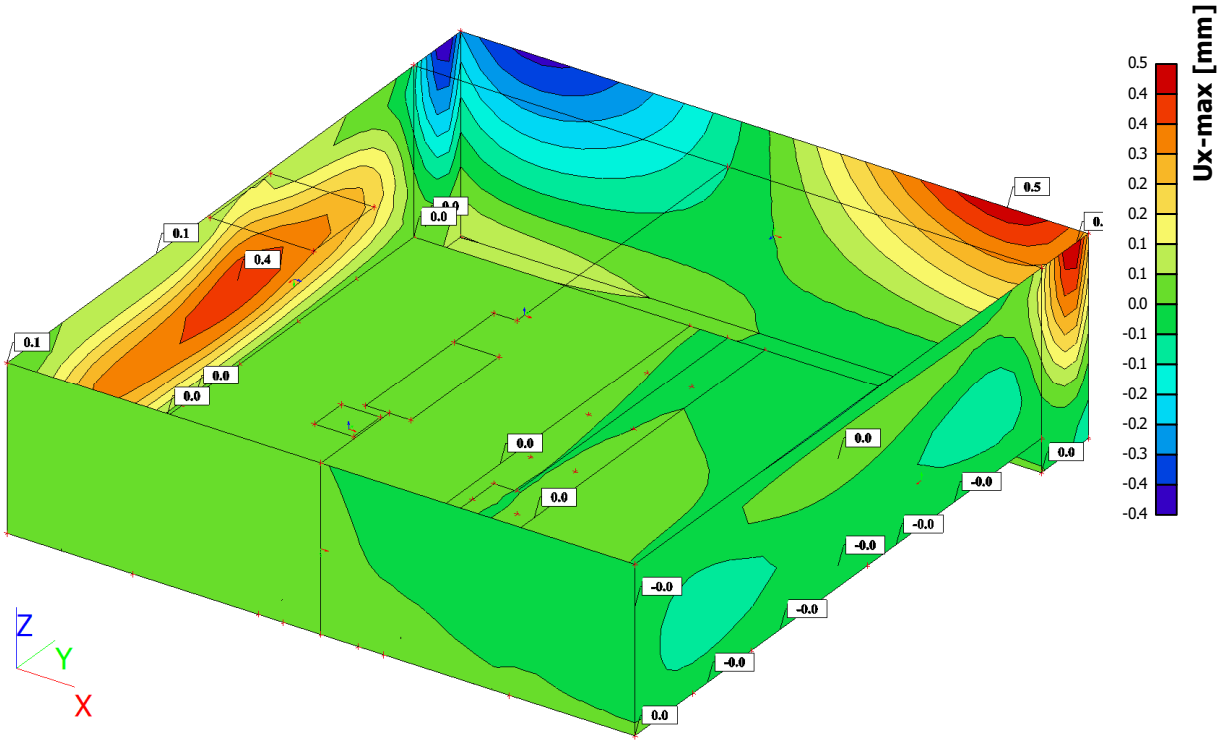
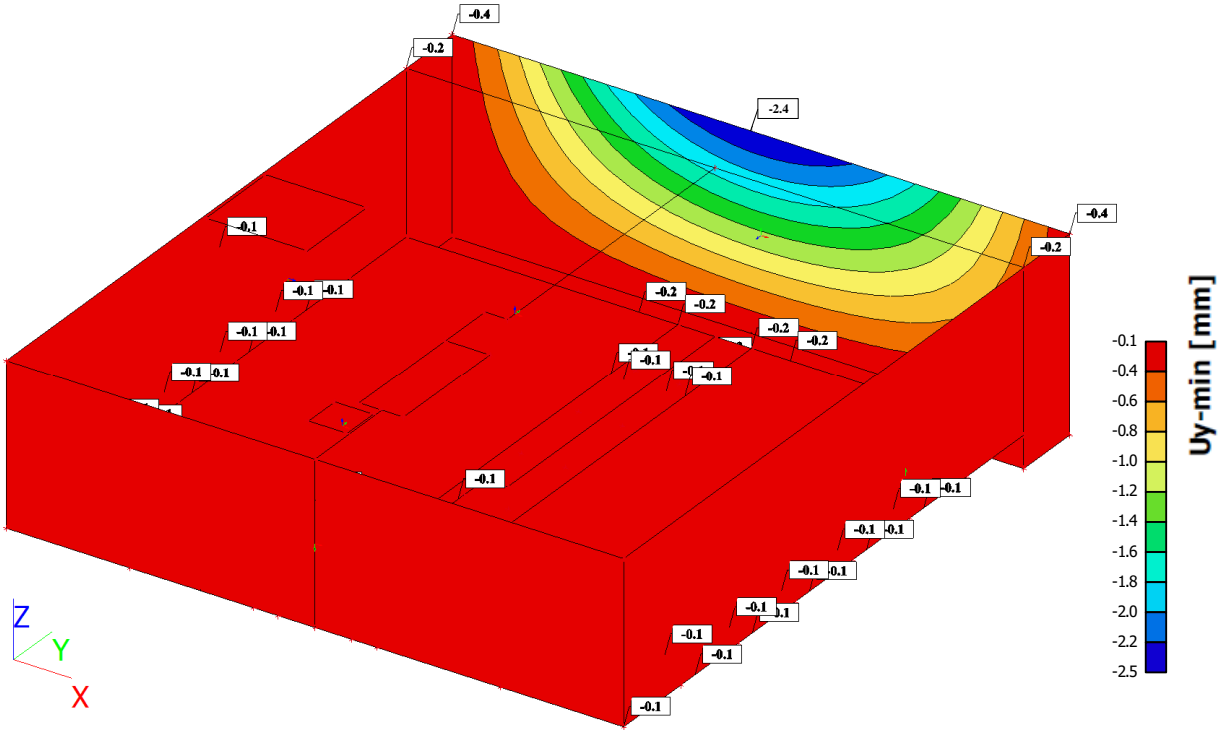
7.2.3. Displacement of nodes; Ux (SLS) - Basement



7.2.4. Displacement of nodes; Uy (SLS) - Basement



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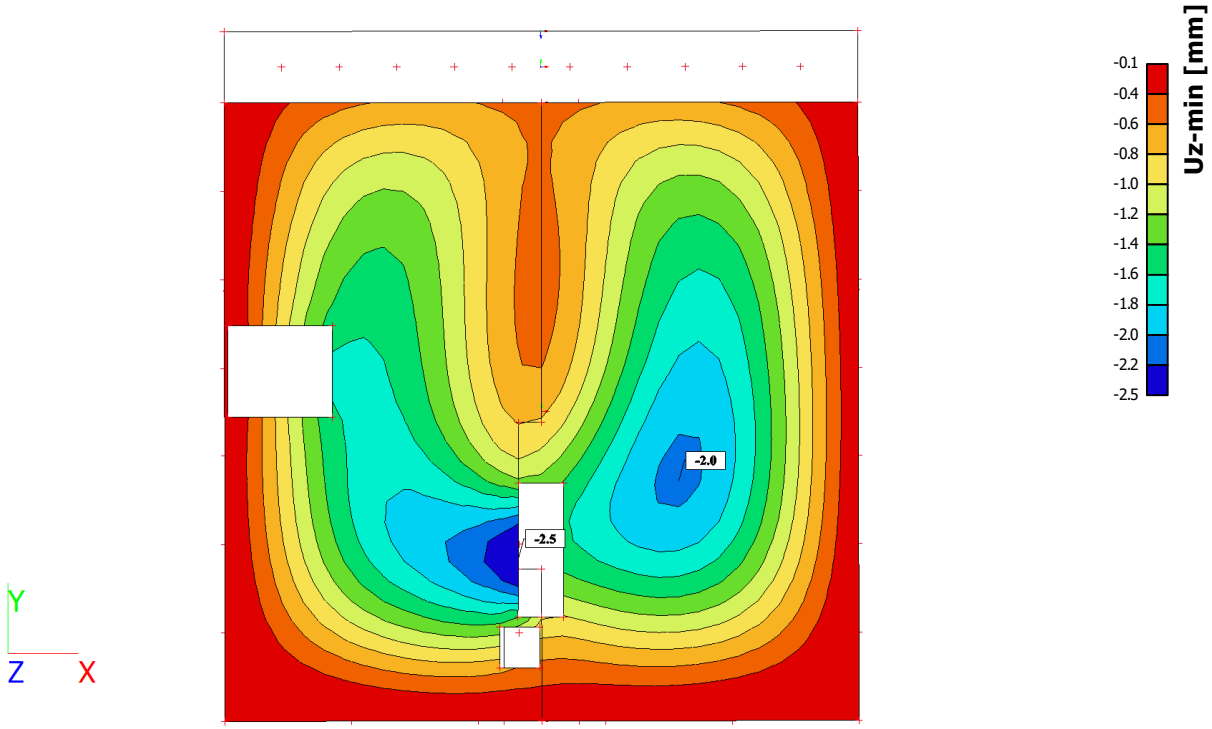
7.2.5. Displacement of nodes; Uz (SLS) - Ground Floor Slab



7.3. Internal Forces - Basement (ULS)

Design magnitude

Quantities mxD and myD (respectively nxD and nyD) are design moments (respectively forces) in the reinforcement. Negative design moments have no practical meaning and are stated just for the reason of completeness.

Project: plate	mxD+, myD+, mcD+, mxD–, myD–, mcD–
Project: wall	nxD, nyD, ncD
Project: general (shell)	mxD+, myD+, mcD+, mxD–, myD–, mcD–, nxD, nyD, ncD

Design moments in slabs that are related to the surface with positive element coordinate and are marked with + (plus sign).

Design moments in slabs that are related to the surface with negative element coordinate and are marked with – (minus sign).

Design forces in a wall are in the middle plane.

Corresponding surface of action of design moments in shells is given directly by the sigh of the moment.

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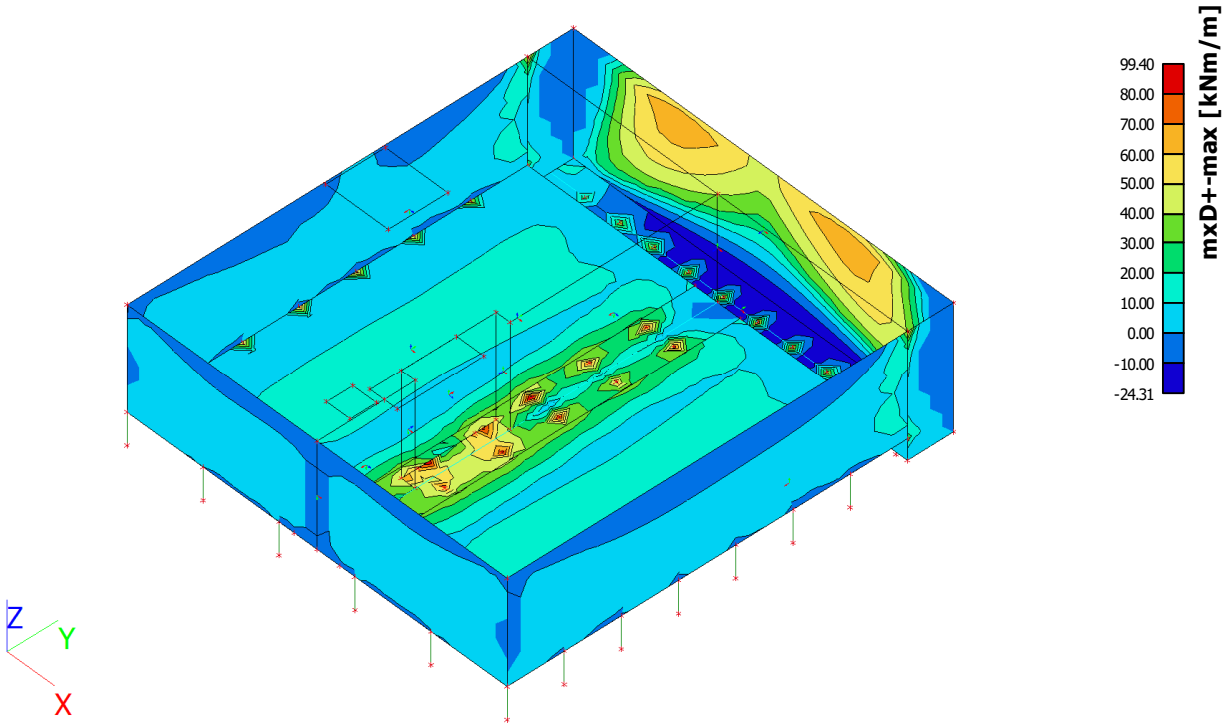
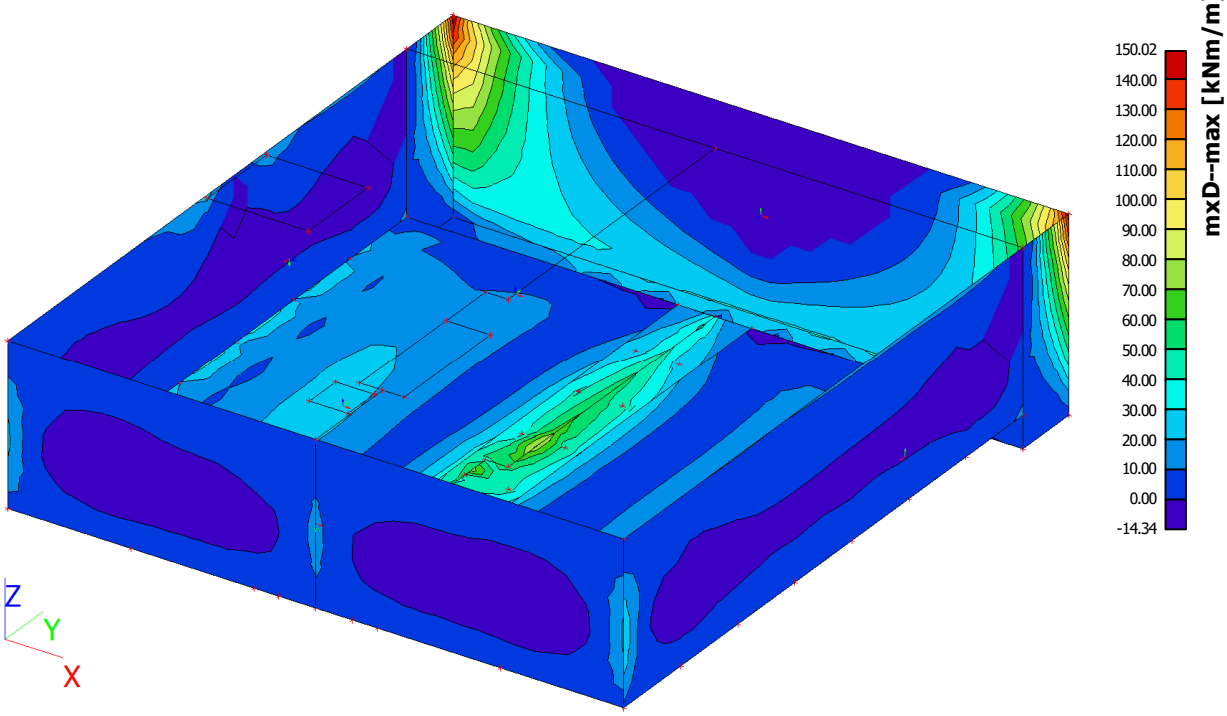
7.3.1. 2D member - Internal forces; mxD+



7.3.2. 2D member - Internal forces; mxD-



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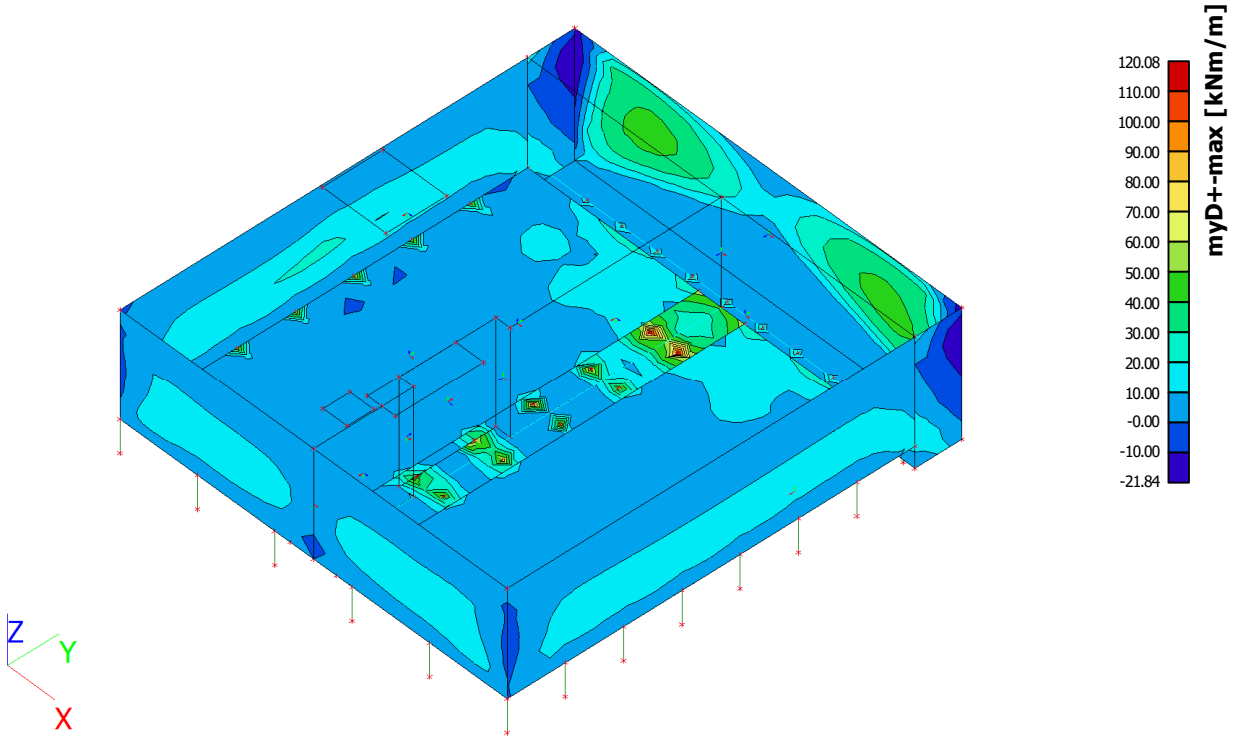
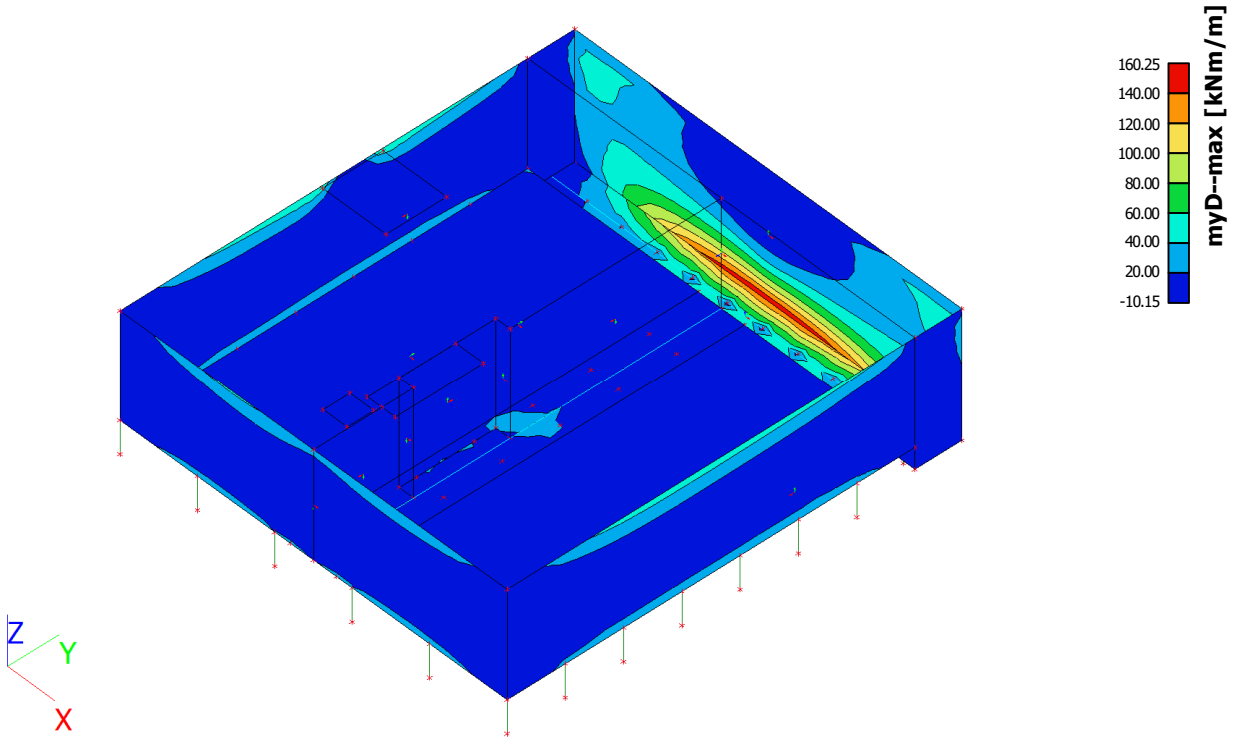
7.3.3. 2D member - Internal forces; myD+



7.3.4. 2D member - Internal forces; myD-



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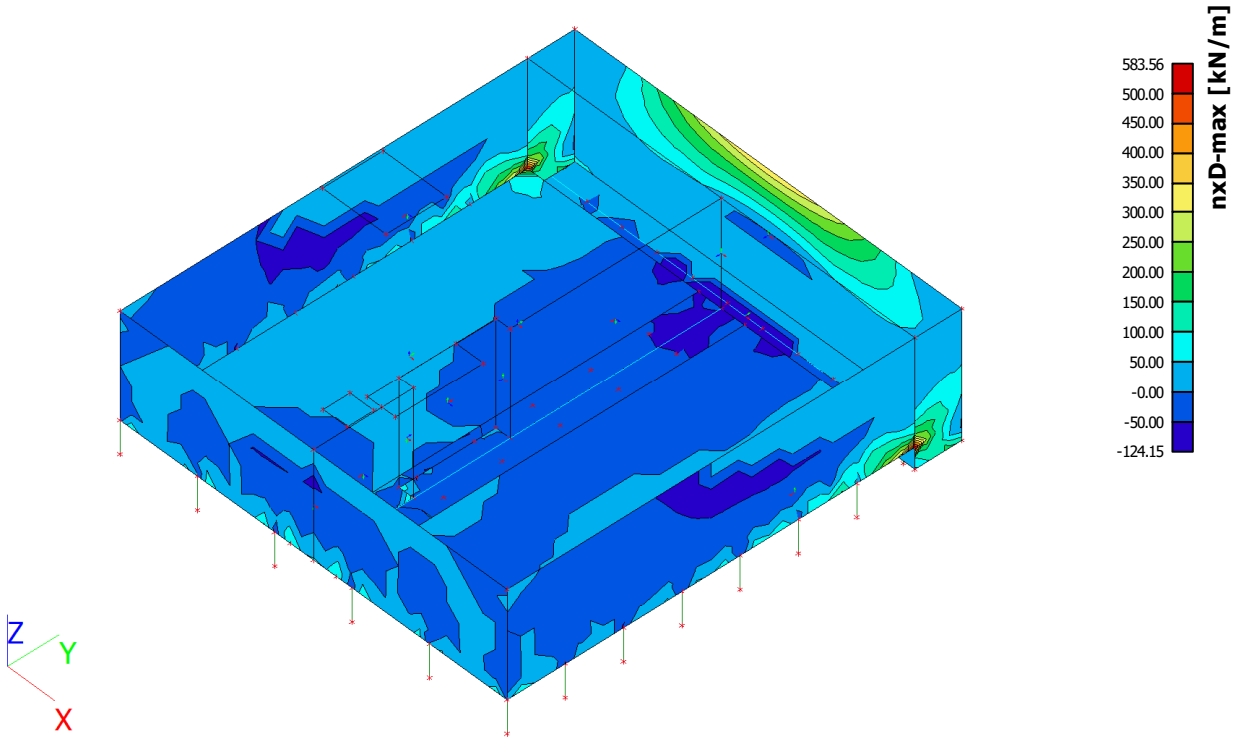
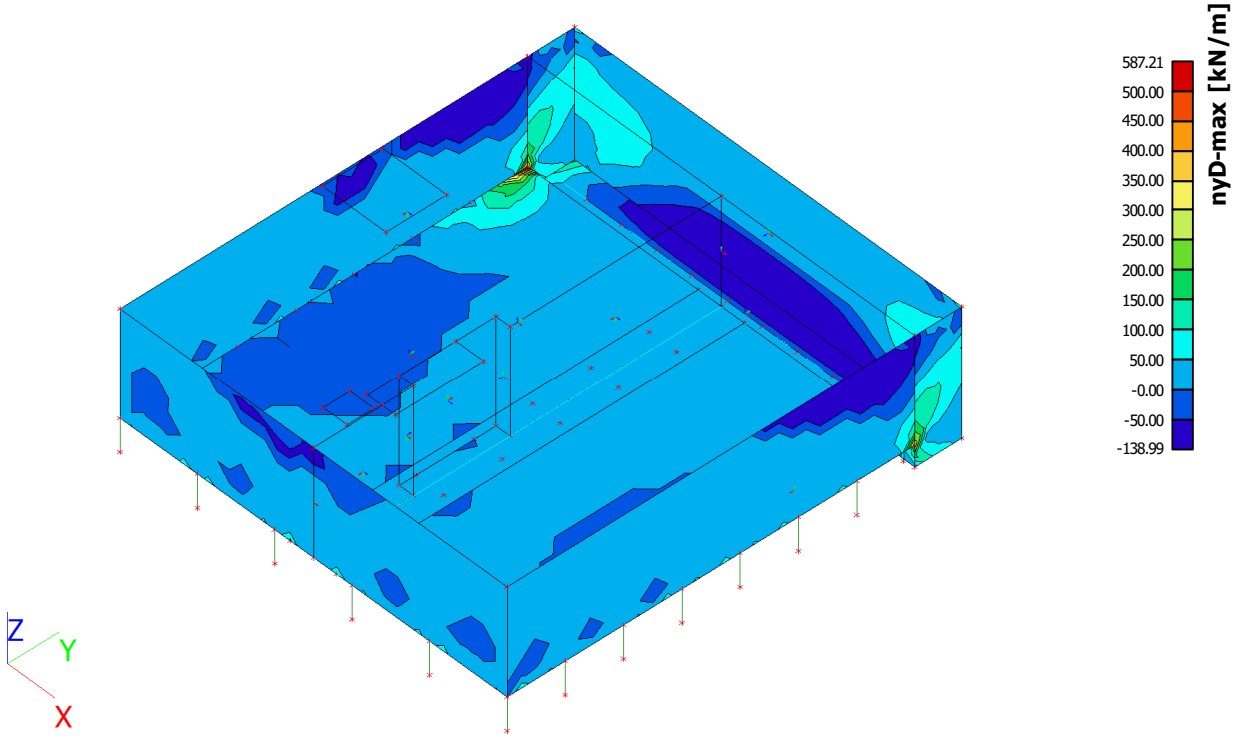
7.3.5. 2D member - Internal forces; nxD



7.3.6. 2D member - Internal forces; nyD



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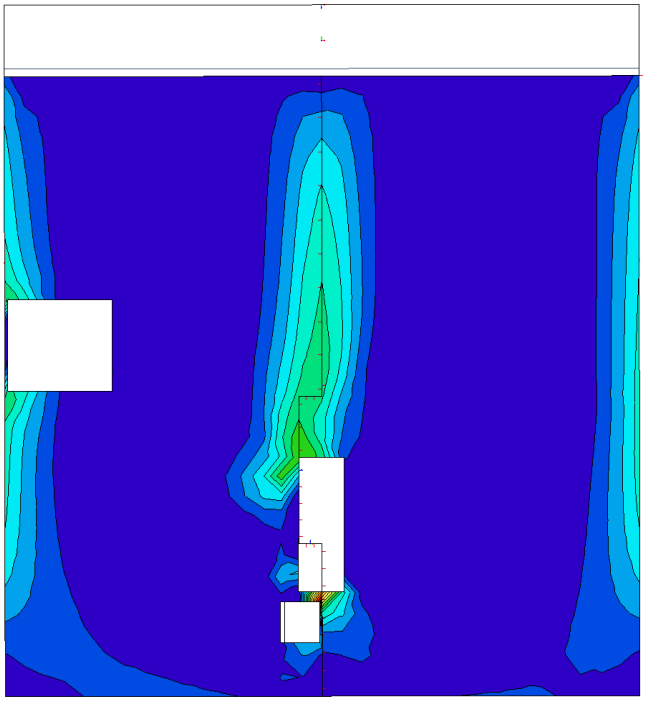
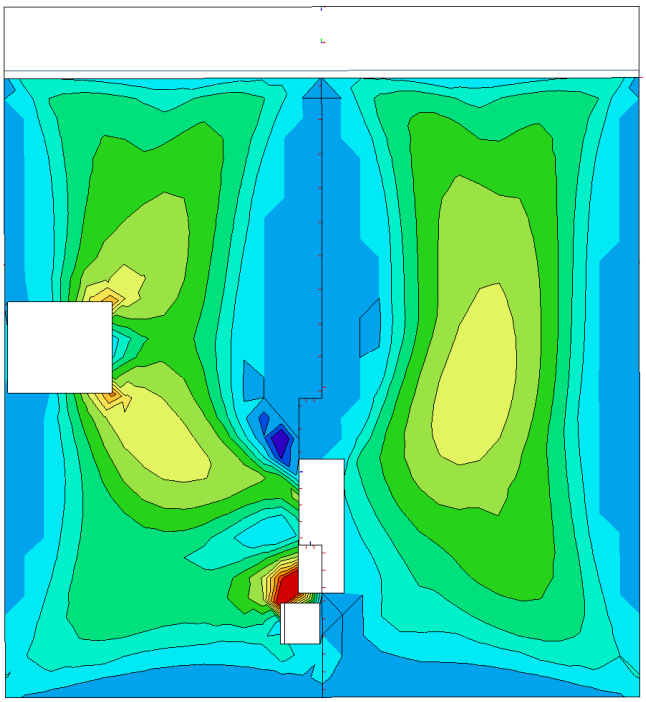
7.4. Internal Forces - Ground Floor Slab

7.4.1. 2D member - Internal forces; mxD+



7.4.2. 2D member - Internal forces; mxD-



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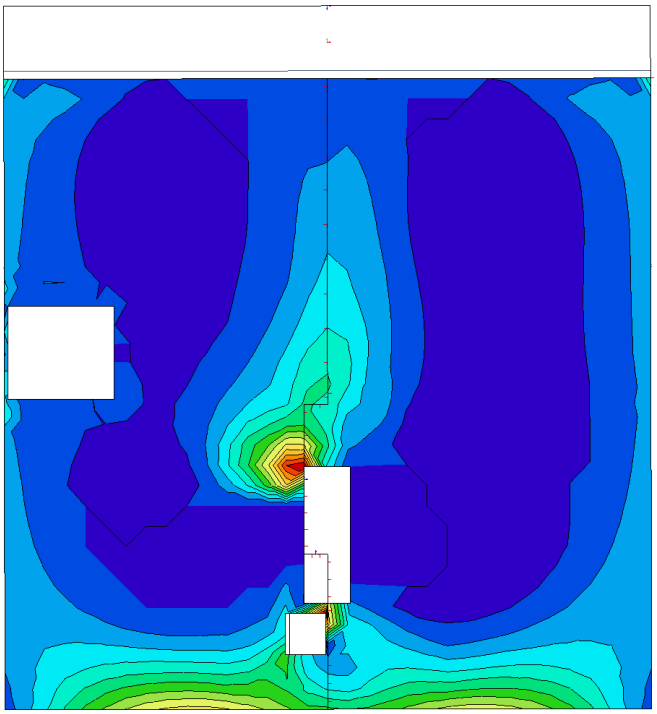
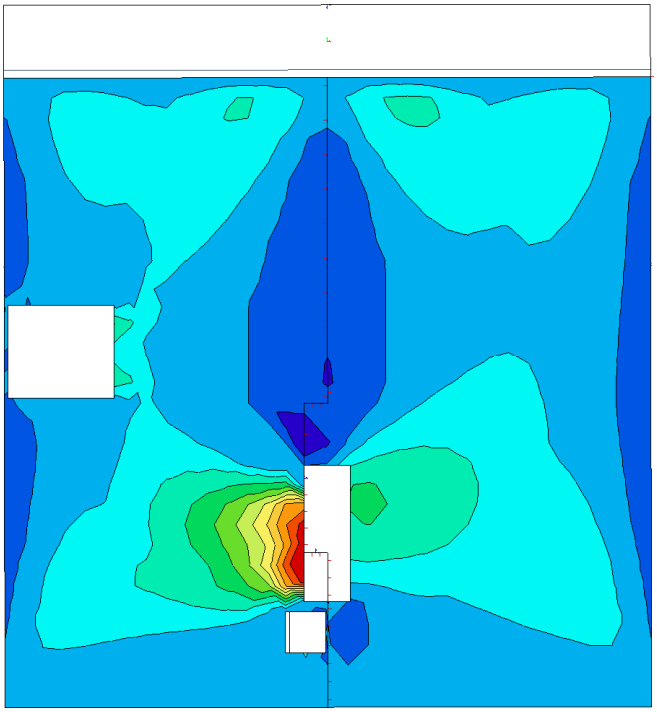
7.4.3. 2D member - Internal forces; myD+



7.4.4. 2D member - Internal forces; myD-



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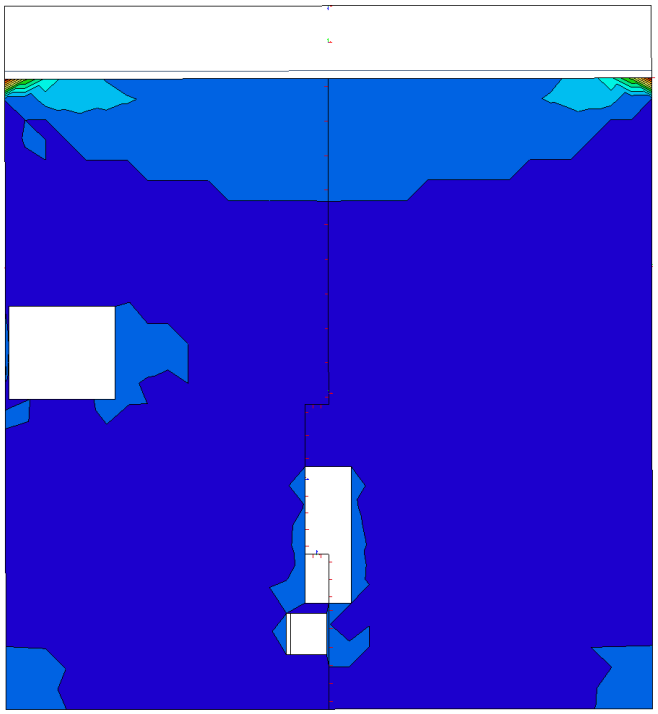
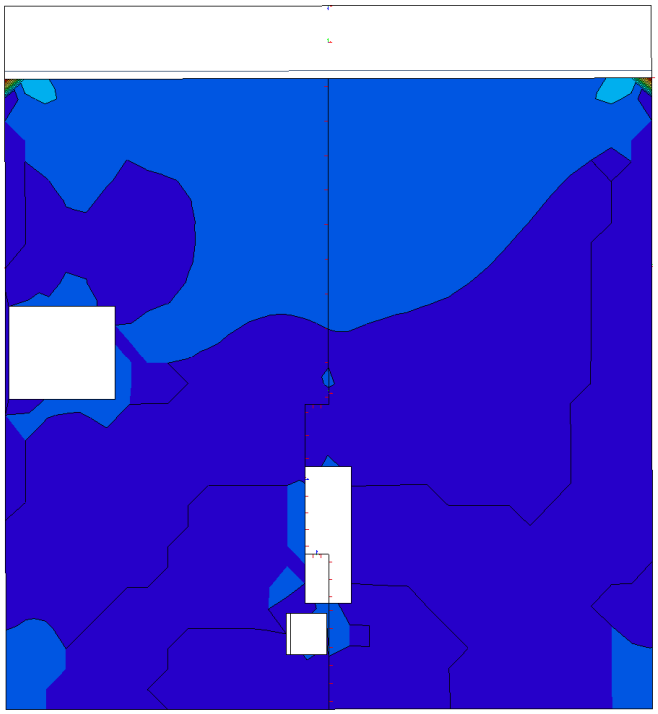
7.4.5. 2D member - Internal forces; nxD



7.4.6. 2D member - Internal forces; nyD



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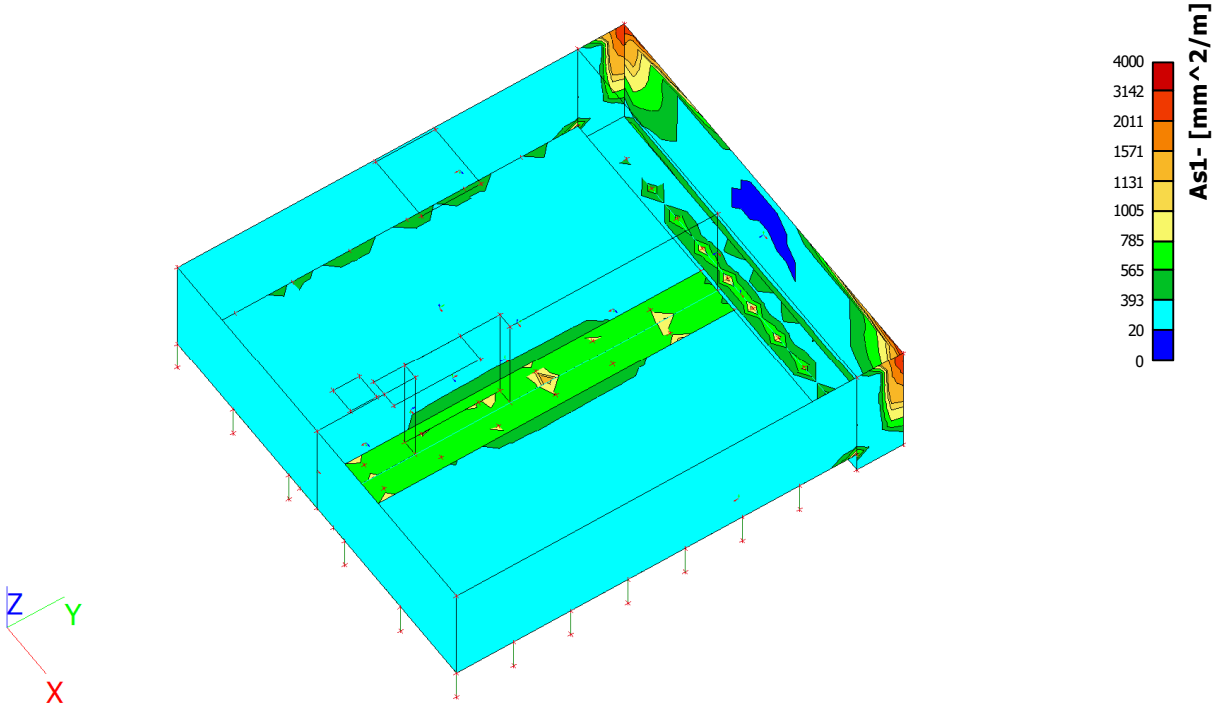
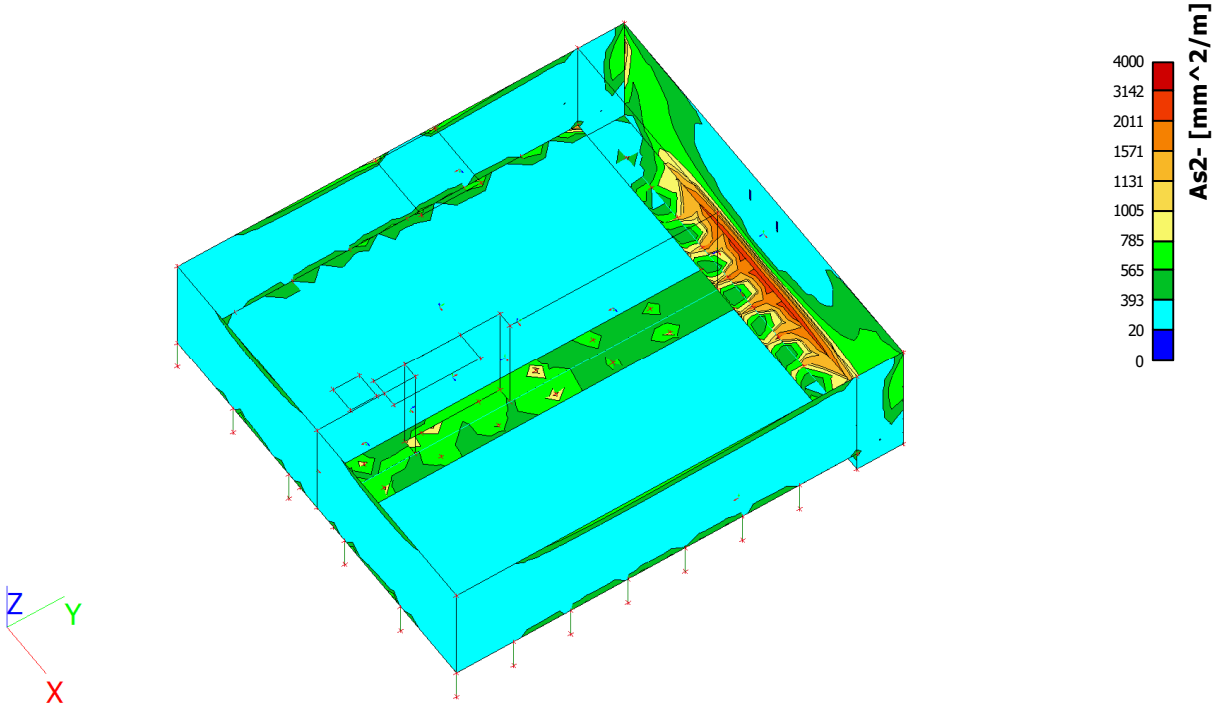
8. Design

8.1. Basement Reinforcement (ULS)

8.1.1. Member 2D - design - required areas; As1- (ULS) Slab Bottom - x, Walls Outer Face -x



8.1.2. Member 2D - design - required areas; As2- (ULS) Slab Bottom - y, Walls Outer Face -y



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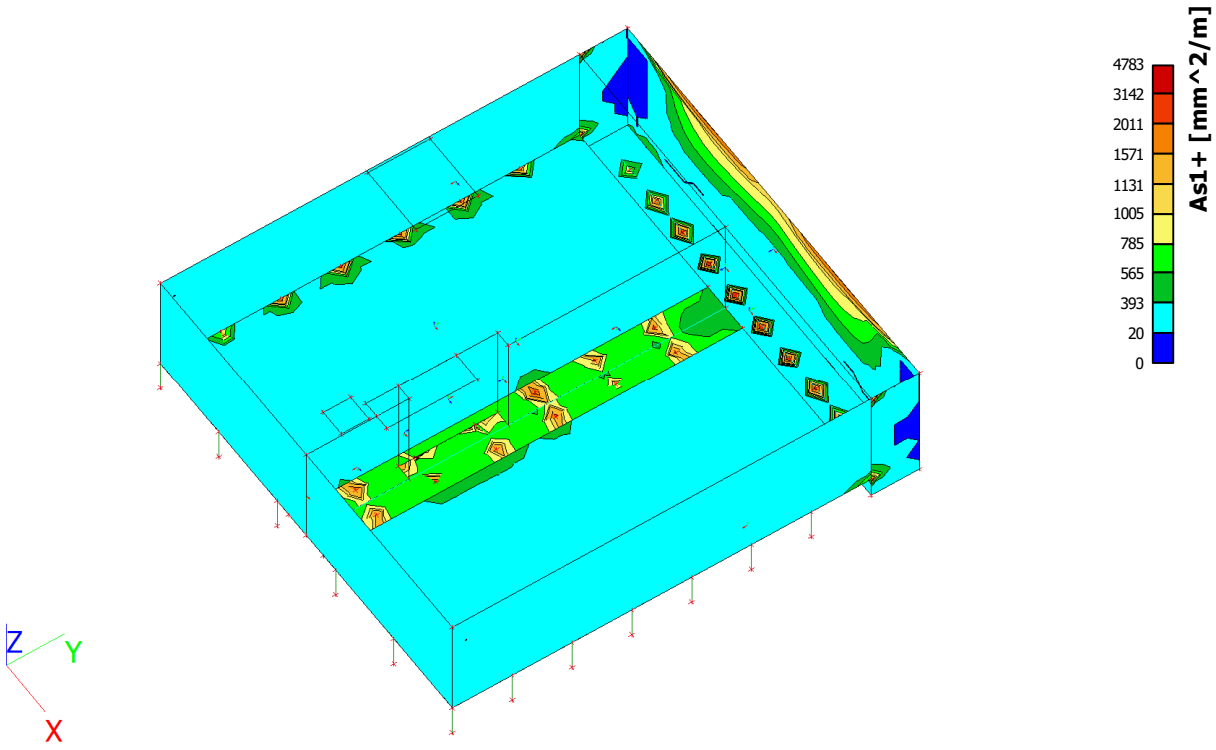
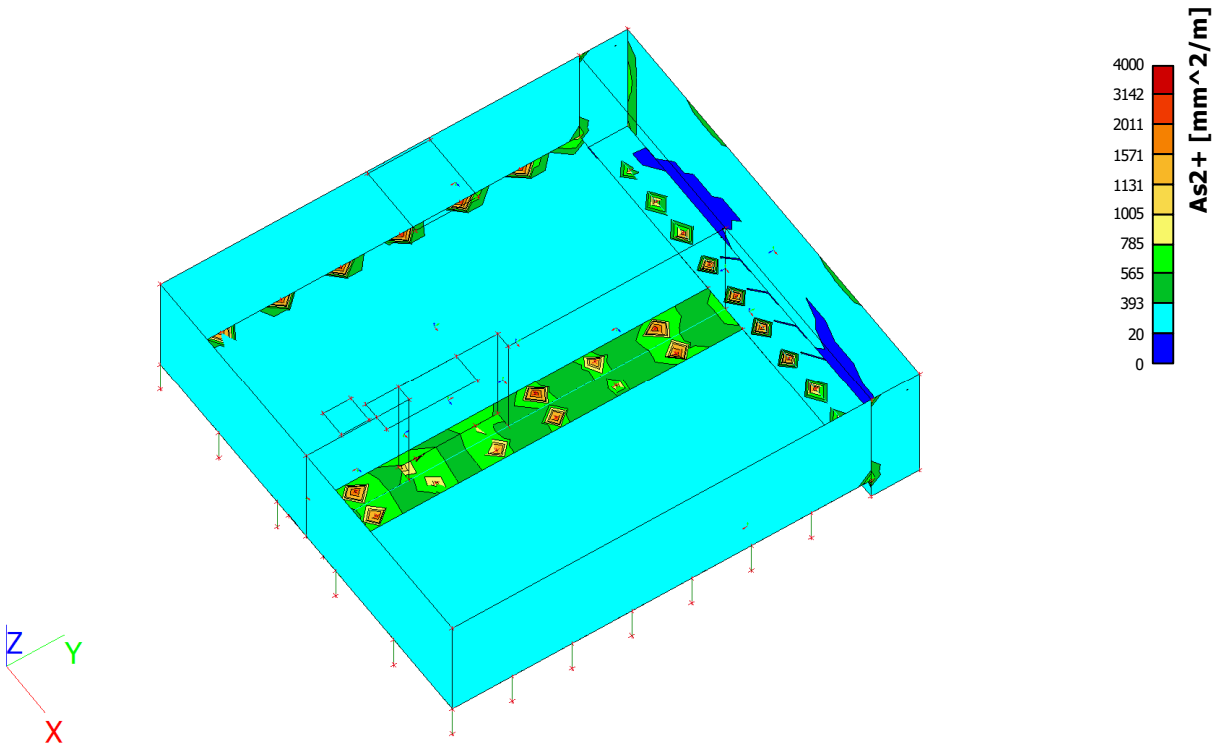
8.1.3. Member 2D - design - required areas; As1+ (ULS) Slab Top - x, Walls Inner Face -x



8.1.4. Member 2D - design - required areas; As2+ (ULS) Slab Top - y, Walls Inner Face -y



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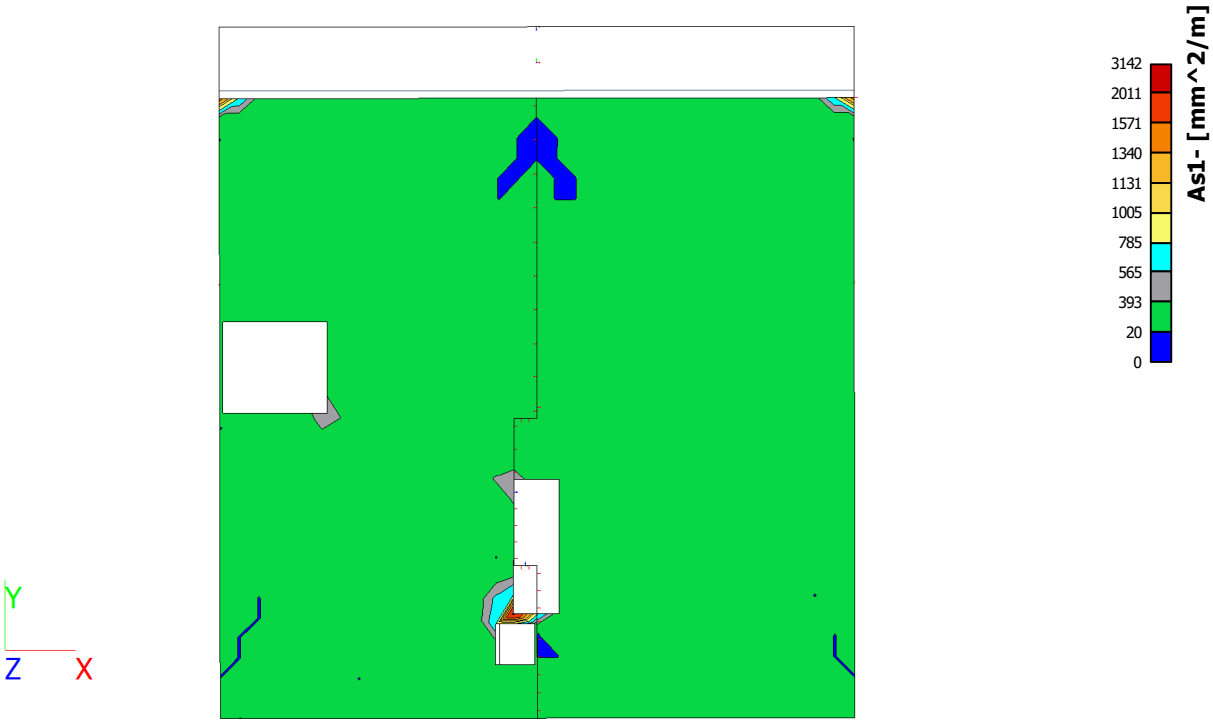
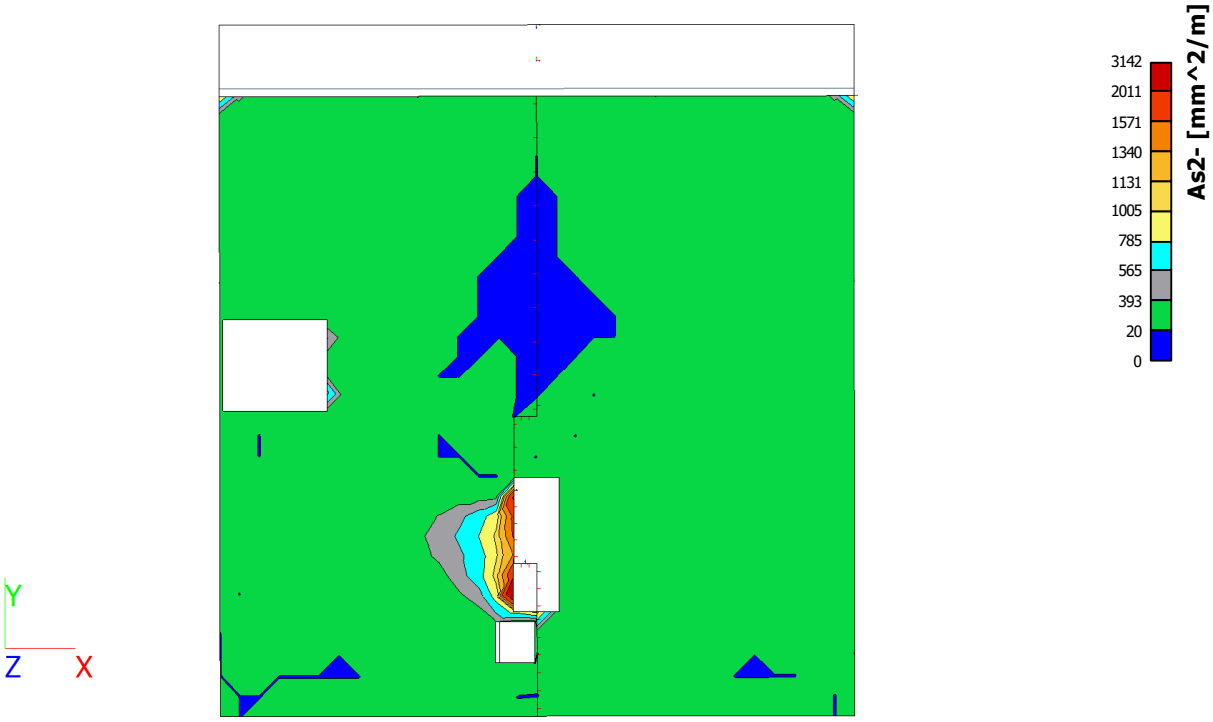
8.2. Ground Floor Slab Reinforcement

8.2.1. Member 2D - design - required areas; As1- (ULS) Slab bottom - x



8.2.2. Member 2D - design - required areas; As2- (ULS) - Slab Bottom - y



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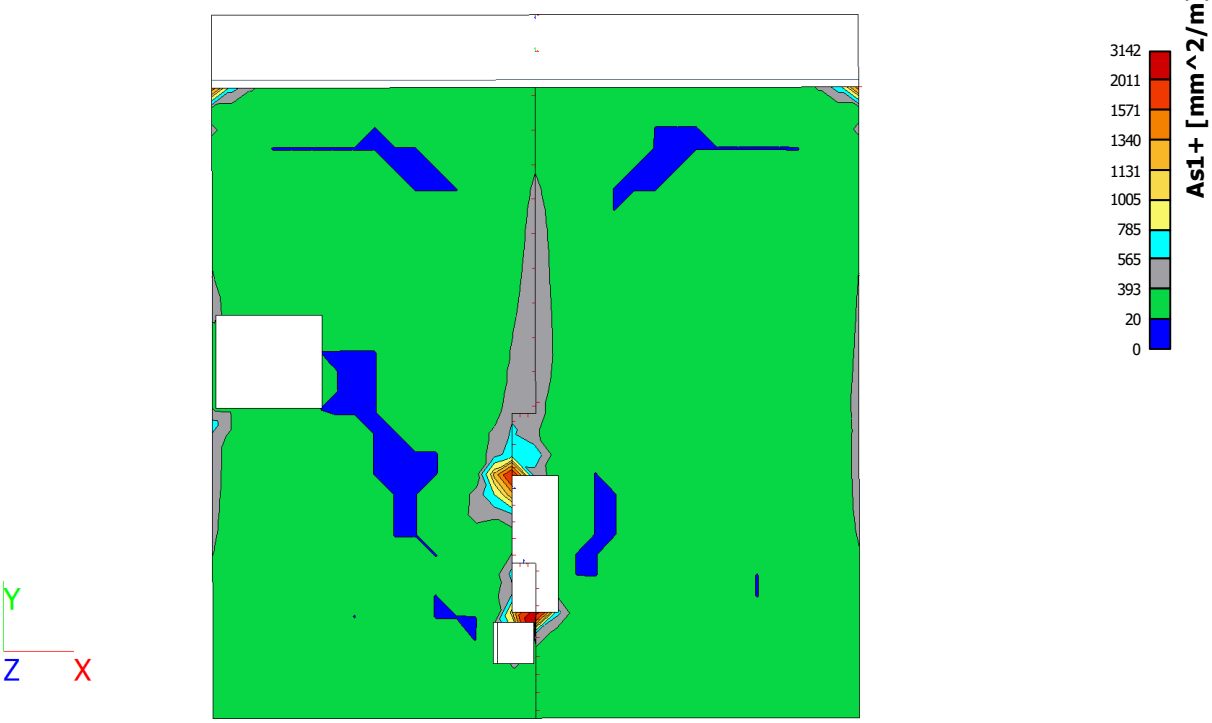
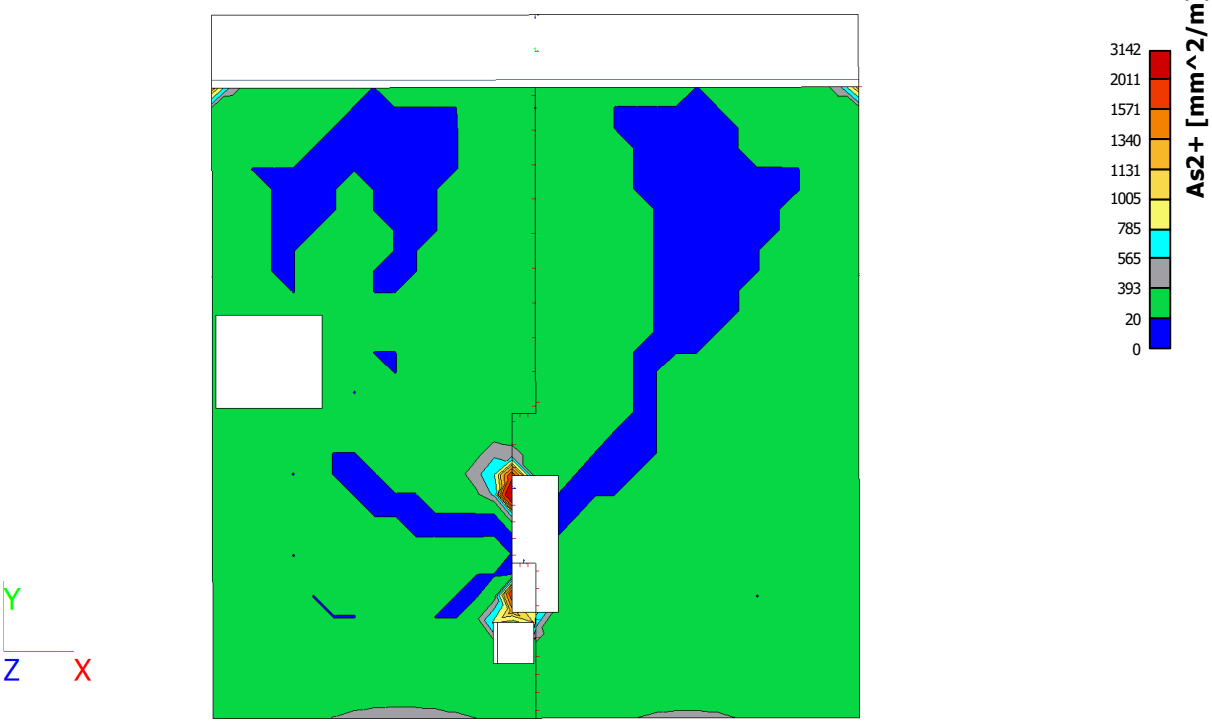
8.2.3. Member 2D - design - required areas; As1+ (ULS) Slab Top - x



8.2.4. Member 2D - design - required areas; As2+ (ULS) Slab Top - y



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