Test Frame Design for Gaped K-joints of Tubular Trusses

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ABSTRACT

This research was conducted for HAMK Tech, Research Unit of Häme University of Applied Sciences, to study the behaviour of welded tubular truss joints of high strength steel (HSS). The main purpose of this bachelor's thesis was to set up K-joint test arrangement of truss in laboratory by modifying existing reaction frame from HAMK Tech. According to the joint classification of truss structures, each braces of a K joint is subject to either tension or compression force. On that account, for testing of K joint in the lab, three to four loading devices are needed to apply load on a K joint to creates tenson and compression force to the members. But, due to lack of sufficient loading device in HAMK Tech lab, two load actuators with 630 kilonewtons were available to generate required tension and compression force to the members.

First, rigid curved support beam is designed for two bracing members to generate equal amount of tension and compression forces. Second step is to build the BIM model of steel frame using Tekla structures. In addition, structural analysis of steel frame was done according to elastic design in Dlubal RFEM. Finally, structural drawings such as general arrangement drawings and workshop drawings were created for manufacture and assembly of reaction frame component.

As a result, this report shows the BIM integrated workflow between Tekla structures and Dlubal RFEM programme. Furthermore, this thesis highlights the use of Finite element design software and BIM software into design and analysis of the structure. Detailed representation of research task for K joint test arrangement including 3D modelling and structural analysis of steel reaction frame were presented in this thesis report. Structural calculation and design were based on Eurocode and K joint test project requirements.

Keywords Structural analysis, K-joint, Steel frame, Tekla structures, Dlubal RFEM.

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Aashish Rokka
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1 INTRODUCTION

The strength of materials (Mechanics of materials) is an interesting topic in an engineering that gives knowledge of stress and strain in a solid object under applied load. It is a fundamental part of engineering research and development which gives engineers to build safe structure. In modern society, designing structure and its component is based on strength, stiffness, and stability criteria. Without having the knowledge of strength of materials it is impossible to design structures based on those norms. Therefore, structural engineers and research scientists perform structural element and component testing in laboratory to study properties and strength of materials. To this date, there has been several test arrangement plans were used to test welded hollow section joint connection of K joint. Thus, different system and equipment can be used to test welded K joint, but the basic principle of testing is to consider all the natural loads acting on K joints. While performing test in laboratory those natural loads must be applied through loading devices such as hydraulic actuator. In this report, a new test arrangement plan was developed to test K joints for Hamk Tech lab.

Available reaction frame from Hamk Tech lab cannot be used to test K joints due to instability of hydraulic actuator in angled position. Thus, for new test arrangement plan for K joint test, existing steel reaction frame was modified and changed position of hydraulic actuator in 30-degree angle. The main requirement of steel reaction frame is to be suitable for various testing of K, N and T hollow section joint types.

The goal of this thesis is to modify existing reaction frame for K joint test. This report includes a study of the reaction frame and test floor from Hamk Tech lab. The structural calculation is based on Ultimate limit state and Serviceability limit state approach using Eurocode standard and Finnish national annex. Similarly, this reports also covers 3D BIM modelling of modified reaction frame using Tekla structures software. After modelling, structural drawings were generated. Experimental data from calculation reports and structural drawings were presented in this thesis for further experimental projects.

2 LITERATURE REVIEW

2.1 Truss

A truss is a rigid structure made by straight members, connected at their ends through joints. In traditional design and analysis, the joints in a truss are considered as pinned connection, meaning that members can rotate freely at each joint. External loads are only acting on the joints of the truss. Since, joints of truss are assumed as pinned connection, they can carry only tension and compression force, but they cannot carry bending moment. Thus, the members of truss are designed to take only axial force but not lateral load. They are used in building, bridge, tower, and crane structures.

The joint classification of truss is based on the method of force acting in the joint but not on the physical appearance of the joint. The most common types of truss joints are K, X, N, Y, and T.

2.2 K-Joints

K type joints in steel structure is formed when load is acting in all joint of K-type and those loads create tension and compression in bracing member and compression in chord member. Tension force and compression force in bracing member must be equal or approximately equal. K type joint are common, simple, and economical in steel structure. The centroidal axis of the horizontal member and two lateral bracings connect with the central axis of the upper chord to generate K - type joints in steel constructions. Figure 1 below shows the example of truss structure.

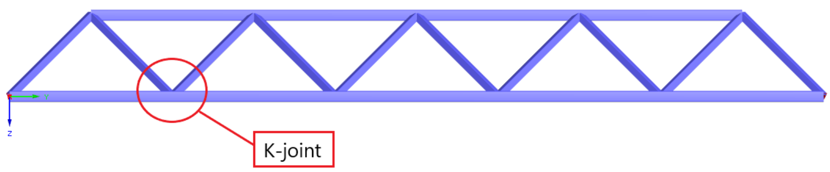


Figure 1. Location of K-joint in the truss.

Figure 2 below shows the gaped K joints of Truss.

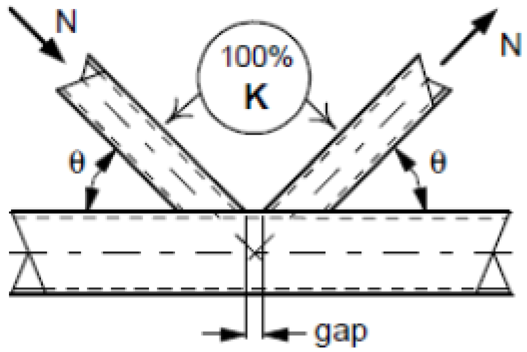


Figure 2. K joints of truss structure. (Eurocode 1993)

2.3 **Welded and non-welded Connection**

The members of truss are either connected by welded or bolted connection, but for calculation they are considered as pinned connection. Therefore, the force acting at each member are only axial force.

2.3.1 Welded connection

Even bolted connection is used to assemble prefabricated elements of hollow section, the most common way to connect hollow section joint is welding. Welded connections are connections where two or more than two metal components are jointed by the method of weld. Welding is the process of joining materials together through the process of heat and melting metal parts. The common types of welded joints used for welded connections are lap, tee, and butt joints. Welding is the most common method to connect hollow section truss type. According to Eurocode EN 1993-1-8, the design joint resistances of connections between hollow sections are based on the following failure modes as applicable:

- Chord face failure (plastic failure of the chord face) or chord plasticisation (plastic failure of the chord cross-section).
- Chord side wall failure (or chord web failure) by yielding, crushing or instability (crippling or buckling of the chord side wall or chord web) under the compression brace member.
- Chord shear failure.
- Punching shear failure of a hollow section chord wall (crack initiation leading to rupture of the brace members from the chord member).
- Brace failure with reduced effective width (cracking in the welds or in the brace members).
- Local buckling failure of a brace member or of a hollow section chord member at the joint location.

2.3.2 Bolted connection

Bolted connection is another method of connecting truss joints. Mostly, joint members of trusses are rigidly connected using gusset plate. When the centrelines of all members intersect at same point then the joint act as a pinned connection. Therefore, when designing truss or hollow section joint it is important to consider that centre lines of all members will intersect at same point. Usually, bolted connection is used to connect main assembly of structure, on the site. And welding on site is more costly than using bolt. So, to avoid welding on site, bolt connection is used. The common type of bolted connection in hollow section truss type are bolted knee joints, flange connections, splice joints, joints with fork ends, Screwed tensioner, through bolting, bolted connections with flattened ends, Hinged support, Column bases, fish plate connections, and bolted sub-assemblies.

3 DESCRIPTION OF PROJECT

3.1 Reaction frame

The purpose of reaction frame is to provide support to the test specimen and hydraulic actuators. Reaction frame carries all the forces from frame to ground which is generated during testing by hydraulic actuators. Two hydraulic actuators are going to use for test arrangement. Each actuator has capacity of 630 KN force. The reaction frame is only able to apply loads into vertical direction. One of hydraulic actuator is fixed at perpendicular direction whereas another is placed at 30-degree angle.

3.2 Location of the structure

It is planned to place the frame inside lab facility of HAMK Tech research unit building. The whole laboratory consists of different area for testing, fabrication, and storage. Besides to these workshops, Hamk Tech building has other areas such as control rooms and office rooms for Hamk University of Applied Sciences and Ruukki Construction Oy for teaching, research, and development purpose.

HAMK Techs major research areas include materials, design and manufacturing technologies, construction, and the energy efficiency of the built environment. Structural testing lab in HAMK Tech is very large and equipped with multiple reaction frames and hydraulic cylinders for different testing such as compression and tension test of various materials, resistance capacity test of joint materials and testing of load carrying capacity of building materials.
Figure 3 shows the planned location of reaction frame in area layout of Hamk Tech lab.

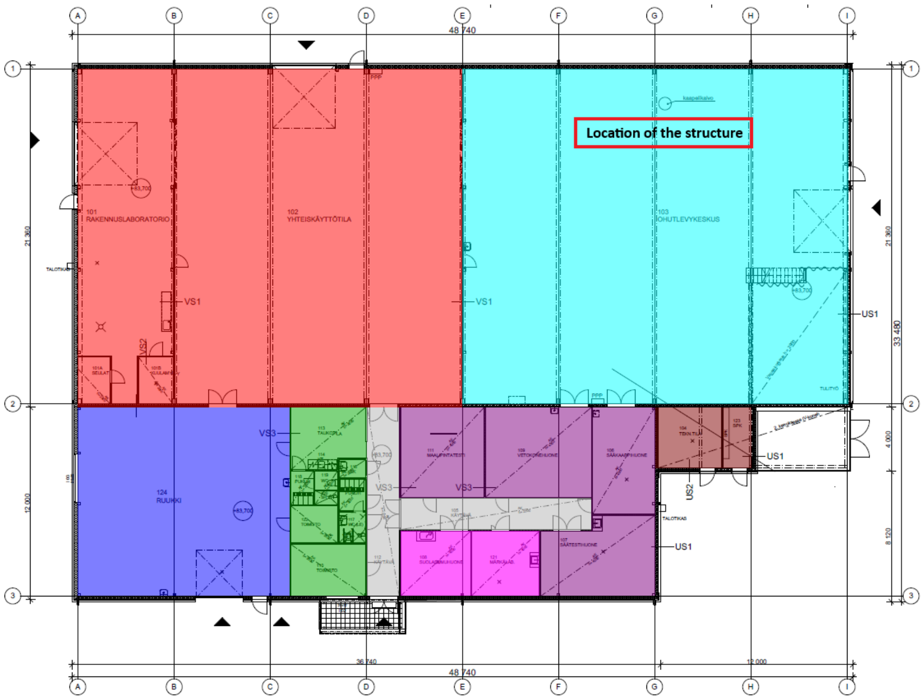


Figure 3. First floor area plan of Hamk Tech laboratory with planned location of the frame.

3.3 **Methodology**

3.3.1 Codes and standards

The applied codes and standards used in thesis are presented in Table 1.

In all calculations and analysis Finnish National Annex is used.

Description	Standard / source
Basics of structural design	EUROCODE 0 (SFS EN 1990 + Finnish Nation Annex)
Steel structures	EUROCODE 3 (SFS EN 1993 + Finnish NA)
Design of joints	EUROCODE 3 (SFS EN 1993-1-8)

3.3.2 Software used during project.

All the software used in this project are educational version and provided by HAMK University of Applied Sciences. Educational version software is free for students to use for learning and study purpose. General description of software used in this project are discussed below.

- Tekla structures

Tekla structures is 3D Building Information Modelling (BIM) software which help designers and engineers to create model made up of steel, concrete, and Timber structures. It enables users to model structure in 3D and generate drawing in 2D. Generating technical drawing from 3D model in Tekla is automated. It can be available in different configuration and environment. Material library and components may differ from different environment.
Figure 4 down below shows the version and licence information of the Tekla structures.

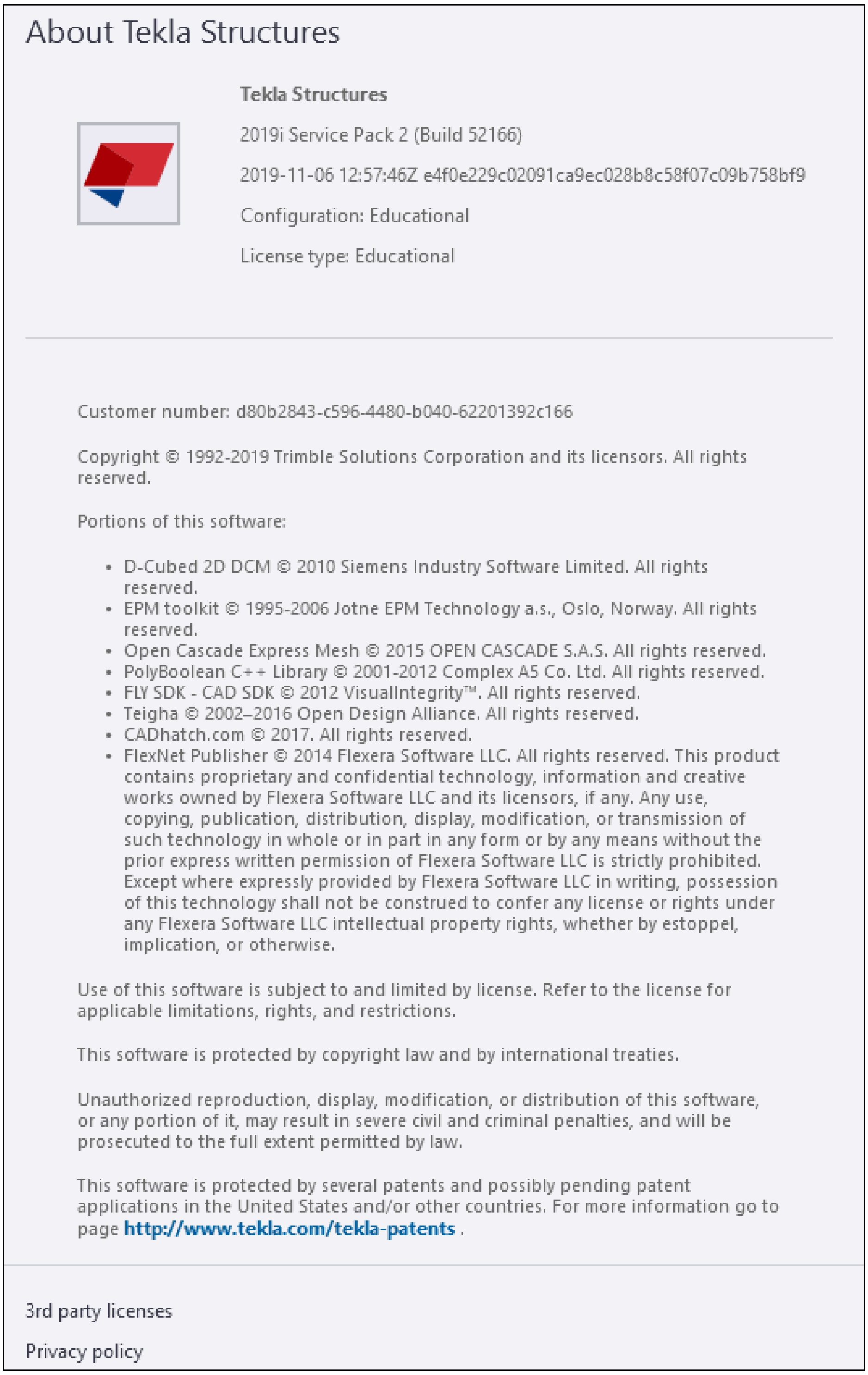


Figure 4. The version and licence window of Tekla structures.

- Dlubal RFEM

Dlubal RFEM is a 3D Finite Element Analysis and design software. It has add-on module concept which helps to design steel, concrete, timber, aluminium, and glass structures based on various standard and national building codes such as Eurocodes and Finnish National Annex. It is also capable for nonlinear analysis calculation. With direct integration with BIM software such as Tekla structures, and Autodesk Revit and

interface with AutoCAD and another file format like (.ifc), (.iges) and (.stp), RFEM is easier to use for designers and engineers.
Figure 5 below shows the version and information about licence of the software.

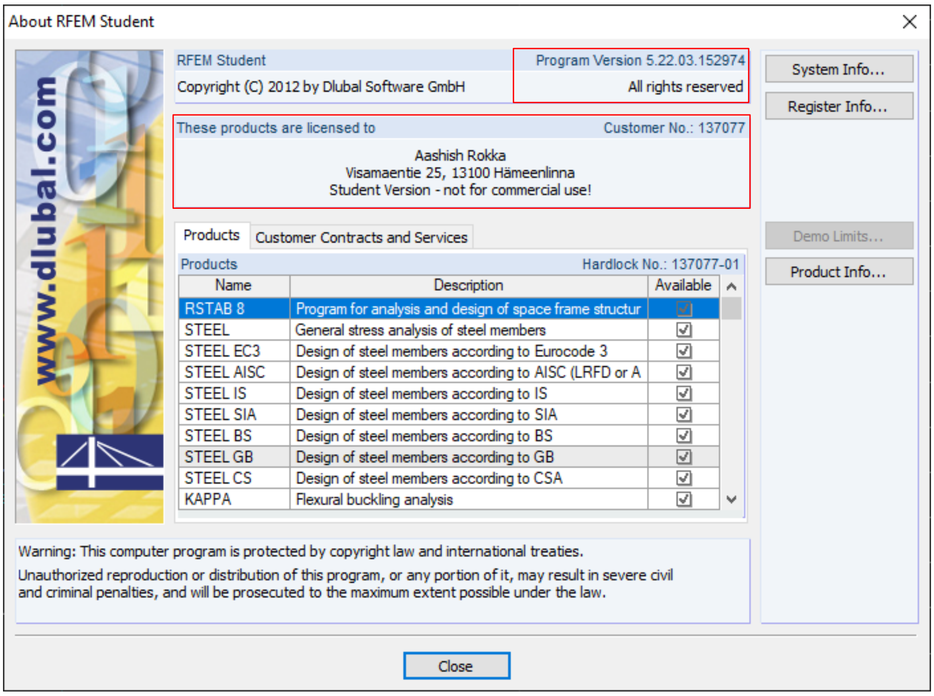


Figure 5. The version and licence information of Dlubal RFEM 5.

4 TESTING ARRANGEMENT, FRAME AND SYSTEM

4.1 Reaction frame setup

Currently, reaction frame is installed with two hydraulic actuators in perpendicular direction which allows to apply load to test specimen only in vertical direction. For the test of K joint, a new test setup was arranged, to apply load in each joint of test specimen from different direction. In new test arrangement, position and loading direction of one of hydraulic actuator is changed from perpendicular direction to 30-degree angle. Bracing members of K joint is connected to curve support beam. Connection between curve support beam and bracing member is pinned. One of brace member is applied with tension force, due to connection between curve beam and bracing member, compression force is generated in another side of brace. The function of curve support beam is to create tension and compression force to different bracing member with single load. To create equal amount of tension and compression force to different bracing member, curve beam must be very stiff. Similarly, one end of chord is loaded with compression force while another end is connected to fixed support. Figure 6 shows components of steel reaction frame and planned K joint test arrangement in HAMK Tech.

4.2 **Actuator**

Hamk Tech has five actuators available for testing building components. From those available actuators only two of them are going to use for this project. The function of actuator is to supply required load to our testing specimen. The maximum capacity of hydraulic actuator available in HAMK lab is of 630KN force. Even though for large scale of testing available actuator in HAMK Tech is not enough for bigger materials. The calculation of hydraulic actuator is not part of this thesis, only load capacity and physical dimension of actuator is considered in this research.

4.3 **Frames and System**

In this section, we briefly describe the component that is needed for new reaction frame. Since reaction frame is just modified for new test arrangement, design of frame is same, but we changed some of profiles from old frame. Figure 6 shows the structure and position of each type of element within new reaction frame.

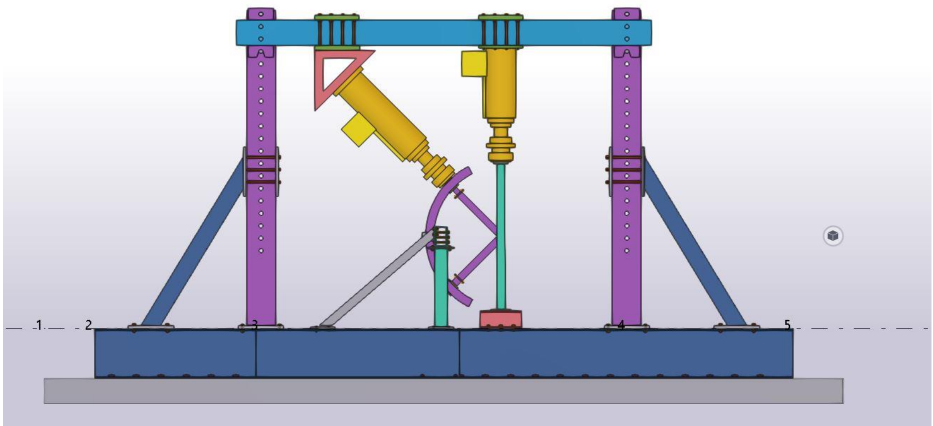


Figure 6. Structure and position of component in new steel frame.

The materials used to assemble reaction frame are reviewed in this section. The following table shows the steel profile of modified reaction frame.

Table.1 Profiles and steel grade of reaction frame components.

Structural parts	Profiles	Steel grade	Quantity in number
Beams	300×200×12.5	S355	2
Columns	350×300×16	S355	2
Base beam	HEB 500/600	S355	1
Bracing	200×150×16	S355	2

4.4 HAMK Tech floor for structural testing

The test floor of Hamk Tech is made up of concrete C25/30 and normal reinforcement of steel with overall height of 300mm thickness. Although test floor was not designed for heavy testing, we can still perform test in that hall by using base beam under reaction frame which helps to distribute force equally to the floor. The base beam also reacts to high bending moment occur in foundation during test.
Figure 7 below shows floor layout of test floor of HAMK Tech laboratory.

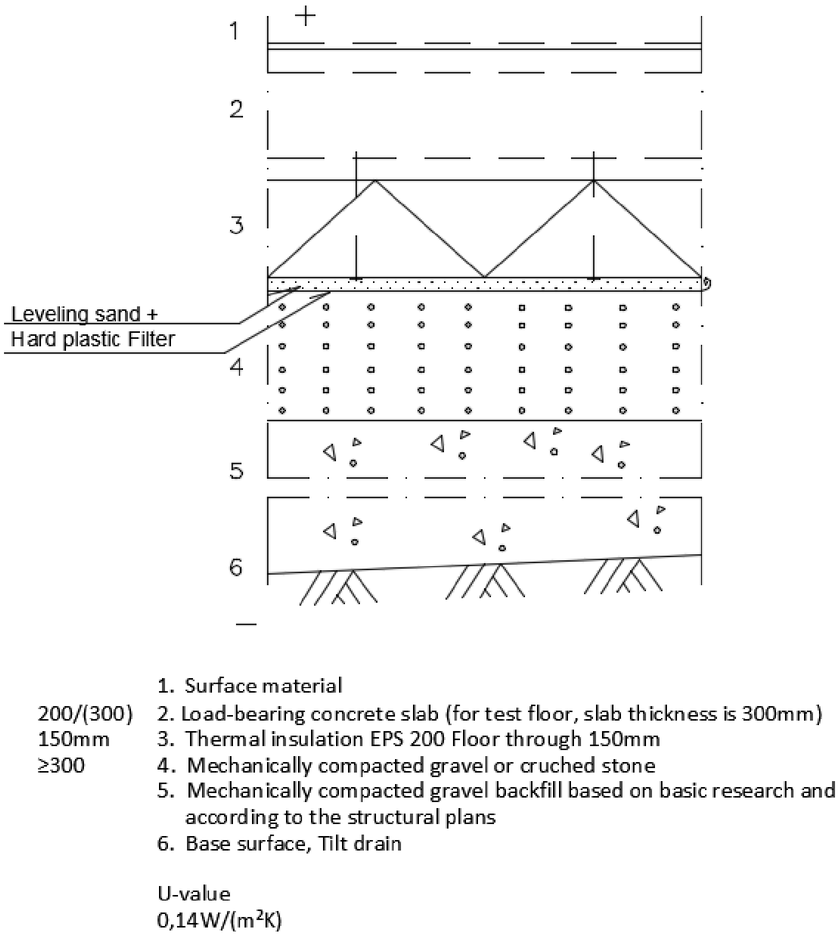


Figure 7. Floor layout of HAMK Tech lab.

4.5 Beams

There are two beams of RHS 200×300×12.5 profile with 4 holes of 50mm diameter on each side to connect with columns. Due to connecting holes on both beams it can be assembled at different height of the columns. Two beams are paired together to take equal loads from hydraulic actuator and testing specimen. Beams profiles remains same from old reaction frame. Figure 8 shows beam structure of reaction frame.

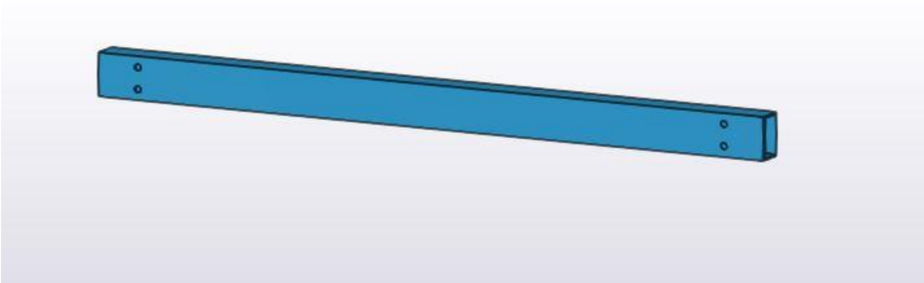


Figure 8. Beam modelled in Tekla structures.

4.6 **Column**

Two columns of RHS 350×300×16 profile is placed at 4.4m distance apart. Those columns take load from beam members and transfers load to base element. There are some connecting holes in column to adjust beams at different height level as needed. Column profiles are changed in new design of steel reaction frame. In old frame, column profile RHS 200×300×12.5 is used but for new design we increase size of column. Figure 9 shows position of column in reaction frame.

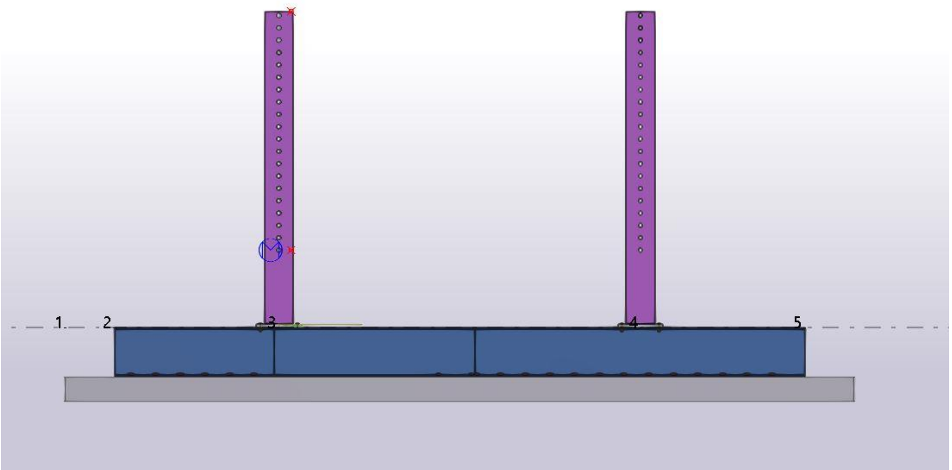


Figure 9. Column modelled in Tekla structures.

4.7 **Base beam**

Custom welded box profile steel beam is used under reaction frame, which is referred as base beam in this thesis. During testing, hydraulic actuator generate large number of moment force in the foundation of frame. To resist moment force caused during test base beam is used. This steel beam helps to transfer tension force to anchor bolt and distribute all the shear force evenly to the concrete floor. Bigger the base beam, it will distribute load into bigger area so the floor under frame has less pressure and will not fail.

We choose welded box profile for base beam because it is east to connect with floor. We can easily use anchor bolt connection in outer flange of base beam and test floor. Therefore, we decide to use steel beam under reaction frame. Figure 10 shows base beam modelled in Tekla structures.

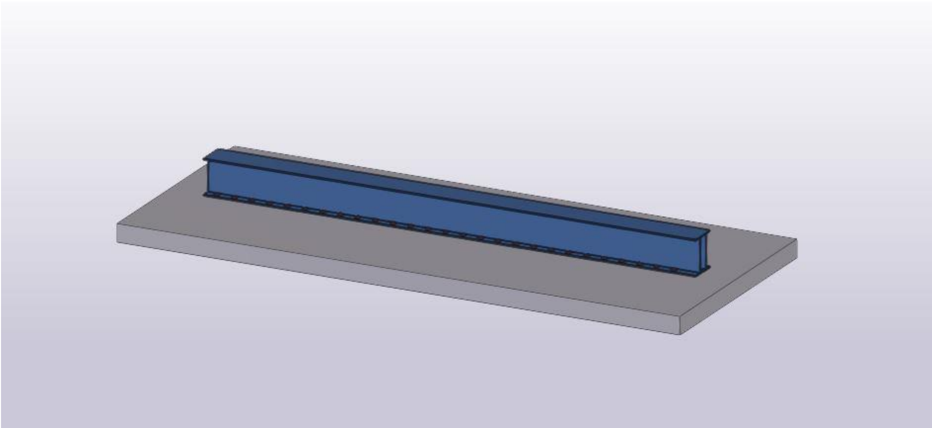


Figure 10. Base beam modelled using Tekla structures.

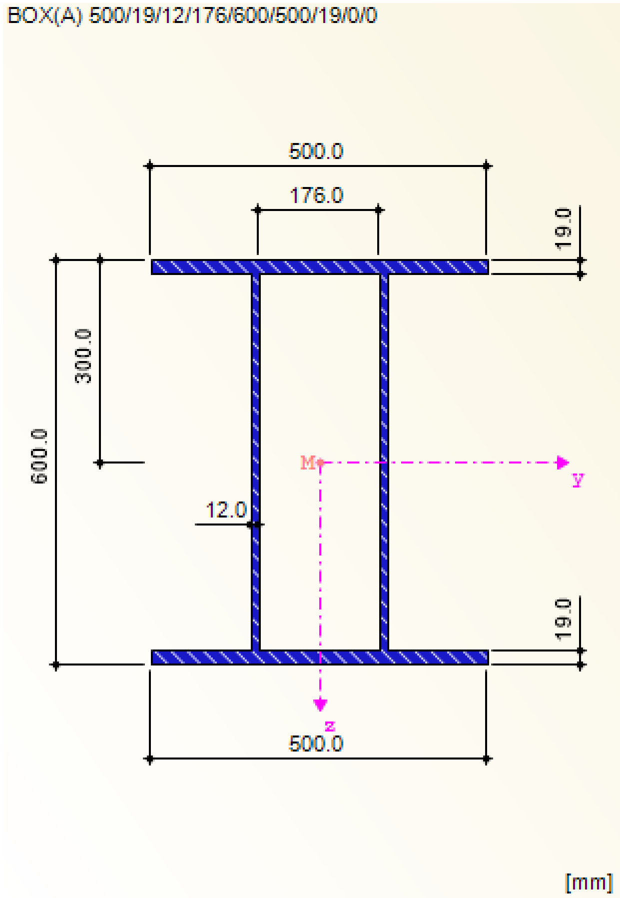


Figure 11. Base beam profile used in steel frame.

4.8 **Bracing**

Bracing is used to provide extra support to our frame during long term testing. It also helps to reduce deformation of frame structure. The bracings are modelled as beam-column element and makes steel frame more stable by transferring horizontal force to base beam. For FEM calculation connection between bracing to column and base beam is considered as moment resistant connection. RHS 200×150×16 is used for bracing. Bracing are new component designed for new frame. Figure 12 shows bracing member of reaction frame.

Figure 12. Bracing member of reaction frame.

4.9 **Plates and actuator adaptor**

The actuator adaptor is used to fix hydraulic cylinder to the frame. To test K and N types of joints we must adjust loading device at certain angle. In our case we are going to test K joint having an angle of 30 degree, so we design actuator adaptor for 30 degrees.

Similarly, three different plates are used to connect hydraulic cylinder at perpendicular direction.

4.10 **Foundation bolt connection**

Steel frame components were connected using bolts and welds. So, it was easy to design connection for steel frame. In case of base beam connection to concrete floor was challenging task since concrete floor was already built. The Anchoring technology has developed over few years and developed chemical anchors. For connection between base beam and concrete floor we use chemical anchor. Chemical anchoring is the technique for anchoring concrete and other solid surfaces such as rock. Ground-breaking chemical anchoring formulas and inventions of injection technologies helps us to drill holes to rigid surface and create connection. Thickness of our concrete floor was 300mm. So, we choose M16 chemical anchor with 200mm length. Foundation bolt connection to concrete floor can be found in figure 34.

5 DESIGN METHODOLOGY

5.1 Design priorities

The commissioned party has made strict requirement for designing new steel reaction frame. The main goal of HAMK Teck is that the steel frame should be stable for long time testing, very strong, reuse for different testing, easy to upgrade and assemble. Choosing frame component is challenging task since frame design must be like old frame and material should be easy to buy from the market. Considering all these requirements we consider following design priorities to design new frame:

- Easy to manufacture and assemble.
- Similar design with old reaction frame model.
- Highly stiff and able to perform test for long duration.
- The frames component selection is standard that steel profiles are easily available in the market so that it will be easy to fabricate.
- Reuse frame in the future for testing different joint types.

5.2 Analytical modelling and calculation

In the preliminary design, analytical calculation of K joint with curve beam is done. The main idea is to generate equal tension and compression force to the bracing members of K joint with 1 hydraulic actuator. Since bracing members are in inclined position and with single actuator it is very difficult to generate equal tension and compression force to the bracing members. But, in this project curve support beam is used to create tension and compression force. To create equal tension and compression force to both bracing member, curve support beam must be very rigid, so that, we use S355 solid square section 100×100 steel curve beam. Also, curve beam is supported in middle to prevent from sliding and unnecessary movement during test. For analytical calculation in RFEM, curve beam is supported with nodal support at the midpoint as shown in figure. Figure 13 shows model of K joint with curve beam in Dlubal RFEM for analytical calculation.

The axial forces in the braces depend on the stiffness of the K-joint. This means internal force inside braces depend on the cross section of the materials used. If we use bigger profile, then stiffness of the member will be high, and the internal force will be less. Sample of K- joints examined for thesis is shown in figure 13.

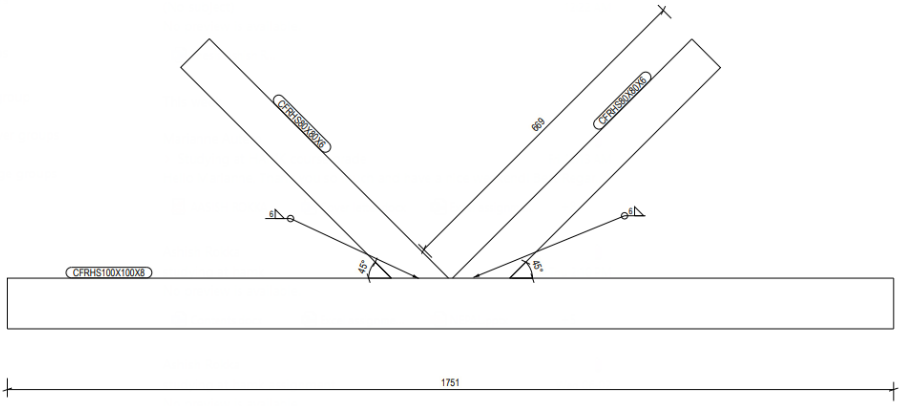


Figure 13. K- joints examined for this thesis.

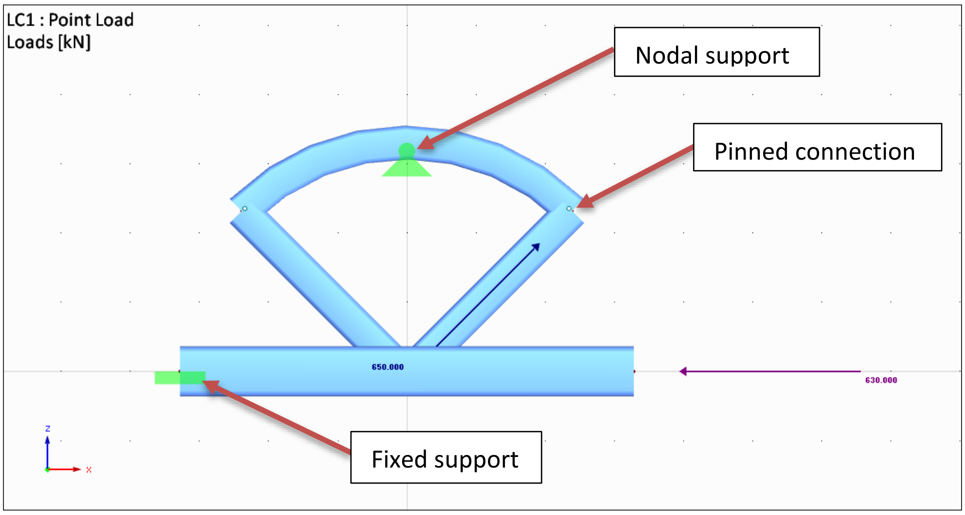


Figure 13. Simple K joint model in RFEM.

Simple 3D model of the K Joint is designed with curve support beam in Dlubal RFEM software as shown in figure. Connection between curve support beam and K joint is defined as pinned connection in RFEM. After complete model in RFEM, load is applied to K joint, and run the calculation. The results obtained from analytical calculation in RFEM is later used for load cases in reaction frame calculation.

5.2.1 Analytical calculation result

From analytical calculation result, we mainly focus on internal force of the member, reaction force in nodal and fixed support. Internal force of member is observed when load is applied in different direction. But to get maximum reaction force in nodal and fixed support, both load is applied in same direction. Figure 14 illustrates internal force inside bracing member.

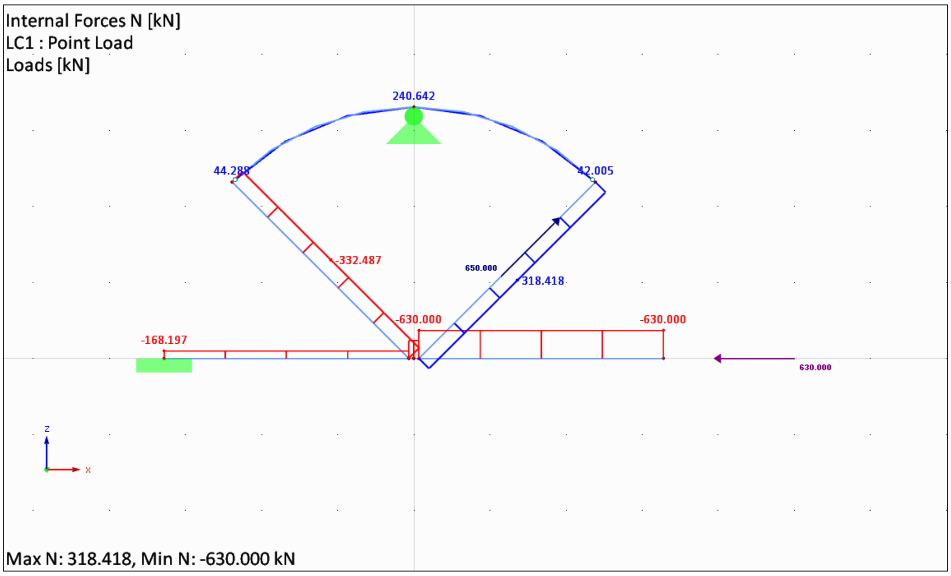


Figure 14. Internal force of the member in RFEM.

The result from RFEM shows that tension force and compression force of the bracing member are nearly equal. As we discussed before, to test K joint, we must apply equal number of tension and compression force to the bracing member. Since, tension and compression force in bracing member is nearly equal we can use curve beam for K joint test arrangement.

After load applied to K joint, in analytical calculation we observe reaction force at opposite side of chord member and at midpoint of curve beam. These reaction forces are later used for designing of test frame for K joint test. Maximum reaction force at chord is taken and later used as load case in steel frame calculation to get precise results. And similarly, reaction force at centre of curve beam is used to design support frame for K joint.

5.3 **Elastic foundation**

Soil is very complex structure for modelling because in real it is not fully fixed nor fully elastic. Therefore, it is very complex to analysis the soil-structure intersection problem. But, in general, we often see that structure element such as beams, slab and foundations are directly placed and supported by soil structure. To build safe and economic design, it is very important to understand soil and surface structure intersection. When the structure member is resting in continuous soil foundation and applied external force due to external load, reaction is distributed along the length of the member. If the reaction force of continuous support or foundation is a function of the displacement of the member resting, then such type of support is considered as elastic. And a beam reasting in an elastic support is known as beam on elastic foundation. Wrinkler first developed the idea to study the beam in an elastic foundation. Figure 15 below shows the beam reasting in an elastic foundation.

In this thesis, contact between base beam and concrete floor is considered as elastic connection. Concrete floor is the elastic foundation to the base beam.

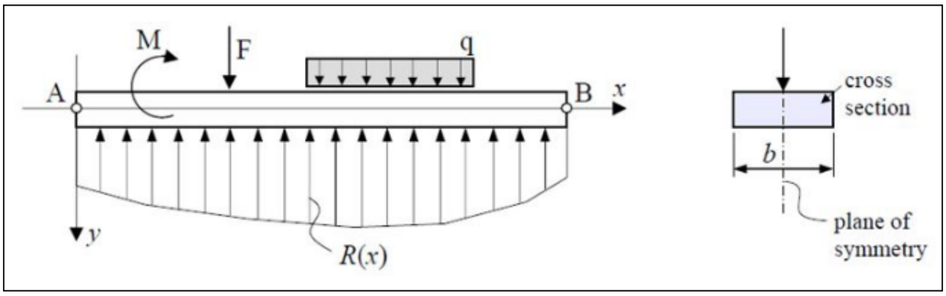


Figure 15. Schematic diagram of beam resting in an elastic foundation (Uzodimma, 2020.)

5.3.1 Wrinkler method

In 1862, Wrinkler first introduce the beam in an elastic foundation which is also known as Wrinkler foundation model. The Wrinkler foundation model is commonly used in structural analysis which is based on the pure bending beam theory. The application of Wrinkler model is useful for analysis of soil-structure intersection problem such as beam resting in soil surface. Winkler has proposed a very popular method of modelling the soil-structure interaction. In this method, the vertical translations of the soil ‘w’, at a point is assumed to depend only upon the contact pressure ‘p’, acting at the point in the idealized elastic foundation and a proportionality constant, K. (Rajpurohit, Gore and Sayagavi, 2014.)

P=Kw.

The proportionality constant, K, is commonly called the modulus of subgrade reaction.

5.3.2 Modulus of subgrade reaction

The modulus of subgrade reaction is a relationship between soil pressure and deflection that is widely used in structural analysis of foundation members. It is used for continuous footings, mats, and various types of piling. (Rajpurohit, Gore and Sayagavi, 2014.). In this thesis modulus of subgrade reaction is calculated and later used in RFEM to define spring constant of member elastic foundation.

In 1961, Vesic proposed an expression for modulus of subgrade reaction (k) in terms of modulus of elasticity and Poisson's ratio of soil as Bowels 1996 which can be expressed as:

$$k = \frac{0{,}65E_S}{(1-V_S^2)} \sqrt[12]{\frac{B^4E_S}{EI}}$$

Where;
B = beam width
E_S = modulus of elasticity of the soil
EI = bending rigidity of beam
V_S = Poisson's ratio of soil

Table 2 below shows calculation of subgrade modulus reaction.

Foundation modulus of elasticity	Es	31000000	kN/m	C25/30
Poisson'sratio of the soil	vs	0,2		
beam width	B	0,5	m	
Beam's modulus of elasticity	E	210000000	kN/m2	
Beam's moment of inertia	I	0,002	m^4	
	k=	36344605	kN/m2	

Material Properties		Concrete C25/30 | EN 1992-1-1:2004/A1:2014	
⊟ Main Properties			
Modulus of Elasticity	E	31000000.00	kN/m²
Shear Modulus	G	12916700.00	kN/m²
Poisson's Ratio	ν	0.200	
Specific Weight	γ	25.00	kN/m³
Coefficient of Thermal Expansion	α	1.0000E-05	1/°C

Calculated subgrade modulus reaction (k) value is used to define spring constant in RFEM, as shown in figure 19.

6 STRUCTURAL ANALYSIS BY DLUBAL RFEM

Dlubal RFEM is 3D finite element analysis software that is used to perform structural calculation and design of structural member made of steel, concrete, timber, glass, membrane, and tensile structures. The work process consists of following steps in RFEM:

1. Modelling the structure defining cross section and material property or we can also import model from CAD and BIM software such as Tekla structures, Autodesk Revit, and AutoCAD.
2. Defining boundary conditions such as supporting structure and applying member hinges to fully or partially fix or release for 6 degrees of freedom.
3. Set up loadings and loading combinations.
4. Run analysis.
5. Design of structure member according to various standard such as Eurocode.

In RFEM, two different calculation is done. One calculation is for reaction frame and another for test specimen. The first calculation is an analytical calculation of K joint. With the help of analytical calculation, we arrange test arrangement. The second calculation is to design and analysis of steel frame. The RFEM structural analysis calculation for the reaction frame is described below.

6.1 Geometry of the structure

First, a complete BIM model is made in Tekla structures. After finishing modelling in Tekla, analytical model is imported in RFEM software from Tekla structures. While importing into RFEM only load bearing component is transferred. RFEM has direct integration with BIM software such as Autodesk Revit and Tekla structures. So, model data such as material class, cross section and position is transferred directly from Tekla model to RFEM. In RFEM, members are represented as 1D line element. These 1D line element represents material property and connected with nodes. When creating member each member has start and end node which helps to create boundary conditions. Figure 16 illustrates 3D model of steel reaction frame.

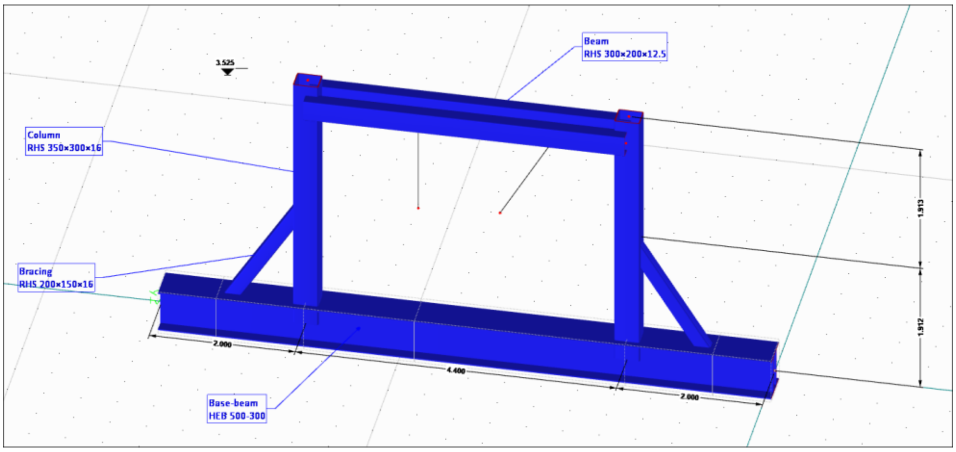


Figure 16. shows the 3d structural model build in RFEM software.

Figure 17 shows wireframe display of steel reaction frame in RFEM.

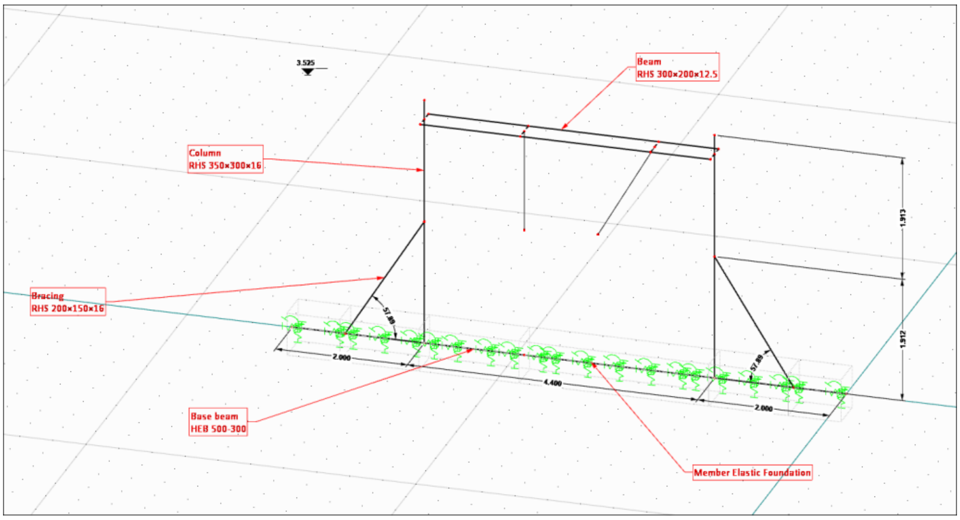


Figure 17. shows wireframe view of the model in RFEM.

6.2 Boundary condition

After modelling structure in RFEM, we can define boundary condition by adding supports to the structure and releasing moment and rotation. Boundary conditions can be defined according to suitable degree of freedom. Degree of freedom is the movement of structure at each node. For 3D element analysis each member has 6 degrees of freedom; 3 degrees in translation and 3 degrees in rotation. This means each joints of structure moves in x, y and z direction and rotates in along x, y, and z plane. Similarly, in RFEM we can define boundary condition in 6 degrees of freedom. We can use member hinges option to define boundary condition. We can apply hinges only to start and end nodes of each member.

For accurate result during calculation in RFEM, we consider the contact between base beam and test floor is elastic. We set member elastic foundation to our structure considering soil, concrete, and base beam properties. We define movement of spring constant value in local x, y, z direction and for rotation of member we input value of rotational spring in its longitudinal axis as shown in figure. The spring constant calculation is done separately and applied to our model in RFEM. The calculation of spring constant is found in table 2 as subgrade modulus reaction calculation. In the case of upward loading in the foundation beam, the tension forces of foundation bolts are calculated based on the obtained vertical displacement in the distributed springs.
Similarly for other part of steel frame connection we assume no release point for structural calculation. This means that rigid connections are assumed for the beam-to-column connections, brace-to-column and brace-to-foundation beam, column-to-foundation beam. Figure 18 shows boundary condition of reaction frame.

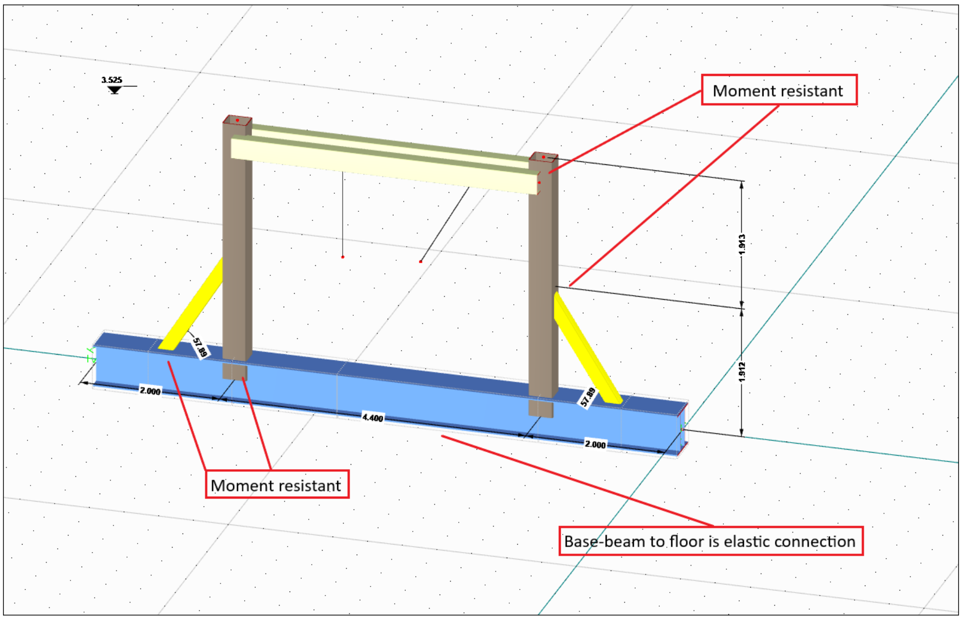


Figure 18. Shows boundary condition in RFEM.

Figure 19 shows the member elastic foundation between base-beam and test floor.

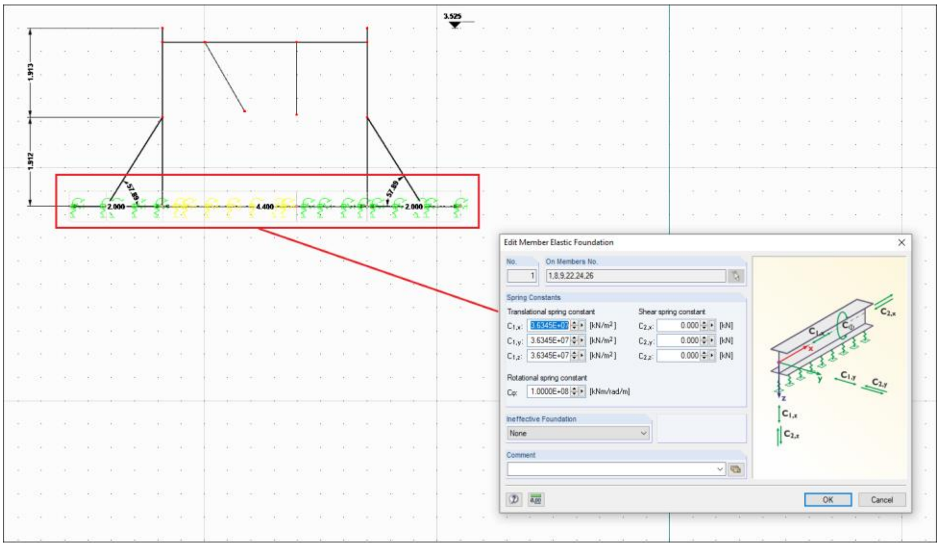


Figure 19. Description of member elastic foundation defined in RFEM.

6.3 **Load cases and load combinations**

6.3.1 Load cases

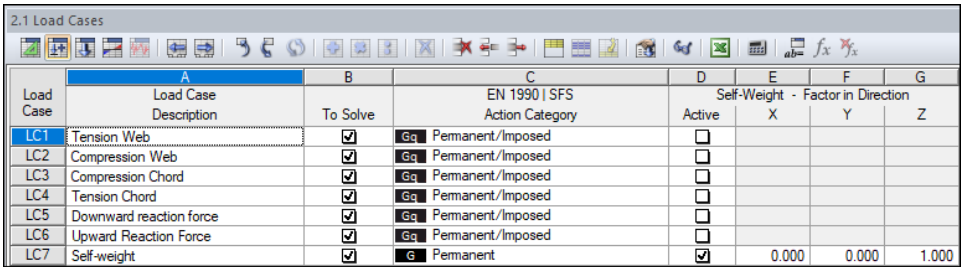
Load cases were defined in the software according to the test arrangement. To make steel frame calculation more accurate in RFEM, reaction force from base beam to K Joint is also considered as load case. In total 7 load cases were defined. Even though 3 load cases are enough for K joint test arrangement, other extra 4 load cases were defined to make steel frame more versatile and rigid for future testing.

The forces coming from hydraulic actuator, self-weight of the reaction frame, and the reaction force from base beam to test specimen were the load cases in this project. The reaction force from base beam to test specimen is calculated in analytical calculation of K joint. The reaction force obtained from analytical calculation of K joint is also mentioned as load case in this thesis. Each load case is considered in positive and negative direction. The basic load cases defined in RFEM is presented in Table 3.

Load Case	Load Case Description	Action category	Action	LC Factor
LC1	Self-weight	Permanent	+	1,00
LC2	Tension Web	Permanent/Imposed	-	1,00
LC3	Compression Web	Permanent/Imposed	-	1,00
LC4	Compression Chord	Permanent/Imposed	-	1,00
LC5	Tension Chord	Permanent/Imposed	-	1,00

LC6	Upward Reaction Force	Permanent/Imposed	-	1,00
LC7	Downward Reaction Force	Permanent/Imposed	-	1,00

Load cases defined in RFEM are shown in figure 20 below.



2.1 Load Cases

Load Case	Load Case Description	To Solve	EN 1990 | SFS Action Category	Self-Weight Active	Factor in Direction X	Y	Z
LC1	Tension Web	☑	Gq Permanent/Imposed	☐			
LC2	Compression Web	☑	Gq Permanent/Imposed	☐			
LC3	Compression Chord	☑	Gq Permanent/Imposed	☐			
LC4	Tension Chord	☑	Gq Permanent/Imposed	☐			
LC5	Downward reaction force	☑	Gq Permanent/Imposed	☐			
LC6	Upward Reaction Force	☑	Gq Permanent/Imposed	☐			
LC7	Self-weight	☑	G Permanent	☑	0.000	0.000	1.000

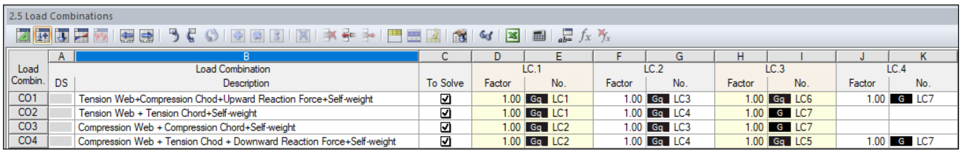
Figure 20. Load cases defined in RFEM.

6.3.2 Load combination

Load combination can be defined either automatically or manually in RFEM. But, for this thesis, all load combination were arranged manually according to the test arrangement. Each load cases are considered in positive and negative direction. Extra load cases were defined in this thesis for further testing of mechanical joint of trusses in future. The basic load combination defined in RFEM is presented in Table 4.

Load combination (LC)	Load combination description
CO1	Tension Web + Compression Chod + Upward Reaction Force + Self-weight
CO2	Tension Web + Tension Chord + Self-weight
CO3	Compression Web + Compression Chord + Self-weight
CO4	Compression Web + Tension Chod + Downward Reaction Force + Self-weight

The load combination defined in RFEM software is shown in figure 21 below.



2.5 Load Combinations

Load Combin.	DS	Load Combination Description	To Solve	LC.1 Factor	LC.1 No.	LC.2 Factor	LC.2 No.	LC.3 Factor	LC.3 No.	LC.4 Factor	LC.4 No.
CO1		Tension Web+Compression Chod+Upward Reaction Force+Self-weight	☑	1.00	Gq LC1	1.00	Gq LC3	1.00	Gq LC6	1.00	G LC7
CO2		Tension Web + Tension Chord+Self-weight	☑	1.00	Gq LC1	1.00	Gq LC4	1.00	G LC7		
CO3		Compression Web + Compression Chord+Self-weight	☑	1.00	Gq LC2	1.00	Gq LC3	1.00	G LC7		
CO4		Compression Web + Tension Chod + Downward Reaction Force+Self-weight	☑	1.00	Gq LC2	1.00	Gq LC4	1.00	Gq LC5	1.00	G LC7

Figure 21. Load combination defined in RFEM.

Loads were applied to the structure after defining load cases and combinations. As mentioned before all the loads were considered in positive and negative direction and arranged them accordingly to test plan. Figure shows load combination one applied to the Steel frame in RFEM. Figure 22 below the load combination 1 assigned to the reaction frame.

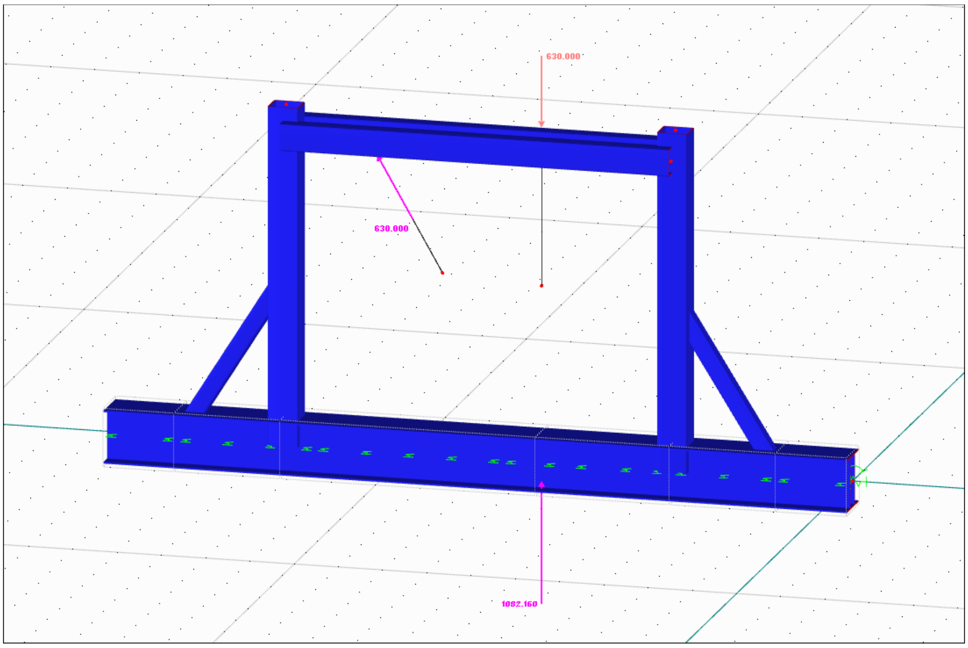


Figure 22. Load combination 1 in RFEM.

6.4 **Structural analysis and results**

The calculation can be done in RFEM after creating geometry model, defining boundary conditions, load cases and load combinations. From the calculation report we can get information such as deflection, support reaction and internal forces. As mentioned before, RFEM has different add on module options which allows user to run different types of calculation for designing. After calculating basic load and load cases in RFEM, RF- Steel EC3 add-on module is used for designing of steel member. The calculation window in RFEM software is presented in figure.

After calculation of the structure in RFEM with basic load and load cases, we can observe deflection, internal force, and support reaction of each member. Calculation window in RFEM is shown in Figure 23.

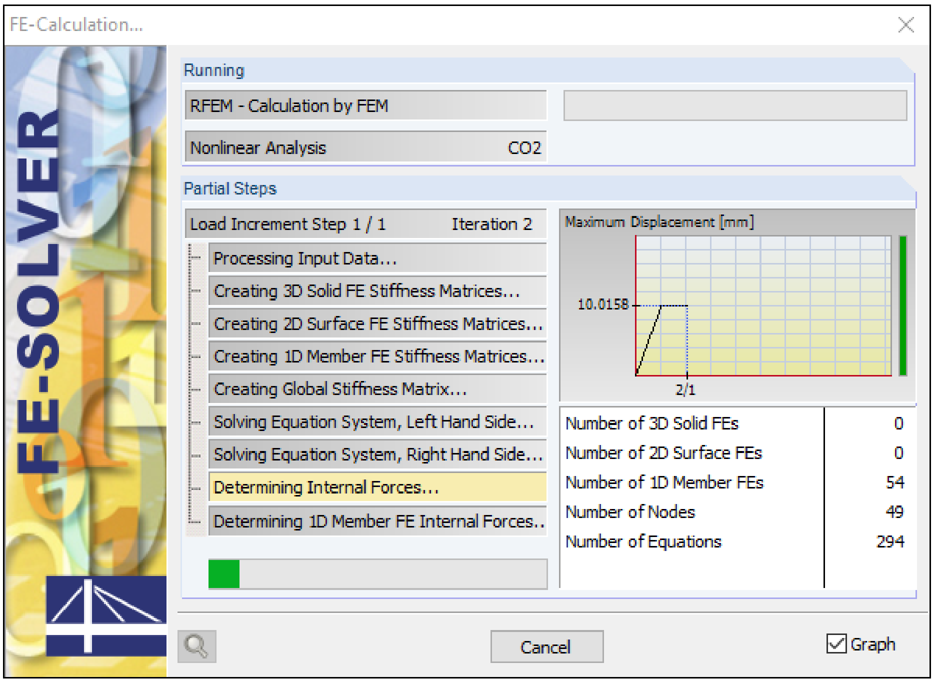


Figure 23. Finite element-calculation running in RFEM.

As mentioned before when finite element calculation is ready, we can check deflection, support reaction and internal force of each member according to different load case and combination. Local deformation of steel frame member in load combination 1 (LC 1) is shown in figure. LC 1 is worse load case and arranged according to test plan of K joint.

6.4.1 Deformation

In RFEM it can be possible to view both local deformation and global deformation of member.

Global deformation

Steel reaction frame displacement is shown in figure 24.

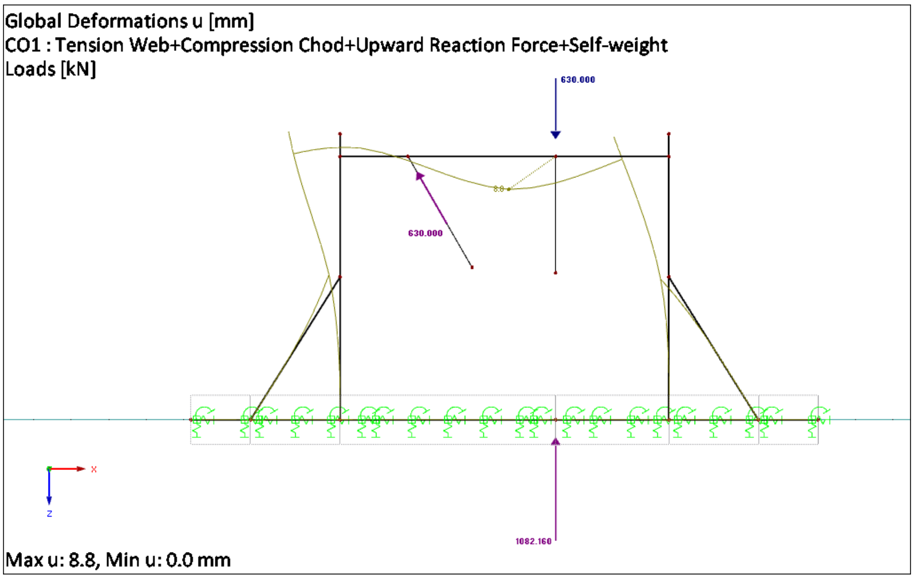


Figure 24. Deformation of frame in load combination 1.

Local deformation

Reaction frame displacement shown in 25.

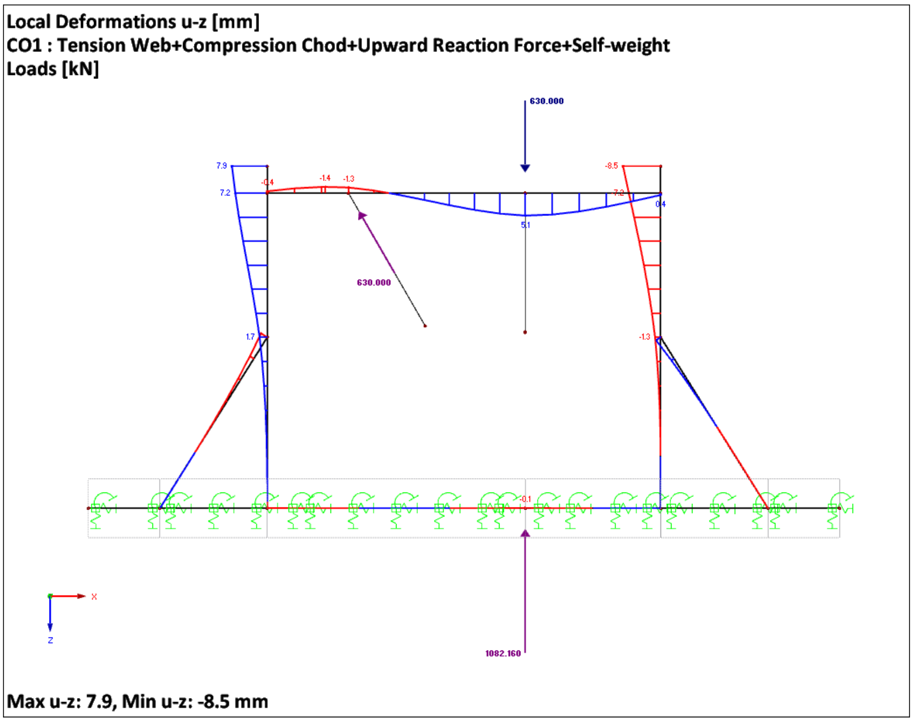


Figure 25. Local deformation of frame in load combination 1.

The RFEM results are presented in Appendix.

6.4.2 Internal force

Loads coming from hydraulic actuator along with self-weight of beam and hydraulic actuator transfers through column with shear force and moment. All these forces are divided into column and bracing member and carries to the base beam. Figure 26 and 27 shows internal force and moment developed inside member of reaction frame.

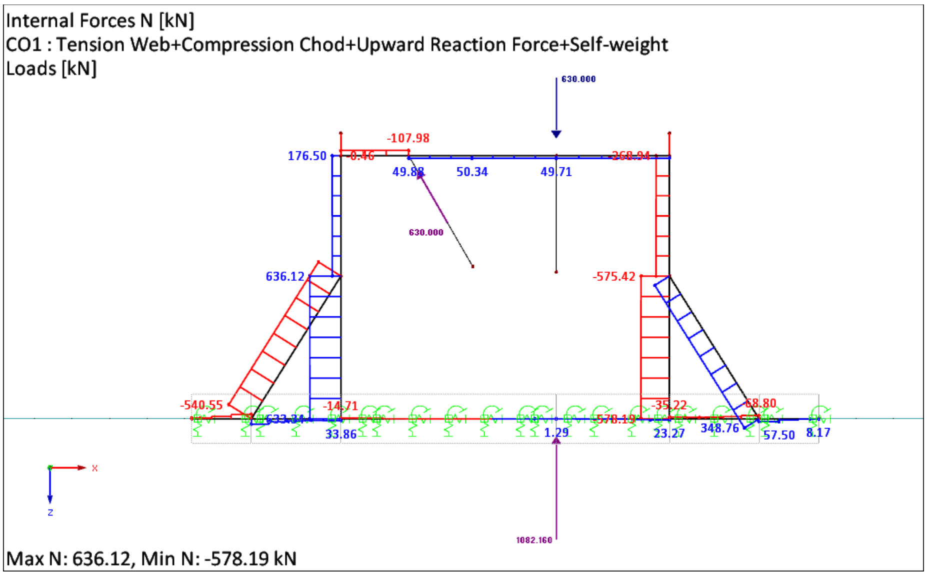


Figure 26. Internal force of steel reaction frame in LC1.

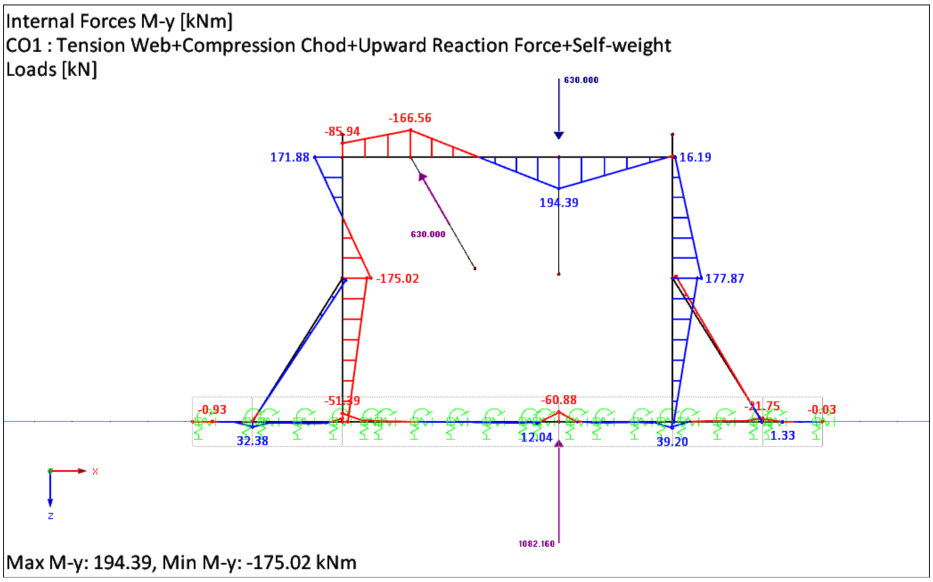


Figure 27. Moment diagram of steel reaction frame.

6.5 Design resistance of structural member

If we run calculation only with load cases and load combinations in RFEM, it only calculates basic calculations such as internal force, support reaction and deformation and it does not show whether the profiles hold or not. Therefore, inside main programme RFEM, it has various add-on module concept for different design according to different standards and national annex such as Eurocode and Finnish national annex. Therefore, in this thesis, add-on module RF-Steel EC3 CA1 is used for design of steel member. RF-Steel EC3 CA1 helps to design member resistance of steel structure.

6.5.1 Design of steel member

Steel member design is done according to SFS EN 1993-1-1. In RFEM by default plastic design is done for cross section class 1 and 2 but to run elastic design for cross section class 1 and 2 we must activate elastic design option in detail of RF-Steel EC3. In this thesis, elastic design method is done for steel reaction frame. Figure below shows elastic design option has been activated for cross section class 1 and 2 in detail of RF-Steel EC3. Figure 28 shows elastic design method used to design steel member of reaction frame.

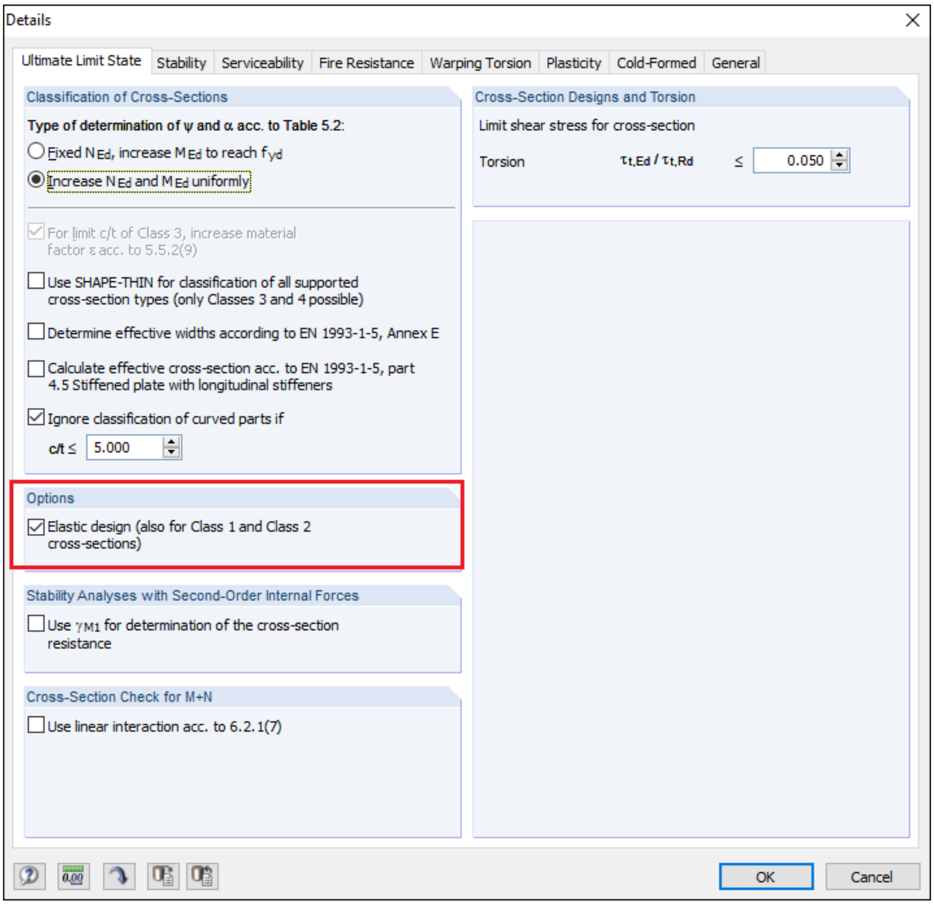


Figure 28. shows elastic design method is activated in RF-Steel EC3.

The RFEM calculate the most critical action in the member according to ultimate limit state design and perform calculation. In total 4 load combination were used for member design calculation in RF-Steel EC3. The design ratio of structure member in RFEM is shown in figure 29.

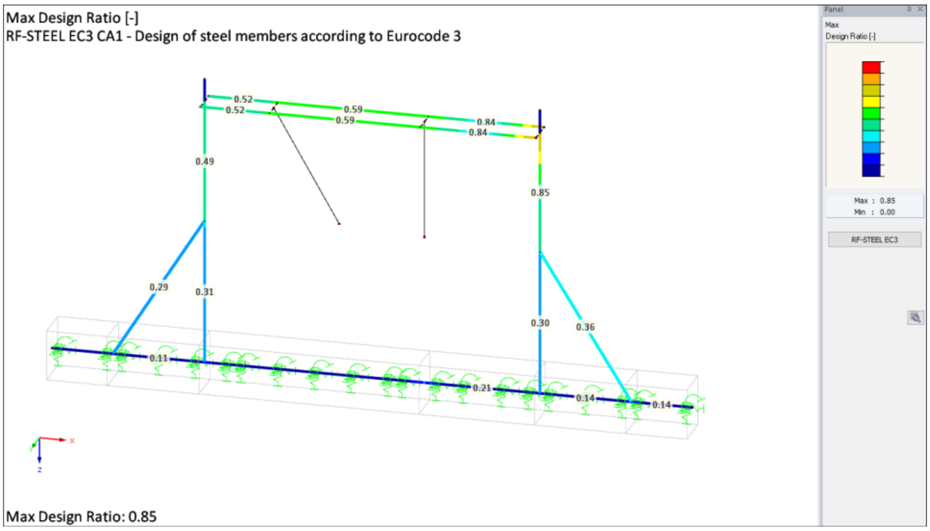


Figure 29. Design ratios of structure member in RFEM.

“Utility ratio is the ratio of Actual Load on member to the capacity of the member, if it exceeds more than 1 then load on member will be greater than its capacity and member gets collapsed” (Kazi, 2016). From RFEM, the maximum design ratio of the steel reaction frame is 0.85. It means out of 100% capacity of the member; 85% capacity of profile is used, and 15% capacity of member was not used. Utility ratio is also known as design ratio. Since, utility ratio of the steel reaction frame is less than 1, design criteria of steel frame were satisfied. The results of steel member design are shown in Table 5.

Section No.	Member No.	Location x [m]	Load-ing	Design Ratio		Design According to Formula
1	BOX(A) 500/19/12/176/600/500/19/0/0 - WB600-12-19*500-150					
	26	0,533	LC3	0,00	≤1	CS100) Negligible internal forces
	9	1,200	CO3	0,01	≤1	CS101) Cross-section check - Tension acc. to 6.2.3
	9	1,200	CO2	0,01	≤1	CS102) Cross-section check - Compression acc. to 6.2.4
	9	0,960	CO2	0,02	≤1	CS103) Cross-section check - Compression acc. to 6.2.4 - Class 4
	22	0,000	CO1	0,03	≤1	CS112) Cross-section check - Bending about y-axis acc. to 6.2.5 - Class 3
	8	2,884	CO1	0,21	≤1	CS122) Cross-section check - Shear force in z-axis acc. to 6.2.6(4) - Class 3 or 4
	22	0,000	CO1	0,03	≤1	CS143) Cross-section check - Bending and shear force acc. to 6.2.9.2 and 6.2.10 - Class 3 - General cross-section
	9	1,200	CO3	0,04	≤1	CS183) Cross-section check - Bending, shear and axial force acc. to 6.2.9.2 - Class 3 - General cross-section
	9	0,960	CO2	0,01	≤1	CS191) Cross-section check - Bending, shear and axial force acc. to 6.2.9.3 - Class 4
	9	0,960	CO2	0,04	≤1	ST354) Stability analysis - Bending and compression acc. to 6.3.3, Method 1
17	RRO 200x150x16 | ALUKÖNIGSTAHL - EN 10210					
	28	2,258	LC7	0,00	≤1	CS100) Negligible internal forces
	28	0,000	CO2	0,24	≤1	CS101) Cross-section check - Tension acc. to 6.2.3
	28	2,258	CO3	0,24	≤1	CS102) Cross-section check - Compression acc. to 6.2.4
	28	0,000	CO1	0,01	≤1	CS122) Cross-section check - Shear force in z-axis acc. to 6.2.6(4) - Class 3 or 4
	27	0,000	LC1	0,00	≤1	CS126) Cross-section check - Shear buckling acc. to 6.2.6(6)
	28	0,000	CO2	0,36	≤1	CS182) Cross-section check - Bending, shear and axial force acc. to 6.2.9.2 - Class 3
	28	0,000	LC3	0,07	≤1	ST301) Stability analysis - Flexural buckling about y-axis acc. to 6.3.1.1 and 6.3.1.2(4)
	28	0,000	LC3	0,08	≤1	ST311) Stability analysis - Flexural buckling about z-axis acc. to 6.3.1.1 and 6.3.1.2(4)
	28	2,258	CO3	0,33	≤1	ST364) Stability analysis - Bending and compression acc. to 6.3.3, Method 2
21	RRO 350x300x16 | ALUKÖNIGSTAHL - EN 10210					
	12	0,538	LC7	0,00	≤1	CS100) Negligible internal forces
	23	0,000	CO1	0,09	≤1	CS101) Cross-section check - Tension acc. to 6.2.3
	23	1,912	CO4	0,09	≤1	CS102) Cross-section check - Compression acc. to 6.2.4
	12	0,000	LC7	0,00	≤1	CS112) Cross-section check - Bending about y-axis acc. to 6.2.5 - Class 3
	25	0,269	CO3	0,21	≤1	CS122) Cross-section check - Shear force in z-axis acc. to 6.2.6(4) - Class 3 or 4
	5	0,000	LC1	0,00	≤1	CS126) Cross-section check - Shear buckling acc. to 6.2.6(6)
	12	0,000	LC7	0,00	≤1	CS142) Cross-section check - Bending and shear force acc. to 6.2.9.2 and 6.2.10 - Class 3
	25	1,612	CO3	0,85	≤1	CS182) Cross-section check - Bending, shear and axial force acc. to 6.2.9.2 - Class 3
	25	0,000	CO3	0,47	≤1	ST364) Stability analysis - Bending and compression acc. to 6.3.3, Method 2
22	RRO 300x200x12.5 | ALUKÖNIGSTAHL - EN 10210					
	17	1,976	LC7	0,00	≤1	CS100) Negligible internal forces
	21	0,606	CO2	0,05	≤1	CS101) Cross-section check - Tension acc. to 6.2.3
	17	1,976	CO3	0,05	≤1	CS102) Cross-section check - Compression acc. to 6.2.4
	16	0,000	LC7	0,00	≤1	CS112) Cross-section check - Bending about y-axis acc. to 6.2.5 - Class 3
	16	0,000	CO3	0,24	≤1	CS122) Cross-section check - Shear force in z-axis acc. to 6.2.6(4) - Class 3 or 4
	16	0,000	LC1	0,00	≤1	CS126) Cross-section check - Shear buckling acc. to 6.2.6(6)
	16	0,000	LC7	0,00	≤1	CS142) Cross-section check - Bending and shear force acc. to 6.2.9.2 and 6.2.10 - Class 3
	21	1,516	CO3	0,84	≤1	CS182) Cross-section check - Bending, shear and axial force acc. to 6.2.9.2 - Class 3
	17	1,976	CO3	0,53	≤1	ST364) Stability analysis - Bending and compression acc. to 6.3.3, Method 2

7 ANCHOR BOLT FORCE CALCULATION

To design anchor bolt connection, we must know force at single spring. In RFEM result, spring force is represented as contact force. These contact forces are displayed as distributed force on beam. So, to design anchor bolt connection we consider maximum tension force on the beam. Since connection design is not part of this thesis it important to know how to calculate anchor force when member is in elastic foundation. Member contact force can be found in RFEM calculation report which is presented in Appendix 1.

We did simple calculation to determine individual spring force. First, we consider the maximum tension force of the beam. Then we multiply the tension force with spacing of the bolt, to get force in 2 bolts. Since we have bolts in both flange of the base beam, we divided the result with number of bolts. For safety we must consider moment force and add to our results. At last, we divided result with the total number of bolts to get single spring force. From separate calculation from Mathcad, we get 4.78 kilonewton force in each anchor bolt.

8 SUPPORT FRAME DESIGN

Support frame is used to provide stability to curve beam during test. It also helps to prevent curve beam from slipping and unnecessary movement. And from RFEM result we observed that large reaction force occurs in the middle of curve beam due to load from hydraulic cylinder. Thus, support frame is designed to resist reaction force developed in the curve beam and to make curve beam more stable. Figure 30 below shows model of support frame in Tekla structures.

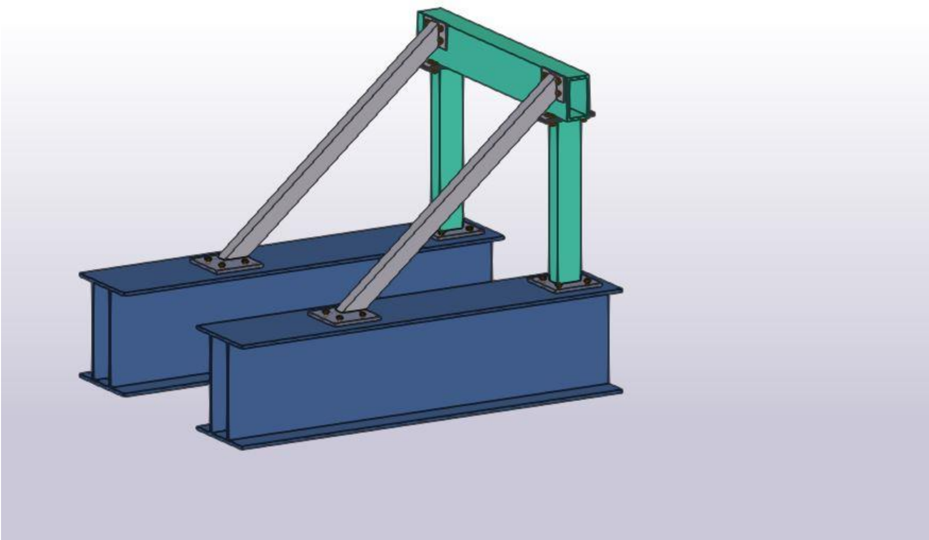


Figure 30. Support frame model in Tekla structures.

Table 6 below shows steel profile used for support frame.

Materials	Profiles	Steel grade	Length (m)	Quantity
Beams	250×150×16	S355	1.2	1
Columns	150×100×10	S355	1.4	2
Base beam	HEB 500/600	S355	2.45	1
Bracing	150×100×10	S355	2	2

In analytical calculation we observed that 469.8KN reaction force occurred at the midpoint of curve beam. So, we consider 470KN force to design support frame for curve beam. Like reaction frame calculation in RFEM, we perform member design calculation of support frame in RFEM using RF Steel EC3 add on module.

For RFEM calculation, all connection of support frame members is considered as moment resistant. And the support frame and floor connection are considered as elastic connection. Same as reaction frame calculation we define translation spring constant with modulus of subgrade reaction. Subgrade of modulus reaction is calculated separately and can be found in chapter 6.3.2 in this thesis.

After calculating support frame model in RFEM some of results are presented in figure below 31.

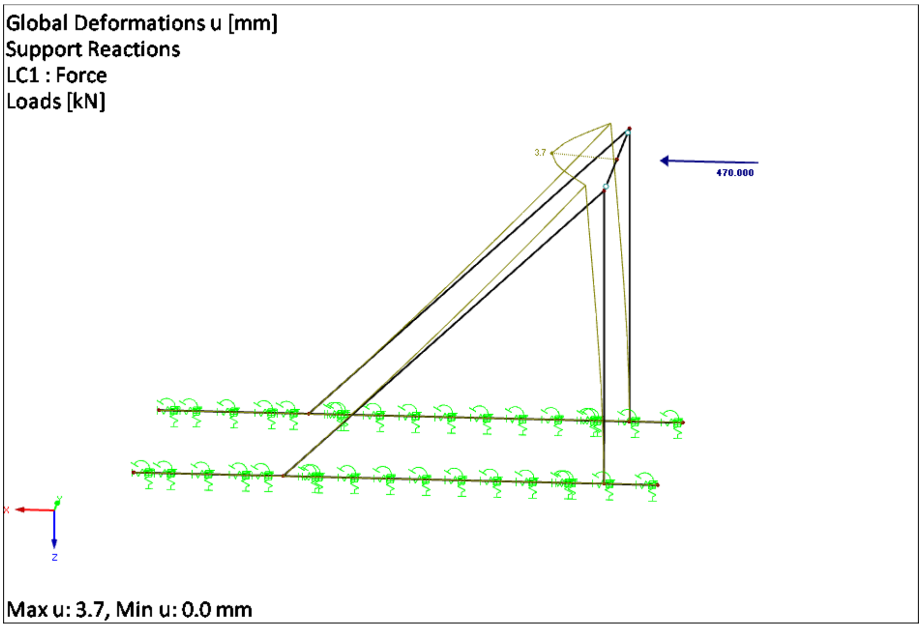


Figure 31. shows global deformation of support frame.

Internal force in beam member is shown in figure 32.

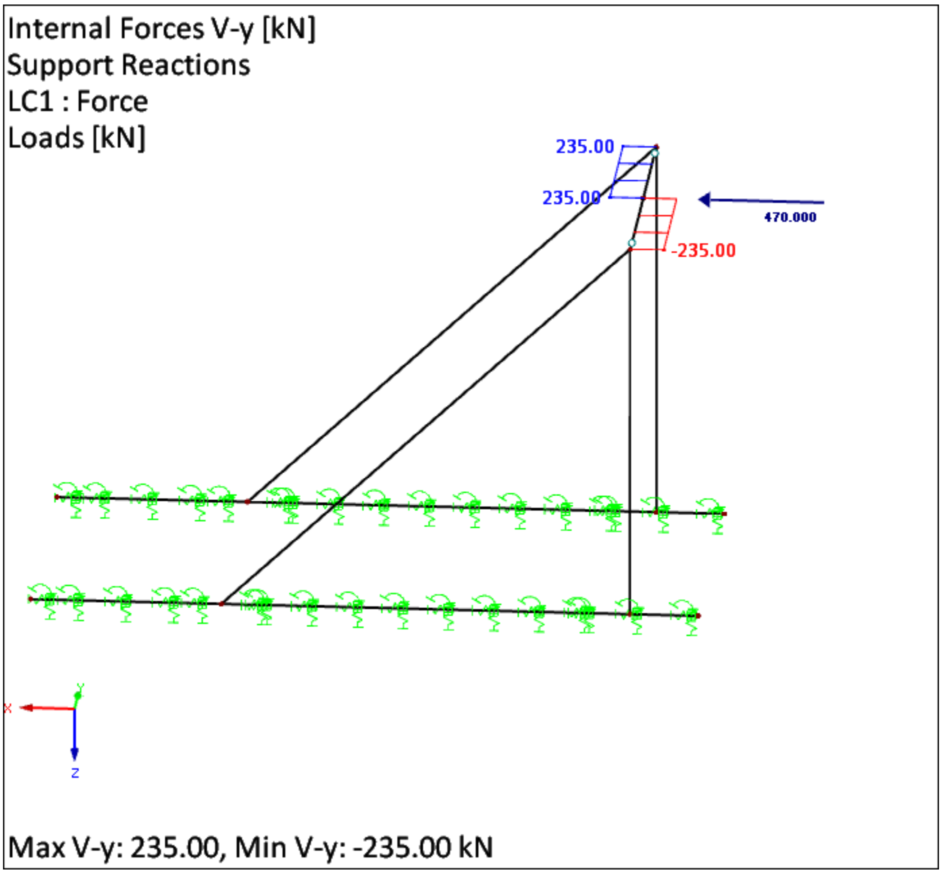


Figure 32 internal force in beam member.

Internal force in column and bracing is shown in figure 33.

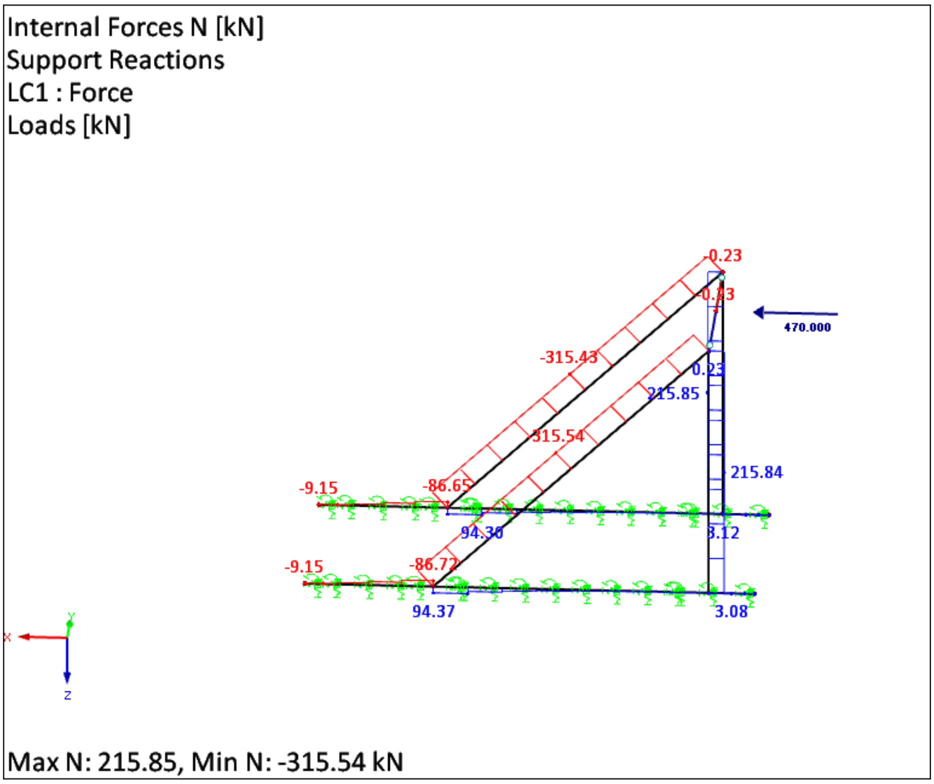


Figure 33. Internal force in column and bracing.

Steel member design of support frame is done according to SFS EN 1993-1-1. RF steel EC3 add on module is done to compute member design for support frame. In all type of calculation for this thesis Finnish national annex is used. The utility ratio of support frame is presented below in figure 34.

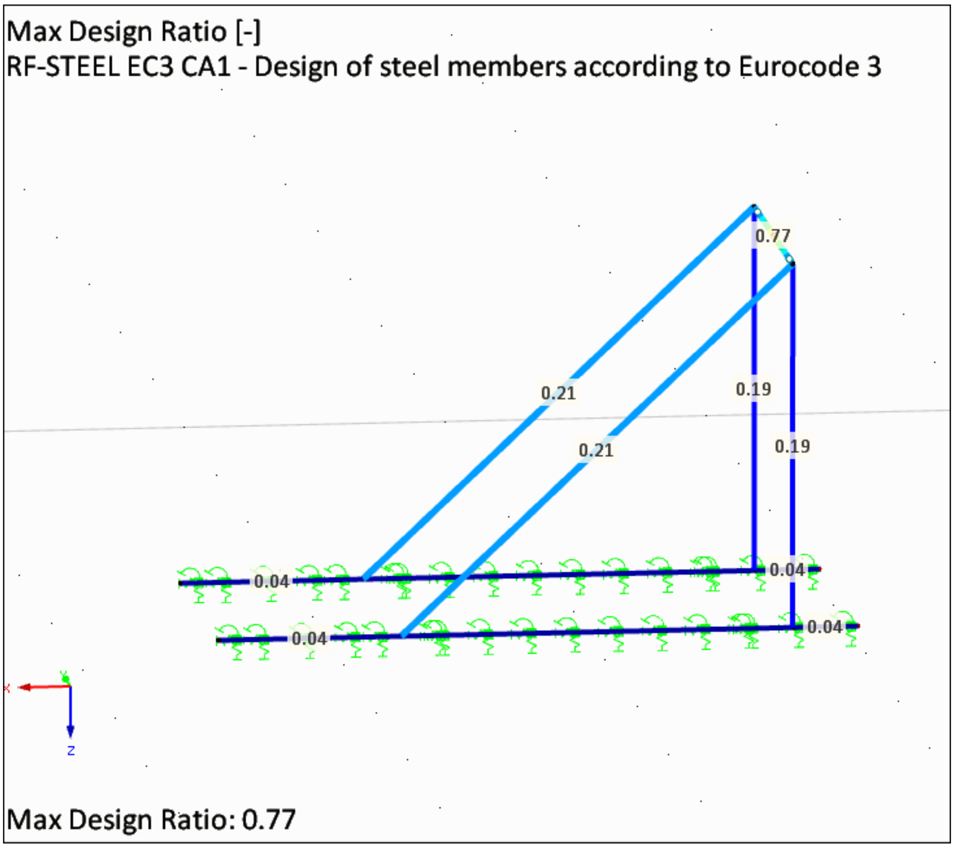


Figure 34. Design ratio of support frame.

Maximum utility ratio of support frame is 0.77. Maximum load effect occur in the beam of support frame and 77% capacity of beam member is used by current loading system. Table 7 shows design ratio of support frame of curve beam.

Section No.	Member No.	Location x [m]	Load-ing	Design Ratio		Design According to Formula
2	BOX(A) 500/19/12/176/600/500/19/0/0 - WB600-12-19*500-150					
	1	0,525	LC1	0,00	≤1	CS100) Negligible internal forces
	19	1,313	LC1	0,01	≤1	CS101) Cross-section check - Tension acc. to 6.2.3
	1	0,000	LC1	0,01	≤1	CS102) Cross-section check - Compression acc. to 6.2.4
	1	0,175	LC1	0,01	≤1	CS103) Cross-section check - Compression acc. to 6.2.4 - Class 4
	10	0,250	LC1	0,01	≤1	CS112) Cross-section check - Bending about y-axis acc. to 6.2.5 - Class 3
	10	0,250	LC1	0,04	≤1	CS122) Cross-section check - Shear force in z-axis acc. to 6.2.6(4) - Class 3 or 4
	10	0,250	LC1	0,01	≤1	CS143) Cross-section check - Bending and shear force acc. to 6.2.9.2 and 6.2.10 - Class 3 - General cross-section
	19	1,500	LC1	0,01	≤1	CS183) Cross-section check - Bending, shear and axial force acc. to 6.2.9.2 - Class 3 - General cross-section
5	RRO 150x100x12.5 | EN 10210-2:2006					
	24	0,000	LC1	0,11	≤1	CS101) Cross-section check - Tension acc. to 6.2.3
	22	0,000	LC1	0,16	≤1	CS102) Cross-section check - Compression acc. to 6.2.4
	23	0,000	LC1	0,01	≤1	CS122) Cross-section check - Shear force in z-axis acc. to 6.2.6(4) - Class 3 or 4
	23	0,000	LC1	0,00	≤1	CS126) Cross-section check - Shear buckling acc. to 6.2.6(6)
	23	0,000	LC1	0,19	≤1	CS182) Cross-section check - Bending, shear and axial force acc. to 6.2.9.2 - Class 3
	22	0,000	LC1	0,21	≤1	ST364) Stability analysis - Bending and compression acc. to 6.3.3, Method 2
11	RRO 250x150x16 | ALUKÖNIGSTAHL - EN 10210					
	12	0,600	LC1	0,77	≤1	CS117) Cross-section check - Bending about z-axis acc. to 6.2.5 - Class 3
	12	0,600	LC1	0,28	≤1	CS124) Cross-section check - Shear force in y-axis acc. to 6.2.6(4) - Class 3 or 4
	12	0,600	LC1	0,77	≤1	CS152) Cross-section check - Bending about z-axis and shear force acc. to 6.2.9.2 and 6.2.10 - Class 3

9 STRUCTURAL DRAWING

Structural drawing is a technical drawing which includes detail plan and information on how to construct building or any kind of civil engineering structures such as bridge, tower, and tunnel. It provides detail information of material or component used in the structures such as dimension, graphical information, material properties and position of parts due to which it can be manufacture, assemble, and build. Usually in steel construction, structural drawings are of two types. The structural drawing of steel structure are as follows:

1. General arrangement drawings
2. Workshop drawings

As discussed before, Tekla structure is used for 3D modelling of the structure and to generate structural drawing of the structure. First 3D model is done in Tekla structure after that structural drawing which includes general arrangement, assembly and part drawings were created. The structural drawings are used to manufacture and assemble the structure. The structural drawing also includes detail manufacturing drawing information such as part drawings and assembly drawings for workshop. BIM software such as Tekla structure has lots of features that helps us to store information of structure, which is later used to modify, renovate, use and maintenance of the structure.

Creating structural drawing is an important part of designing structure. These drawings should contain exact information needed to build, manufacture, and assemble building elements. General requirements needed for structural drawings are as follows:

1. Position, dimension, and material property of construction objects.
2. Construction component such as bolt and weld should mark with symbol.
3. Section view and detail drawing of connecting parts.
4. Bill of quantities.
5. Title block.
6. Drawing must have proper scale and correspond with structural calculation.

9.1 General arrangement drawings

General arrangement drawings (GA) provide position of various parts and assemblies within the overall design of the structure. GA drawing should contain overall composition of the structure. Depending on geometry and complexity of the structure, it requires different projection view such as elevation, plans and section view. In addition, it includes detail drawing and specification of certain part of the structure. They also include notation and symbol of material and marked with component list which helps to fix the structure together. Figure 35 presents general arrangement drawings generated from Tekla structures.

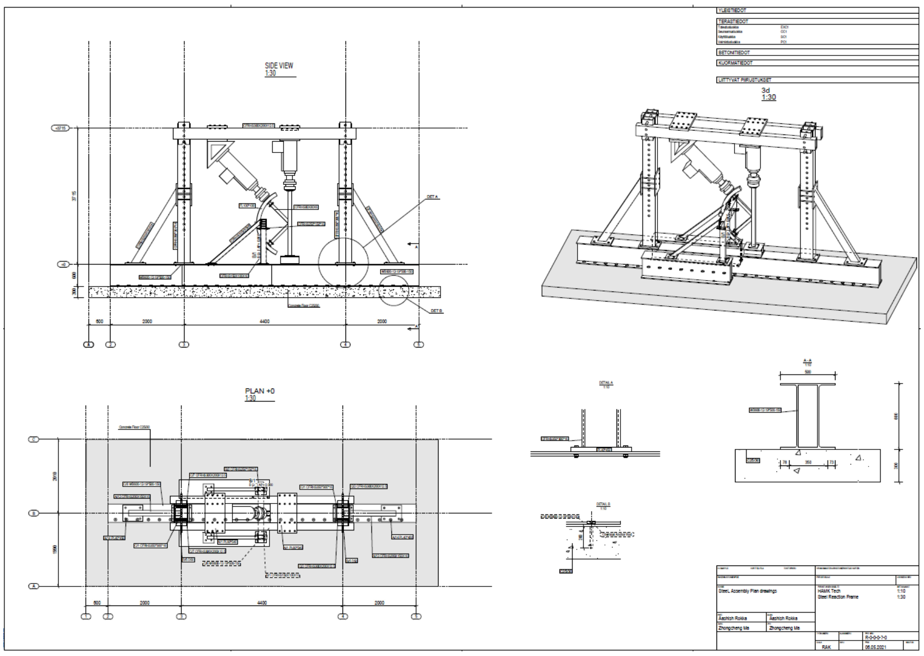


Figure 35. GA drawing of steel reaction frame with test specimen.

9.2 **Workshop drawings**

Workshop drawings contain detail information of all the parts used within the structure. These drawing has detail drawing of different parts of the structures which helps to manufacture components of the structure and assemble them properly. Workshop drawing include assembly and part drawing and they must have necessary information to manufacture and assemble the structural components.

9.2.1 Assembly drawings

Assembly drawings are workshop drawings that presents information of more than one component in single assembly. It includes position of different parts, overall dimension, and diagonal dimension within assemble group. Depending on size and geometry of the structure, assembly drawing has different views such as section, elevation, and three-dimensional views. This type of drawing must have information on how to assemble small parts into single group, position of each part, how they look like and show their shape and size. The position of assembly group is in general arrangement drawing. Figure 36 below shows an example of assembly drawing of steel reaction frame.

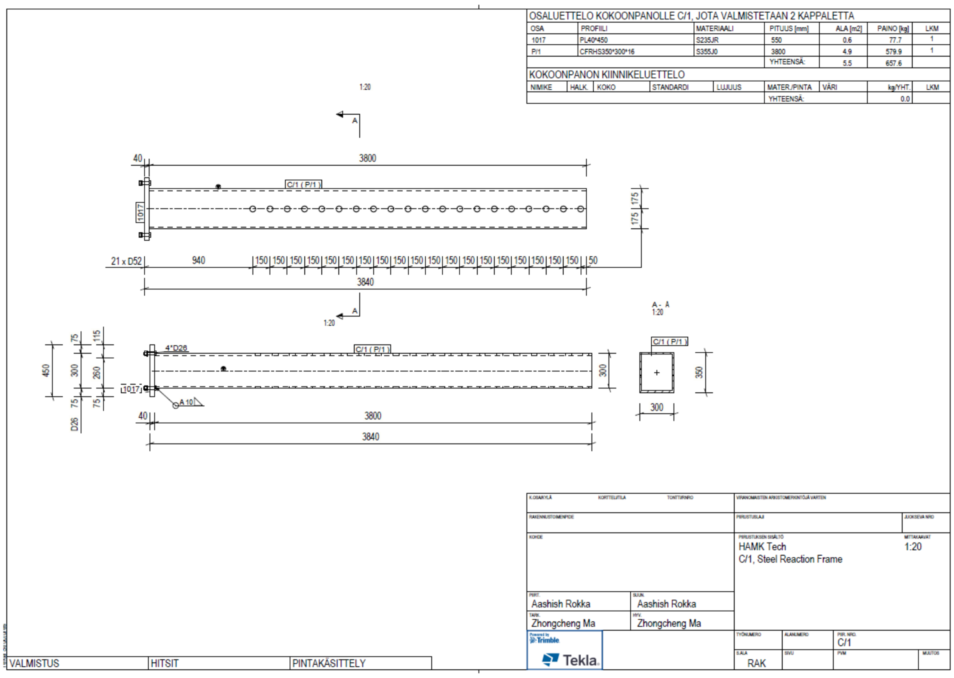


Figure 36. Column assembly drawing of steel reaction frame.

Every component of the assembly is described in detail in the drawing.
Figure 37 shows the position of each assemble parts with their detail information such as quantity, profile, and material property.

OSALUETTELO KOKOONPANOLLE C/1, JOTA VALMISTETAAN 2 KAPPALETTA						
OSA	PROFIILI	MATERIAALI	PITUUS [mm]	ALA [m2]	PAINO [kg]	LKM
1017	PL40*450	S235JR	550	0.6	77.7	1
P/1	CFRHS350*300*16	S355J0	3800	4.9	579.9	1
			YHTEENSÄ:	5.5	657.6	

KOKOONPANON KIINNIKELUETTELO								
NIMIKE	HALK.	KOKO	STANDARDI	LUJUUS	MATER./PINTA	VÄRI	kg/YHT.	LKM
					YHTEENSÄ:		0.0	

Figure 37. Information of assembly drawings.

9.2.2 Part drawings

Part drawing is also known as single-part drawings because it gives detail information of individual parts of the model. It presents detail information of the parts such as profile, dimension, and material properties of the structural parts. In part drawing, part list must be included and provide necessary information on how to assemble individual parts into group. The location of part drawing can be found in either GA or assembly drawing. Figure below shows an example of single-part drawing of a base-beam used in steel reaction frame. Figure 38 below shows the example of single part drawing of bracing member of reaction frame.

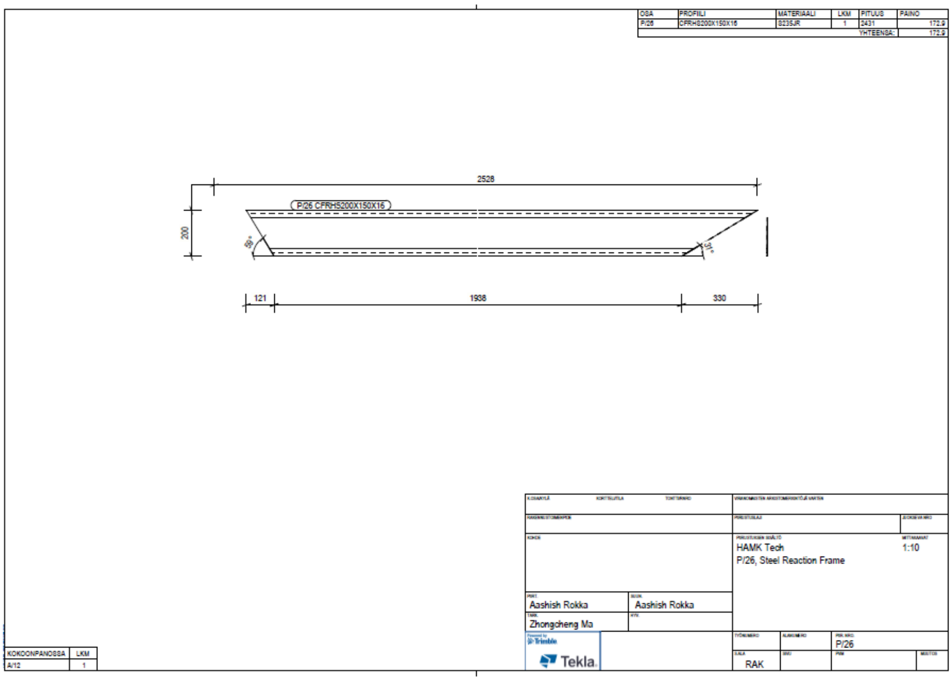


Figure 38. Single-part drawing of bracing member.

Structural drawing made for this thesis is presented in Appendix.

10 CONCLUSION

In this thesis, steel reaction frame was modified and designed to study hollow section joint connection of K-joints. A review of documentation, 3D modelling and structural analysis of steel reaction frame was carried out. This research was commissioned by HAMK Tech research unit.

In accordance with applied load during testing, load cases and load combination were arranged and calculated in software. The reaction frame was examined for strength, stiffness, and stability basis to ensure that it could perform safely in any testing arrangement. The projects used Dlubal RFEM for structural analysis, and Tekla Structures for 3D modelling and eventually creating structural drawings. The components of reaction frame were not failed when actuator force is examined in different direction. But the profile of the column was failed when considering both hydraulic actuators' forces in the same direction. Therefore, sizes of column were changed in new reaction frame. During calculation deformation was very large. To reduce deformation and make reaction frame stiffer and more stable, extra bracing members were designed for the reaction frame.

In addition, for new K joints test arrangement, support frame was required to keep curve support beam balanced. Thus, support frame was designed according to the reaction force coming from steel frame. Member elastic foundation and modulus of subgrade reaction were discussed. Behaviour of continuous beam to ground and load distribution from reaction frame to test floor was studied to design connection between base beam and test floor.

This report will likely assist as a future reference for those who want to acquire a broad concept of how structural analysis and design may be done using contemporary technologies. In terms of enhancing workflow and controlling all components of a project, modern software's are the most crucial tools for engineers and designers today. Regardless the truth that these days computers are competent of performing work at a more exact and proficient level than people, it is essential to remember that there is still no substitution to imaginative human intellect which is required for basic plan.

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APPENDIX 1 SUMMARY OF STRUCTURAL ANALYSIS IN DLUBAL RFEM

Nodes

Node		Reference	Coordinate	Node Coordinates			
No.	Node Type	Node	System	X [m]	Y [m]	Z [m]	Comment
1	Standard	-	Cartesian	19.875	-12.225	0.300	
2	Standard	-	Cartesian	28.275	-12.225	0.300	
3	Standard	-	Cartesian	26.275	-12.425	-3.225	
4	Standard	-	Cartesian	22.784	-12.225	-3.225	
5	Standard	-	Cartesian	24.759	-12.425	-3.225	
6	Standard	-	Cartesian	21.875	-12.425	-3.225	
7	Standard	-	Cartesian	26.275	-12.025	-3.225	
8	Standard	-	Cartesian	24.759	-12.025	-3.225	
9	Standard	-	Cartesian	21.875	-12.225	-3.225	
10	Standard	-	Cartesian	21.875	-12.025	-3.225	
11	Standard	-	Cartesian	26.275	-12.225	0.300	
12	Standard	-	Cartesian	26.275	-12.225	-3.525	
13	Standard	-	Cartesian	26.275	-12.225	-3.225	
14	Standard	-	Cartesian	27.475	-12.225	0.300	
15	Standard	-	Cartesian	20.675	-12.225	0.300	
18	Standard	-	Cartesian	22.784	-12.025	-3.225	
19	Standard	-	Cartesian	22.784	-12.425	-3.225	
34	Standard	-	Cartesian	24.759	-12.225	-3.225	
49	Standard	-	Cartesian	24.759	-12.225	-1.668	
50	Standard	-	Cartesian	24.759	-12.225	0.300	
68	Standard	-	Cartesian	23.641	-12.225	-1.740	
72	Standard	-	Cartesian	21.875	-12.225	0.300	
73	Standard	-	Cartesian	21.875	-12.225	-3.525	
74	Standard	-	Cartesian	21.875	-12.225	-1.612	
75	Standard	-	Cartesian	26.275	-12.225	-1.612	

Materials

Matl.	Modulus	Modulus	Poisson's Ratio	Spec. Weight	Coeff. of Th. Exp.	Partial Factor	Material
No.	E [kN/cm²]	G [kN/cm²]	ν [-]	γ [kN/m³]	α [1/°C]	γ_M [-]	Model
1	Steel S 355 J2 | SFS EN 10025-2:2004-11						
	21000.00	8076.92	0.300	78.50	1.20E-05	1.00	Isotropic Linear Elastic

Members

Mbr.	Line		Rotation		Cross-Section		Hinge No.		Ecc.	Div.	Length	
No.	No.	Member	Type	β[ďž˝]	Start	End	Start	End	No.	No.	L [m]	
1	1	Beam	Angle	0.00	1	1	-	-	-	-	0.800	X
2	3	Rigid Member	Angle	0.00	0	0	-	-	-	-	0.200	Y
3	4	Rigid Member	Angle	0.00	0	0	-	-	-	-	0.200	Y
4	6	Beam	Angle	0.00	21	21	-	-	-	-	0.300	Z
5	8	Beam	Angle	0.00	21	21	-	-	-	-	1.912	Z
6	26	Rigid Member	Angle	0.00	0	0	-	-	-	-	0.200	Y
7	10	Rigid Member	Angle	0.00	0	0	-	-	-	-	0.200	Y
8	17	Beam	Angle	0.00	1	1	-	-	-	-	2.884	X
9	21	Beam	Angle	0.00	1	1	-	-	-	-	1.200	X
10	13	Rigid Member	Angle	0.00	0	0	-	-	-	-	0.200	Y
11	15	Rigid Member	Angle	0.00	0	0	-	-	-	-	0.200	Y
12	16	Beam	Angle	0.00	21	21	-	-	-	-	1.612	Z
13	19	Rigid Member	Angle	0.00	0	0	-	-	-	-	0.200	Y
14	14	Rigid Member	Angle	0.00	0	0	-	-	-	-	0.200	Y
15	18	Beam	Angle	0.00	21	21	-	-	-	-	0.300	Z
16	2	Beam	Angle	0.00	22	22	-	-	-	-	0.909	X
17	5	Beam	Angle	0.00	22	22	-	-	-	-	1.976	X
18	7	Beam	Angle	0.00	22	22	-	-	-	-	0.909	X
19	9	Beam	Angle	0.00	22	22	-	-	-	-	1.976	X
20	11	Beam	Angle	0.00	22	22	-	-	-	-	1.516	X
21	12	Beam	Angle	0.00	22	22	-	-	-	-	1.516	X
22	22	Beam	Angle	0.00	1	1	-	-	-	-	1.516	X
23	20	Beam	Angle	0.00	21	21	-	-	-	-	1.912	Z
24	24	Beam	Angle	0.00	1	1	-	-	-	-	1.200	X
25	27	Beam	Angle	0.00	21	21	-	-	-	-	1.612	Z

26	28	Beam	Angle	0.00	1	1	-	-	-	-	0.800	X
27	23	Beam	Angle	0.00	17	17	-	-	-	-	2.258	XZ
28	25	Beam	Angle	0.00	17	17	-	-	-	-	2.258	XZ

Member Elastic Foundations

Found.	Member	$C_{1,x}$	$C_{1,y}$	$C_{1,z}$	$C_{2,x}$	$C_{2,y}$	$C_{2,z}$	C_{φ}
No.	No.	[kN/m^2]	[kN/m^2]	[kN/m^2]	[kN]	[kN]	[kN]	[kNm/rad/m]
1	1,8,9,22,24,26	36345000.000	36345000.000	36344600.000	0.000	0.000	0.000	1.00000E+08

Load Cases

Load	Load Case	EN 1990 | SFS	Self-Weight - Factor in Direction			
Case	Description	Action Category	Active	X	Y	Z
LC1	Tension Web	Permanent/Imposed	-			
LC2	Compression Web	Permanent/Imposed	-			
LC3	Compression Chord	Permanent/Imposed	-			
LC4	Tension Chord	Permanent/Imposed	-			
LC5	Downward reaction force	Permanent/Imposed	-			
LC6	Upward Reaction Force	Permanent/Imposed	-			
LC7	Self-weight	Permanent	x	0.000	0.000	1.000

Load Cases - Calculation Parameters

Load	Load Case				
Case	Description	Calculation Parameters			
LC1	Tension Web	Method of analysis	:	x	Geometrically linear analysis
		Method for solving system of nonlinear algebraic equations	:	x	Newton-Raphson
		Activate stiffness factors of:	:	x	Cross-sections (factor for J, I_y, I_z, A, A_y, A_z)
			:	x	Members (factor for GJ, EI_y, EI_z, EA, GA_y, GA_z)
LC2	Compression Web	Method of analysis	:	x	Geometrically linear analysis
		Method for solving system of nonlinear algebraic equations	:	x	Newton-Raphson
		Activate stiffness factors of:	:	x	Cross-sections (factor for J, I_y, I_z, A, A_y, A_z)
			:	x	Members (factor for GJ, EI_y, EI_z, EA, GA_y, GA_z)
LC3	Compression Chord	Method of analysis	:	x	Geometrically linear analysis
		Method for solving system of nonlinear algebraic equations	:	x	Newton-Raphson
		Activate stiffness factors of:	:	x	Cross-sections (factor for J, I_y, I_z, A, A_y, A_z)
			:	x	Members (factor for GJ, EI_y, EI_z, EA, GA_y, GA_z)
LC4	Tension Chord	Method of analysis	:	x	Geometrically linear analysis
		Method for solving system of nonlinear algebraic equations	:	x	Newton-Raphson
		Activate stiffness factors of:	:	x	Cross-sections (factor for J, I_y, I_z, A, A_y, A_z)
			:	x	Members (factor for GJ, EI_y, EI_z, EA, GA_y, GA_z)
LC5	Downward reaction force	Method of analysis	:	x	Geometrically linear analysis
		Method for solving system of nonlinear algebraic equations	:	x	Newton-Raphson
		Activate stiffness factors of:	:	x	Cross-sections (factor for J, I_y, I_z, A, A_y, A_z)
			:	x	Members (factor for GJ, EI_y, EI_z, EA, GA_y, GA_z)
LC6	Upward Reaction Force	Method of analysis	:	x	Geometrically linear analysis
		Method for solving system of nonlinear algebraic equations	:	x	Newton-Raphson
		Activate stiffness factors of:	:	x	Cross-sections (factor for J, I_y, I_z, A, A_y, A_z)
			:	x	Members (factor for GJ, EI_y, EI_z, EA, GA_y, GA_z)
LC7	Self-weight	Method of analysis	:	x	Geometrically linear analysis
		Method for solving system of nonlinear algebraic equations	:	x	Newton-Raphson
		Activate stiffness factors of:	:	x	Cross-sections (factor for J, I_y, I_z, A, A_y, A_z)
			:	x	Members (factor for GJ, EI_y, EI_z, EA, GA_y, GA_z)

Load Combinations

Load	Load Combination					
Combin.	DS	Description	No.	Factor	Load Case	
CO1		Tension Web + Compression Chod + Upward Reaction Force + Self-weight	1	1.00	LC1	Tension Web
			2	1.00	LC3	Compression Chord
			3	1.00	LC6	Upward Reaction Force
			4	1.00	LC7	Self-weight
CO2		Tension Web + Tension Chord +Downward Reaction Force + Self-weight	1	1.00	LC1	Tension Web

			2	1.00	LC4	Tension Chord
			3	1.00	LC5	Downward reaction force
			4	1.00	LC7	Self-weight
CO3		Compression Web + Compression Chord + Self-weight	1	1.00	LC2	Compression Web
			2	1.00	LC3	Compression Chord
			3	1.00	LC6	Upward Reaction Force
			4	1.00	LC7	Self-weight
CO4		Compression Web + Tension Chod + Downward Reaction Force + Self-weight	1	1.00	LC2	Compression Web
			2	1.00	LC4	Tension Chord
			3	1.00	LC5	Downward reaction force
			4	1.00	LC7	Self-weight

Load Combinations - Details

Load Combin.	Description	Parameters			
CO1	Tension Web + Compression Chod + U Reaction Force + Self-weight	Load Case 1	Factor	:	1.000
			Load Case	:	LC1 - Tension Web
		Load Case 2	Factor	:	1.000
			Load Case	:	LC3 - Compression Chord
		Load Case 3	Factor	:	1.000
			Load Case	:	LC6 - Upward Reaction Force
		Load Case 4	Factor	:	1.000
			Load Case	:	LC7 - Self-weight
CO2	Tension Web + Tension Chord + Downward Reaction Force + Self-weight	Load Case 1	Factor	:	1.000
			Load Case	:	LC1 - Tension Web
		Load Case 2	Factor	:	1.000
			Load Case	:	LC4 - Tension Chord
		Load Case 3	Factor	:	1.000
			Load Case	:	LC5 - Downward reaction force
		Load Case 4	Factor	:	1.000
			Load Case	:	LC7 - Self-weight
CO3	Compression Web + Compression Chord + Upward Reaction Force + Self-weight	Load Case 1	Factor	:	1.000
			Load Case	:	LC2 - Compression Web
		Load Case 2	Factor	:	1.000
			Load Case	:	LC3 - Compression Chord
		Load Case 3	Factor	:	1.000
			Load Case	:	LC6 - Upward Reaction Force
		Load Case 4	Factor	:	1.000
			Load Case	:	LC7 - Self-weight
CO4	Compression Web + Tension Chod + Downward Reaction Force + Self-weight	Load Case 1	Factor	:	1.000
			Load Case	:	LC2 - Compression Web
		Load Case 2	Factor	:	1.000
			Load Case	:	LC4 - Tension Chord
		Load Case 3	Factor	:	1.000
			Load Case	:	LC5 - Downward reaction force
		Load Case 4	Factor	:	1.000
			Load Case	:	LC7 - Self-weight

Load Combinations - Calculation Parameters

Load Combin.	Description	Calculation Parameters			
CO1	Tension Web + Compression Chod + U Reaction Force + Self-weight	Method of analysis	:	x	Second order analysis (P-Delta)
		Method for solving system of nonlinear algebraic equations	:	x	Picard
		Options	:	x	Consider favorable effects due to tension
			:	x	Refer internal forces to deformed system for:
				x	Normal forces N
				x	Shear forces V_y and V_z
				x	Moments M_y, M_z and M_T
		Activate stiffness factors of:	:	x	Materials (partial factor γM)
			:	x	Cross-sections (factor for J, I_y, I_z, A, A_y, A_z)
			:	x	Members (factor for GJ, EI_y, EI_z, EA, GA_y, GA_z)
CO2	Tension Web + Tension Chord + Downward Reaction Force + Self-weight	Method of analysis	:	x	Second order analysis (P-Delta)
		Method for solving system of nonlinear algebraic equations	:	x	Picard

		Options	:	x		Consider favorable effects due to tension
			:	x		Refer internal forces to deformed system for:
					x	Normal forces N
					x	Shear forces V_y and V_z
					x	Moments M_y, M_z and M_T
		Activate stiffness factors of:	:	x		Materials (partial factor γM)
			:	x		Cross-sections (factor for J, I_y, I_z, A, A_y, A_z)
			:	x		Members (factor for GJ, EI_y, EI_z, EA, GA_y, GA_z)
CO3	Compression Web + Compression Chord + Upward Reaction Force + Self-weight	Method of analysis	:	x		Second order analysis (P-Delta)
		Method for solving system of nonlinear algebraic equations	:	x		Picard
		Options	:	x		Consider favorable effects due to tension
			:	x		Refer internal forces to deformed system for:
					x	Normal forces N
					x	Shear forces V_y and V_z
					x	Moments M_y, M_z and M_T
		Activate stiffness factors of:	:	x		Materials (partial factor γM)
			:	x		Cross-sections (factor for J, I_y, I_z, A, A_y, A_z)
			:	x		Members (factor for GJ, EI_y, EI_z, EA, GA_y, GA_z)
CO4	Compression Web + Tension Chod + Downward Reaction Force + Self-weight	Method of analysis	:	x		Second order analysis (P-Delta)
		Method for solving system of nonlinear algebraic equations	:	x		Picard
		Options	:	x		Consider favorable effects due to tension
			:	x		Refer internal forces to deformed system for:
					x	Normal forces N
					x	Shear forces V_y and V_z
					x	Moments M_y, M_z and M_T
		Activate stiffness factors of:	:	x		Materials (partial factor γM)
			:	x		Cross-sections (factor for J, I_y, I_z, A, A_y, A_z)
			:	x		Members (factor for GJ, EI_y, EI_z, EA, GA_y, GA_z)

LC1

Tension Web

Nodal Loads - By Direction - Same as Line

LC1: Tension Web

	On Nodes	Direction	Force	Moment		
No.	No.	Type	P [kN]	M [kNm]	Line No.	Comment
1	4	Same as line	-630.000	0.000	37	

LC2

Compression Web

Nodal Loads - By Direction - Same as Line

LC2: Compression Web

	On Nodes	Direction	Force	Moment		
No.	No.	Type	P [kN]	M [kNm]	Line No.	Comment
1	4	Same as line	630.000	0.000	37	

LC3

Compression Chord

Nodal Loads - By Direction - Same as Line

LC3: Compression Chord

	On Nodes	Direction	Force	Moment		
No.	No.	Type	P [kN]	M [kNm]	Line No.	Comment
1	34	Same as line	630.000	0.000	30	

LC4

Tension Chord

Nodal Loads - By Direction - Same as Line

LC4: Tension Chord

	On Nodes	Direction	Force	Moment		
No.	No.	Type	P [kN]	M [kNm]	Line No.	Comment
1	34	Same as line	-630.000	0.000	30	

LC5

Downward reaction force

Nodal Loads - By Direction - Rotated						LC5: Downward reaction force		
	On Nodes	Direction	Force	Moment		Rotation [°]		
No.	No.	Type	P [kN]	M [kNm]	Sequence	about X	about Y	about Z
1	50	Rotated	1082.160	0.000	XYZ	0.00	0.00	0.00

LC6

Upward Reaction Force

Nodal Loads - By Direction - Rotated						LC6: Upward Reaction Force		
	On Nodes	Direction	Force	Moment		Rotation [°]		
No.	No.	Type	P [kN]	M [kNm]	Sequence	about X	about Y	about Z
1	50	Rotated	-1082.160	0.000	XYZ	0.00	0.00	0.00

Members - Internal Forces

Member		Node	Location	Forces [kN]			Moments [kNm]			
No.	LC/CO	No.	x [m]	N	V_y	V_z	M_T	M_y	M_z	Section
1	LC1	1	0.000	-5.69	-0.00	-0.01	0.00	0.00	-0.00	1 - BOX(A) 500/19/12/176/600/500/19/0/0
		15	0.800	-40.04	0.00	108.92	-0.00	13.12	0.00	
	LC2	1	0.000	5.69	0.00	0.01	0.00	-0.00	0.00	
		15	0.800	40.04	-0.00	-108.92	0.00	-13.12	-0.00	
	LC3	1	0.000	-7.30	-0.00	-0.00	0.00	-0.04	-0.00	
		15	0.800	-51.36	0.00	126.70	-0.00	16.35	-0.00	
	LC4	1	0.000	7.30	0.00	0.00	0.00	0.04	0.00	
		15	0.800	51.36	-0.00	-126.70	0.00	-16.35	0.00	
	LC5	1	0.000	0.00	0.00	-0.00	0.00	0.00	0.00	
		15	0.800	0.00	0.00	-0.05	0.00	-0.02	0.00	
	LC6	1	0.000	-0.00	0.00	0.00	0.00	-0.00	0.00	
		15	0.800	-0.00	0.00	0.05	0.00	0.02	0.00	
	LC7	1	0.000	-0.08	0.00	-0.00	0.00	-0.01	0.00	
		15	0.800	-0.60	0.00	1.69	0.00	0.09	-0.00	
	CO1	1	0.000	-13.07	-0.00	-0.01	0.00	-0.05	-0.00	
		15	0.800	-92.01	0.00	237.56	-0.00	29.56	0.00	
	CO2	1	0.000	1.52	-0.00	-0.01	0.00	0.02	-0.00	
		15	0.800	10.67	-0.00	-16.03	0.00	-3.10	0.00	
	CO3	1	0.000	-1.70	0.00	0.01	0.00	-0.05	0.00	
		15	0.800	-11.98	0.00	19.64	-0.00	3.41	-0.00	
	CO4	1	0.000	12.91	0.00	0.01	0.00	0.03	0.00	
		15	0.800	90.82	-0.00	-233.83	0.00	-29.43	-0.00	
2	LC1	6	0.000	0.00	-29.50	193.28	-26.94	-0.00	0.00	
		9	0.200	0.00	-29.50	193.28	-26.94	38.66	5.90	
	LC2	6	0.000	-0.00	29.50	-193.28	26.94	0.00	-0.00	
		9	0.200	-0.00	29.50	-193.28	26.94	-38.66	-5.90	
	LC3	6	0.000	0.00	-77.29	-102.96	111.72	0.00	0.00	
		9	0.200	0.00	-77.29	-102.96	111.72	-20.59	15.46	
	LC4	6	0.000	-0.00	77.29	102.96	-111.72	-0.00	-0.00	
		9	0.200	-0.00	77.29	102.96	-111.72	20.59	-15.46	
	LC5	6	0.000	0.00	0.00	0.00	-0.00	0.00	0.00	
		9	0.200	0.00	0.00	0.00	-0.00	0.00	-0.00	
	LC6	6	0.000	0.00	-0.00	-0.00	0.00	0.00	0.00	
		9	0.200	0.00	-0.00	-0.00	0.00	-0.00	0.00	
	LC7	6	0.000	0.00	-0.80	-2.02	1.20	0.00	0.00	
		9	0.200	0.00	-0.80	-2.02	1.20	-0.40	0.16	
	CO1	6	0.000	0.00	-107.64	88.48	85.94	0.00	0.00	
		9	0.200	0.00	-107.64	88.48	85.94	17.70	21.53	
	CO2	6	0.000	0.00	48.11	293.98	-137.44	-0.00	0.00	
		9	0.200	0.00	48.11	293.98	-137.44	58.80	-9.62	
	CO3	6	0.000	-0.00	-47.43	-298.51	139.87	0.00	-0.00	
		9	0.200	-0.00	-47.43	-298.51	139.87	-59.70	9.49	
	CO4	6	0.000	-0.00	105.95	-92.16	-83.64	-0.00	-0.00	
		9	0.200	-0.00	105.95	-92.16	-83.64	-18.43	-21.19	
3	LC1	3	0.000	0.00	-128.00	79.52	128.93	-0.00	-0.00	
		13	0.200	0.00	-128.00	79.52	128.93	15.90	25.60	
	LC2	3	0.000	-0.00	128.00	-79.52	-128.93	0.00	0.00	
		13	0.200	-0.00	128.00	-79.52	-128.93	-15.90	-25.60	

	LC3	3	0.000	-0.00	77.29	-212.04	-136.08	0.00	0.00	
		13	0.200	-0.00	77.29	-212.04	-136.08	-42.41	-15.46	
	LC4	3	0.000	0.00	-77.29	212.04	136.08	-0.00	-0.00	
		13	0.200	0.00	-77.29	212.04	136.08	42.41	15.46	
	LC5	3	0.000	0.00	-0.00	-0.00	-0.00	0.00	0.00	
		13	0.200	0.00	-0.00	-0.00	-0.00	-0.00	0.00	
	LC6	3	0.000	0.00	0.00	0.00	0.00	0.00	0.00	
		13	0.200	0.00	0.00	0.00	0.00	0.00	-0.00	
	LC7	3	0.000	-0.00	0.80	-2.02	-1.20	0.00	0.00	
		13	0.200	-0.00	0.80	-2.02	-1.20	-0.40	-0.16	
	CO1	3	0.000	0.00	-50.22	-134.24	-8.09	0.00	-0.00	
		13	0.200	0.00	-50.22	-134.24	-8.09	-26.85	10.04	
	CO2	3	0.000	0.00	-204.59	289.08	262.63	-0.00	-0.00	
		13	0.200	0.00	-204.59	289.08	262.63	57.82	40.92	
	CO3	3	0.000	-0.00	205.99	-294.06	-267.44	0.00	0.00	
		13	0.200	-0.00	205.99	-294.06	-267.44	-58.81	-41.20	
	CO4	3	0.000	-0.00	51.22	130.80	6.18	-0.00	0.00	
		13	0.200	-0.00	51.22	130.80	6.18	26.16	-10.24	
4	LC1	73	0.000	0.00	0.00	0.00	0.00	0.00	0.00	21 - RRO 350x300x16 | ALUKÖNIGSTAHL - EN 10210
		9	0.300	0.00	0.00	0.00	0.00	0.00	0.00	
	LC2	73	0.000	0.00	0.00	0.00	0.00	0.00	0.00	
		9	0.300	0.00	0.00	0.00	0.00	0.00	0.00	
	LC3	73	0.000	0.00	0.00	0.00	0.00	0.00	0.00	
		9	0.300	0.00	0.00	0.00	0.00	0.00	0.00	
	LC4	73	0.000	0.00	0.00	0.00	0.00	0.00	0.00	
		9	0.300	0.00	0.00	0.00	0.00	0.00	0.00	
	LC5	73	0.000	0.00	0.00	0.00	0.00	0.00	0.00	
		9	0.300	0.00	0.00	0.00	0.00	0.00	0.00	
	LC6	73	0.000	0.00	0.00	0.00	0.00	0.00	0.00	
		9	0.300	0.00	0.00	0.00	0.00	0.00	0.00	
	LC7	73	0.000	0.00	0.00	0.00	0.00	0.00	0.00	
		9	0.300	-0.46	0.00	-0.00	0.00	-0.00	-0.00	
	CO1	73	0.000	0.00	0.00	0.00	0.00	0.00	0.00	
		9	0.300	-0.46	0.00	-0.00	0.00	-0.00	-0.00	
	CO2	73	0.000	0.00	0.00	0.00	0.00	0.00	0.00	
		9	0.300	-0.46	0.00	-0.00	0.00	-0.00	-0.00	
	CO3	73	0.000	0.00	0.00	0.00	0.00	0.00	0.00	
		9	0.300	-0.46	0.00	0.00	0.00	0.00	-0.00	
	CO4	73	0.000	0.00	0.00	0.00	0.00	0.00	0.00	
		9	0.300	-0.46	0.00	0.00	0.00	0.00	-0.00	
5	LC1	11	0.000	-351.89	-0.00	51.81	-0.00	33.28	-0.00	21 - RRO 350x300x16 | ALUKÖNIGSTAHL - EN 10210
		75	1.912	-351.89	-0.00	51.81	-0.00	132.36	-0.00	
	LC2	11	0.000	351.89	0.00	-51.81	0.00	-33.28	0.00	
		75	1.912	351.89	0.00	-51.81	0.00	-132.36	0.00	
	LC3	11	0.000	-219.08	-0.00	24.09	-0.00	-24.67	0.00	
		75	1.912	-219.08	-0.00	24.09	-0.00	21.40	0.00	
	LC4	11	0.000	219.08	0.00	-24.09	0.00	24.67	-0.00	
		75	1.912	219.08	0.00	-24.09	0.00	-21.40	-0.00	
	LC5	11	0.000	-0.22	-0.00	0.14	0.00	-0.25	-0.00	
		75	1.912	-0.22	-0.00	0.14	0.00	0.02	0.00	
	LC6	11	0.000	0.22	0.00	-0.14	-0.00	0.25	0.00	
		75	1.912	0.22	0.00	-0.14	-0.00	-0.02	-0.00	
	LC7	11	0.000	-7.86	-0.00	-0.17	-0.00	0.02	-0.00	
		75	1.912	-4.93	-0.00	-0.17	-0.00	-0.30	0.00	
	CO1	11	0.000	-578.19	-0.00	76.12	-0.00	8.59	-0.00	
		75	1.912	-575.42	-0.00	74.89	-0.00	153.46	0.00	
	CO2	11	0.000	-137.43	0.00	27.29	-0.00	57.52	-0.00	
		75	1.912	-134.56	0.00	26.99	-0.00	109.45	-0.00	
	CO3	11	0.000	128.75	0.00	-28.46	0.00	-57.86	0.00	
		75	1.912	131.62	0.00	-28.76	0.00	-112.54	0.00	
	CO4	11	0.000	563.35	0.00	-75.41	0.00	-9.12	0.00	
		75	1.912	566.12	0.00	-76.63	0.00	-154.06	-0.00	
6	LC1	4	0.000	0.00	157.50	272.80	-0.00	-54.56	31.50	
		19	0.200	0.00	157.50	272.80	-0.00	0.00	-0.00	
	LC2	4	0.000	-0.00	-157.50	-272.80	0.00	54.56	-31.50	
		19	0.200	-0.00	-157.50	-272.80	0.00	-0.00	0.00	
	LC3	4	0.000	0.00	0.00	0.00	-0.00	0.00	0.00	
		19	0.200	0.00	0.00	0.00	-0.00	0.00	-0.00	
	LC4	4	0.000	-0.00	-0.00	-0.00	0.00	-0.00	-0.00	
		19	0.200	-0.00	-0.00	-0.00	0.00	-0.00	0.00	
	LC5	4	0.000	0.00	0.00	0.00	0.00	0.00	0.00	
		19	0.200	0.00	0.00	0.00	0.00	0.00	0.00	
	LC6	4	0.000	0.00	-0.00	0.00	0.00	0.00	0.00	
		19	0.200	0.00	-0.00	0.00	0.00	0.00	0.00	
	LC7	4	0.000	0.00	0.00	0.00	-0.00	-0.00	0.00	
		19	0.200	0.00	0.00	0.00	-0.00	-0.00	-0.00	

	CO1	4	0.000	0.00	157.87	272.59	-0.00	-54.52	31.57	
		19	0.200	0.00	157.87	272.59	-0.00	0.00	-0.00	
	CO2	4	0.000	0.00	155.95	273.69	-0.00	-54.74	31.19	
		19	0.200	0.00	155.95	273.69	-0.00	0.00	-0.00	
	CO3	4	0.000	-0.00	-159.08	-271.88	0.00	54.38	-31.82	
		19	0.200	-0.00	-159.08	-271.88	0.00	-0.00	0.00	
	CO4	4	0.000	-0.00	-157.15	-273.00	0.00	54.60	-31.43	
		19	0.200	-0.00	-157.15	-273.00	0.00	-0.00	0.00	
7	LC1	5	0.000	-0.00	0.00	-0.00	0.00	-0.00	0.00	
		34	0.200	-0.00	0.00	-0.00	0.00	-0.00	0.00	
	LC2	5	0.000	0.00	-0.00	0.00	-0.00	0.00	-0.00	
		34	0.200	0.00	-0.00	0.00	-0.00	0.00	-0.00	
	LC3	5	0.000	0.00	-0.00	315.00	0.00	-0.00	-0.00	
		34	0.200	0.00	-0.00	315.00	0.00	63.00	0.00	
	LC4	5	0.000	-0.00	0.00	-315.00	-0.00	0.00	0.00	
		34	0.200	-0.00	0.00	-315.00	-0.00	-63.00	-0.00	
	LC5	5	0.000	0.00	0.00	0.00	0.00	0.00	0.00	
		34	0.200	0.00	0.00	0.00	0.00	0.00	0.00	
	LC6	5	0.000	0.00	-0.00	0.00	0.00	0.00	-0.00	
		34	0.200	0.00	-0.00	0.00	0.00	0.00	0.00	
	LC7	5	0.000	0.00	-0.00	-0.00	-0.00	-0.00	-0.00	
		34	0.200	0.00	-0.00	-0.00	-0.00	-0.00	0.00	
	CO1	5	0.000	-0.00	-0.13	315.00	0.00	-0.00	0.00	
		34	0.200	-0.00	-0.13	315.00	0.00	63.00	0.03	
	CO2	5	0.000	-0.00	1.37	-315.00	-0.00	0.00	0.00	
		34	0.200	-0.00	1.37	-315.00	-0.00	-63.00	-0.27	
	CO3	5	0.000	0.00	1.39	315.00	0.00	-0.00	-0.00	
		34	0.200	0.00	1.39	315.00	0.00	63.00	-0.28	
	CO4	5	0.000	0.00	-0.14	-315.00	-0.00	0.00	-0.00	
		34	0.200	0.00	-0.14	-315.00	-0.00	-63.00	0.03	
8	LC1	72	0.000	-19.20	-0.00	308.80	-0.00	-36.14	-0.00	1 - BOX(A) 500/19/12/176/600/500/19/0/0
		50	2.884	0.29	-0.00	1.28	-0.00	0.93	0.00	
	LC2	72	0.000	19.20	0.00	-308.80	0.00	36.14	0.00	
		50	2.884	-0.29	0.00	-1.28	0.00	-0.93	-0.00	
	LC3	72	0.000	4.33	-0.00	37.33	0.00	-15.72	-0.00	
		50	2.884	0.37	0.00	-2.24	0.00	-1.61	0.00	
	LC4	72	0.000	-4.33	0.00	-37.33	-0.00	15.72	0.00	
		50	2.884	-0.37	-0.00	2.24	-0.00	1.61	-0.00	
	LC5	72	0.000	0.00	0.00	-0.34	-0.00	-0.20	0.00	
		50	2.884	0.00	0.00	544.65	-0.00	57.86	0.00	
	LC6	72	0.000	-0.00	-0.00	0.34	0.00	0.20	-0.00	
		50	2.884	-0.00	0.00	-544.65	0.00	-57.86	0.00	
	LC7	72	0.000	-0.02	-0.00	-3.99	0.00	0.42	-0.00	
		50	2.884	-0.00	0.00	-0.02	0.00	-0.03	0.00	
	CO1	72	0.000	-14.71	-0.00	342.84	0.00	-51.39	-0.00	
		50	2.884	0.66	-0.00	-545.65	0.00	-58.58	0.00	
	CO2	72	0.000	-23.22	-0.00	267.47	-0.00	-20.45	-0.00	
		50	2.884	-0.08	-0.00	548.16	-0.00	60.36	0.00	
	CO3	72	0.000	23.84	0.00	-274.78	0.00	20.77	0.00	
		50	2.884	0.07	0.00	-548.20	0.00	-60.43	-0.00	
	CO4	72	0.000	15.05	0.00	-350.12	-0.00	51.94	0.00	
		50	2.884	-0.65	0.00	545.58	-0.00	58.49	-0.00	
9	LC1	11	0.000	-31.89	-0.00	-151.31	0.00	4.77	-0.00	1 - BOX(A) 500/19/12/176/600/500/19/0/0
		14	1.200	-117.43	-0.00	-249.23	0.00	-34.24	0.00	
	LC2	11	0.000	31.89	0.00	151.31	-0.00	-4.77	0.00	
		14	1.200	117.43	0.00	249.23	0.00	34.24	-0.00	
	LC3	11	0.000	-3.32	-0.00	-125.80	-0.00	23.97	-0.00	
		14	1.200	47.92	0.00	98.45	0.00	11.89	-0.00	
	LC4	11	0.000	3.32	0.00	125.80	0.00	-23.97	0.00	
		14	1.200	-47.92	-0.00	-98.45	-0.00	-11.89	0.00	
	LC5	11	0.000	-0.06	-0.00	2.87	0.00	-1.78	-0.00	
		14	1.200	-0.06	-0.00	0.36	-0.00	-0.22	0.00	
	LC6	11	0.000	0.06	0.00	-2.87	-0.00	1.78	0.00	
		14	1.200	0.06	0.00	-0.36	0.00	0.22	0.00	
	LC7	11	0.000	0.14	-0.00	-3.88	0.00	0.43	-0.00	
		14	1.200	0.67	0.00	2.09	-0.00	0.30	0.00	
	CO1	11	0.000	-35.22	-0.00	-283.83	0.00	31.08	-0.00	
		14	1.200	-68.80	-0.00	-148.92	0.00	-21.75	0.00	
	CO2	11	0.000	-28.28	-0.00	-24.89	0.00	-20.64	-0.00	
		14	1.200	-164.18	-0.00	-343.27	-0.00	-45.65	0.00	
	CO3	11	0.000	28.98	0.00	20.44	-0.00	21.32	0.00	
		14	1.200	166.65	0.00	351.43	0.00	47.08	-0.00	
	CO4	11	0.000	35.11	0.00	276.17	-0.00	-29.97	0.00	
		14	1.200	70.11	0.00	153.42	-0.00	22.52	-0.00	
10	LC1	34	0.000	-0.00	0.00	-0.00	0.00	-0.00	0.00	
		8	0.200	-0.00	0.00	-0.00	0.00	-0.00	-0.00	
	LC2	34	0.000	0.00	-0.00	0.00	-0.00	0.00	-0.00	
		8	0.200	0.00	-0.00	0.00	-0.00	0.00	0.00	

	LC3	34	0.000	0.00	-0.00	-315.00	-0.00	63.00	0.00	
		8	0.200	0.00	-0.00	-315.00	-0.00	-0.00	0.00	
	LC4	34	0.000	-0.00	0.00	315.00	0.00	-63.00	-0.00	
		8	0.200	-0.00	0.00	315.00	0.00	0.00	-0.00	
	LC5	34	0.000	0.00	0.00	0.00	0.00	0.00	0.00	
		8	0.200	0.00	0.00	0.00	0.00	0.00	-0.00	
	LC6	34	0.000	0.00	-0.00	0.00	0.00	0.00	0.00	
		8	0.200	0.00	-0.00	0.00	0.00	0.00	0.00	
	LC7	34	0.000	0.00	-0.00	-0.00	-0.00	-0.00	0.00	
		8	0.200	0.00	-0.00	-0.00	-0.00	-0.00	0.00	
	CO1	34	0.000	-0.00	0.13	-315.00	-0.00	63.00	0.03	
		8	0.200	-0.00	0.13	-315.00	-0.00	-0.00	-0.00	
	CO2	34	0.000	-0.00	-1.37	315.00	0.00	-63.00	-0.27	
		8	0.200	-0.00	-1.37	315.00	0.00	0.00	-0.00	
	CO3	34	0.000	0.00	-1.40	-315.00	-0.00	63.00	-0.28	
		8	0.200	0.00	-1.40	-315.00	-0.00	-0.00	0.00	
	CO4	34	0.000	0.00	0.14	315.00	0.00	-63.00	0.03	
		8	0.200	0.00	0.14	315.00	0.00	0.00	0.00	
11	LC1	9	0.000	0.00	29.50	-193.28	26.94	38.66	5.90	
		10	0.200	0.00	29.50	-193.28	26.94	-0.00	-0.00	
	LC2	9	0.000	-0.00	-29.50	193.28	-26.94	-38.66	-5.90	
		10	0.200	-0.00	-29.50	193.28	-26.94	0.00	0.00	
	LC3	9	0.000	-0.00	77.29	102.96	-111.72	-20.59	15.46	
		10	0.200	-0.00	77.29	102.96	-111.72	-0.00	-0.00	
	LC4	9	0.000	0.00	-77.29	-102.96	111.72	20.59	-15.46	
		10	0.200	0.00	-77.29	-102.96	111.72	0.00	0.00	
	LC5	9	0.000	0.00	-0.00	-0.00	0.00	0.00	-0.00	
		10	0.200	0.00	-0.00	-0.00	0.00	0.00	0.00	
	LC6	9	0.000	0.00	0.00	0.00	-0.00	-0.00	0.00	
		10	0.200	0.00	0.00	0.00	-0.00	0.00	0.00	
	LC7	9	0.000	-0.00	0.80	2.02	-1.20	-0.40	0.16	
		10	0.200	-0.00	0.80	2.02	-1.20	0.00	-0.00	
	CO1	9	0.000	-0.00	107.64	-88.48	-85.94	17.70	21.53	
		10	0.200	-0.00	107.64	-88.48	-85.94	-0.00	-0.00	
	CO2	9	0.000	0.00	-48.11	-293.98	137.44	58.80	-9.62	
		10	0.200	0.00	-48.11	-293.98	137.44	-0.00	0.00	
	CO3	9	0.000	-0.00	47.43	298.51	-139.87	-59.70	9.49	
		10	0.200	-0.00	47.43	298.51	-139.87	0.00	-0.00	
	CO4	9	0.000	0.00	-105.95	92.15	83.64	-18.43	-21.19	
		10	0.200	0.00	-105.95	92.15	83.64	0.00	0.00	
12	LC1	9	0.000	386.56	0.00	-59.00	0.00	-53.87	0.00	21 - RRO 350x300x16 | ALUKÖNIGSTAHL - EN 10210
		74	1.613	386.56	0.00	-59.00	0.00	-149.01	-0.00	
	LC2	9	0.000	-386.56	-0.00	59.00	-0.00	53.87	-0.00	
		74	1.613	-386.56	-0.00	59.00	-0.00	149.01	0.00	
	LC3	9	0.000	-205.92	-0.00	-154.58	-0.00	223.43	-0.00	
		74	1.613	-205.92	-0.00	-154.58	-0.00	-25.83	0.00	
	LC4	9	0.000	205.92	0.00	154.58	0.00	-223.43	0.00	
		74	1.613	205.92	0.00	154.58	0.00	25.83	-0.00	
	LC5	9	0.000	0.00	0.00	0.00	0.00	-0.00	0.00	
		74	1.613	0.00	0.00	0.00	0.00	-0.00	-0.00	
	LC6	9	0.000	-0.00	-0.00	-0.00	-0.00	0.00	0.00	
		74	1.613	-0.00	-0.00	-0.00	-0.00	0.00	0.00	
	LC7	9	0.000	-4.50	-0.00	-1.61	-0.00	2.40	-0.00	
		74	1.613	-6.97	-0.00	-1.61	-0.00	-0.20	0.00	
	CO1	9	0.000	176.50	0.00	-215.29	0.00	171.88	-0.00	
		74	1.613	174.02	0.00	-215.30	0.00	-175.02	-0.00	
	CO2	9	0.000	587.51	0.00	96.22	0.00	-274.87	0.00	
		74	1.613	585.46	0.00	93.63	0.00	-122.20	-0.00	
	CO3	9	0.000	-597.48	-0.00	-94.86	-0.00	279.74	-0.00	
		74	1.613	-599.51	-0.00	-97.55	-0.00	124.20	0.00	
	CO4	9	0.000	-184.77	-0.00	211.91	-0.00	-167.28	0.00	
		74	1.613	-187.26	-0.00	211.90	-0.00	174.69	0.00	
13	LC1	13	0.000	0.00	128.00	-79.52	-128.93	15.90	25.60	
		7	0.200	0.00	128.00	-79.52	-128.93	-0.00	-0.00	
	LC2	13	0.000	-0.00	-128.00	79.52	128.93	-15.90	-25.60	
		7	0.200	-0.00	-128.00	79.52	128.93	0.00	0.00	
	LC3	13	0.000	-0.00	-77.29	212.04	136.08	-42.41	-15.46	
		7	0.200	-0.00	-77.29	212.04	136.08	0.00	0.00	
	LC4	13	0.000	0.00	77.29	-212.04	-136.08	42.41	15.46	
		7	0.200	0.00	77.29	-212.04	-136.08	-0.00	-0.00	
	LC5	13	0.000	0.00	0.00	0.00	0.00	-0.00	0.00	
		7	0.200	0.00	0.00	0.00	0.00	0.00	0.00	
	LC6	13	0.000	0.00	-0.00	-0.00	-0.00	0.00	-0.00	
		7	0.200	0.00	-0.00	-0.00	-0.00	0.00	0.00	
	LC7	13	0.000	-0.00	-0.80	2.02	1.20	-0.40	-0.16	
		7	0.200	-0.00	-0.80	2.02	1.20	0.00	0.00	
	CO1	13	0.000	0.00	50.22	134.24	8.09	-26.85	10.04	

		7	0.200	0.00	50.22	134.24	8.09	0.00	-0.00	
	CO2	13	0.000	0.00	204.59	-289.08	-262.63	57.82	40.92	
		7	0.200	0.00	204.59	-289.08	-262.63	-0.00	-0.00	
	CO3	13	0.000	-0.00	-205.99	294.06	267.44	-58.81	-41.20	
		7	0.200	-0.00	-205.99	294.06	267.44	0.00	0.00	
	CO4	13	0.000	-0.00	-51.22	-130.80	-6.18	26.16	-10.24	
		7	0.200	-0.00	-51.22	-130.80	-6.18	-0.00	0.00	
14	LC1	18	0.000	0.00	-157.50	-272.80	0.00	-0.00	-0.00	
		4	0.200	0.00	-157.50	-272.80	0.00	-54.56	31.50	
	LC2	18	0.000	-0.00	157.50	272.80	-0.00	0.00	0.00	
		4	0.200	-0.00	157.50	272.80	-0.00	54.56	-31.50	
	LC3	18	0.000	0.00	0.00	0.00	-0.00	0.00	0.00	
		4	0.200	0.00	0.00	0.00	-0.00	0.00	0.00	
	LC4	18	0.000	-0.00	-0.00	-0.00	0.00	-0.00	-0.00	
		4	0.200	-0.00	-0.00	-0.00	0.00	-0.00	-0.00	
	LC5	18	0.000	0.00	0.00	0.00	0.00	0.00	0.00	
		4	0.200	0.00	0.00	0.00	0.00	0.00	0.00	
	LC6	18	0.000	0.00	-0.00	0.00	0.00	0.00	0.00	
		4	0.200	0.00	-0.00	0.00	0.00	0.00	0.00	
	LC7	18	0.000	0.00	0.00	0.00	-0.00	-0.00	0.00	
		4	0.200	0.00	0.00	0.00	-0.00	-0.00	0.00	
	CO1	18	0.000	0.00	-157.87	-272.59	0.00	-0.00	-0.00	
		4	0.200	0.00	-157.87	-272.59	0.00	-54.52	31.57	
	CO2	18	0.000	0.00	-155.95	-273.69	0.00	-0.00	-0.00	
		4	0.200	0.00	-155.95	-273.69	0.00	-54.74	31.19	
	CO3	18	0.000	-0.00	159.08	271.88	-0.00	0.00	0.00	
		4	0.200	-0.00	159.08	271.88	-0.00	54.38	-31.82	
	CO4	18	0.000	-0.00	157.15	273.00	-0.00	0.00	0.00	
		4	0.200	-0.00	157.15	273.00	-0.00	54.60	-31.43	
15	LC1	13	0.000	0.00	0.00	0.00	0.00	0.00	0.00	21 - RRO 350x300x16 | ALUKÖNIGSTAHL - EN 10210
		12	0.300	0.00	0.00	0.00	0.00	0.00	0.00	
	LC2	13	0.000	0.00	0.00	0.00	0.00	0.00	0.00	
		12	0.300	0.00	0.00	0.00	0.00	0.00	0.00	
	LC3	13	0.000	0.00	0.00	0.00	0.00	0.00	0.00	
		12	0.300	0.00	0.00	0.00	0.00	0.00	0.00	
	LC4	13	0.000	0.00	0.00	0.00	0.00	0.00	0.00	
		12	0.300	0.00	0.00	0.00	0.00	0.00	0.00	
	LC5	13	0.000	0.00	0.00	0.00	0.00	0.00	0.00	
		12	0.300	0.00	0.00	0.00	0.00	0.00	0.00	
	LC6	13	0.000	0.00	0.00	0.00	0.00	0.00	0.00	
		12	0.300	0.00	0.00	0.00	0.00	0.00	0.00	
	LC7	13	0.000	-0.46	0.00	0.00	0.00	0.00	0.00	
		12	0.300	0.00	0.00	0.00	0.00	0.00	0.00	
	CO1	13	0.000	-0.46	0.00	-0.00	0.00	0.00	0.00	
		12	0.300	0.00	0.00	0.00	0.00	0.00	0.00	
	CO2	13	0.000	-0.46	-0.00	0.00	0.00	-0.00	0.00	
		12	0.300	0.00	0.00	0.00	0.00	0.00	0.00	
	CO3	13	0.000	-0.46	0.00	-0.00	0.00	0.00	0.00	
		12	0.300	0.00	0.00	0.00	0.00	0.00	0.00	
	CO4	13	0.000	-0.46	-0.00	0.00	0.00	-0.00	0.00	
		12	0.300	0.00	0.00	0.00	0.00	0.00	0.00	
16	LC1	10	0.000	-29.50	0.00	-193.28	0.00	26.94	-0.00	22 - RRO 300x200x12.5 | ALUKÖNIGSTAHL - EN 10210
		18	0.909	-29.50	0.00	-193.28	0.00	-148.69	-0.00	
	LC2	10	0.000	29.50	-0.00	193.28	-0.00	-26.94	0.00	
		18	0.909	29.50	-0.00	193.28	-0.00	148.69	0.00	
	LC3	10	0.000	-77.29	-0.00	102.96	0.00	-111.72	-0.00	
		18	0.909	-77.29	-0.00	102.96	0.00	-18.16	0.00	
	LC4	10	0.000	77.29	0.00	-102.96	-0.00	111.72	0.00	
		18	0.909	77.29	0.00	-102.96	-0.00	18.16	-0.00	
	LC5	10	0.000	0.00	0.00	-0.00	0.00	0.00	0.00	
		18	0.909	0.00	0.00	-0.00	0.00	-0.00	0.00	
	LC6	10	0.000	-0.00	0.00	0.00	0.00	-0.00	0.00	
		18	0.909	-0.00	0.00	0.00	0.00	0.00	0.00	
	LC7	10	0.000	-0.80	-0.00	2.02	-0.00	-1.20	-0.00	
		18	0.909	-0.80	-0.00	1.19	-0.00	0.26	0.00	
	CO1	10	0.000	-107.64	-0.00	-88.48	0.00	-85.94	-0.00	
		18	0.909	-107.98	-0.00	-88.90	0.00	-166.56	-0.00	
	CO2	10	0.000	48.11	0.00	-293.98	0.00	137.44	0.00	
		18	0.909	48.15	0.00	-294.81	0.00	-130.02	-0.00	
	CO3	10	0.000	-47.43	-0.00	298.51	-0.00	-139.87	-0.00	
		18	0.909	-47.40	-0.00	297.68	-0.00	131.05	0.00	
	CO4	10	0.000	105.95	0.00	92.15	-0.00	83.64	0.00	
		18	0.909	105.60	0.00	91.72	-0.00	167.14	0.00	
17	LC1	18	0.000	128.00	0.00	79.52	-0.00	-148.69	0.00	22 - RRO 300x200x12.5 | ALUKÖNIGSTAHL - EN 10210
		8	1.976	128.00	0.00	79.52	-0.00	8.42	0.00	

	LC2	18	0.000	-128.00	-0.00	-79.52	0.00	148.69	-0.00	
		8	1.976	-128.00	-0.00	-79.52	0.00	-8.42	-0.00	
	LC3	18	0.000	-77.29	0.00	102.96	-0.00	-18.16	0.00	
		8	1.976	-77.29	0.00	102.96	-0.00	185.27	-0.00	
	LC4	18	0.000	77.29	-0.00	-102.96	0.00	18.16	-0.00	
		8	1.976	77.29	-0.00	-102.96	0.00	-185.27	0.00	
	LC5	18	0.000	0.00	0.00	-0.00	0.00	-0.00	0.00	
		8	1.976	0.00	0.00	-0.00	0.00	-0.00	0.00	
	LC6	18	0.000	-0.00	0.00	0.00	0.00	0.00	0.00	
		8	1.976	-0.00	0.00	0.00	0.00	0.00	0.00	
	LC7	18	0.000	-0.80	0.00	1.19	0.00	0.26	0.00	
		8	1.976	-0.80	0.00	-0.63	0.00	0.81	-0.00	
	CO1	18	0.000	49.88	0.00	183.69	-0.00	-166.56	0.00	
		8	1.976	49.71	0.00	181.92	-0.00	194.39	-0.00	
	CO2	18	0.000	204.10	-0.00	-21.12	-0.00	-130.02	0.00	
		8	1.976	203.87	-0.00	-24.98	-0.00	-175.45	0.00	
	CO3	18	0.000	-206.48	0.00	25.80	0.00	131.05	-0.00	
		8	1.976	-206.73	0.00	21.87	0.00	178.27	-0.00	
	CO4	18	0.000	-51.55	-0.00	-181.28	0.00	167.14	-0.00	
		8	1.976	-51.70	-0.00	-183.05	0.00	-193.01	0.00	
18	LC1	6	0.000	-29.50	-0.00	-193.28	-0.00	26.94	-0.00	22 - RRO 300x200x12.5 | ALUKÖNIGSTAHL - EN 10210
		19	0.909	-29.50	-0.00	-193.28	-0.00	-148.69	0.00	
	LC2	6	0.000	29.50	0.00	193.28	0.00	-26.94	0.00	
		19	0.909	29.50	0.00	193.28	0.00	148.69	-0.00	
	LC3	6	0.000	-77.29	-0.00	102.96	0.00	-111.72	-0.00	
		19	0.909	-77.29	-0.00	102.96	0.00	-18.16	0.00	
	LC4	6	0.000	77.29	0.00	-102.96	-0.00	111.72	0.00	
		19	0.909	77.29	0.00	-102.96	-0.00	18.16	-0.00	
	LC5	6	0.000	0.00	0.00	-0.00	0.00	0.00	0.00	
		19	0.909	0.00	0.00	-0.00	0.00	-0.00	0.00	
	LC6	6	0.000	-0.00	0.00	0.00	0.00	-0.00	0.00	
		19	0.909	-0.00	0.00	0.00	0.00	0.00	0.00	
	LC7	6	0.000	-0.80	-0.00	2.02	0.00	-1.20	-0.00	
		19	0.909	-0.80	-0.00	1.19	0.00	0.26	0.00	
	CO1	6	0.000	-107.64	-0.00	-88.48	0.00	-85.94	-0.00	
		19	0.909	-107.98	-0.00	-88.90	0.00	-166.56	0.00	
	CO2	6	0.000	48.11	-0.00	-293.98	-0.00	137.44	-0.00	
		19	0.909	48.15	-0.00	-294.81	-0.00	-130.02	0.00	
	CO3	6	0.000	-47.43	0.00	298.51	0.00	-139.87	0.00	
		19	0.909	-47.40	0.00	297.68	0.00	131.05	-0.00	
	CO4	6	0.000	105.95	0.00	92.16	-0.00	83.64	0.00	
		19	0.909	105.60	0.00	91.72	-0.00	167.14	-0.00	
19	LC1	19	0.000	128.00	-0.00	79.52	0.00	-148.69	-0.00	22 - RRO 300x200x12.5 | ALUKÖNIGSTAHL - EN 10210
		5	1.976	128.00	-0.00	79.52	0.00	8.42	0.00	
	LC2	19	0.000	-128.00	0.00	-79.52	-0.00	148.69	0.00	
		5	1.976	-128.00	0.00	-79.52	-0.00	-8.42	-0.00	
	LC3	19	0.000	-77.29	0.00	102.96	0.00	-18.16	0.00	
		5	1.976	-77.29	0.00	102.96	0.00	185.27	-0.00	
	LC4	19	0.000	77.29	-0.00	-102.96	-0.00	18.16	-0.00	
		5	1.976	77.29	-0.00	-102.96	-0.00	-185.27	0.00	
	LC5	19	0.000	0.00	0.00	-0.00	0.00	-0.00	0.00	
		5	1.976	0.00	0.00	-0.00	0.00	-0.00	0.00	
	LC6	19	0.000	-0.00	0.00	0.00	0.00	0.00	0.00	
		5	1.976	-0.00	0.00	0.00	0.00	0.00	0.00	
	LC7	19	0.000	-0.80	0.00	1.19	0.00	0.26	0.00	
		5	1.976	-0.80	0.00	-0.63	0.00	0.81	-0.00	
	CO1	19	0.000	49.88	-0.00	183.69	0.00	-166.56	-0.00	
		5	1.976	49.71	-0.00	181.92	0.00	194.39	0.00	
	CO2	19	0.000	204.10	-0.00	-21.12	-0.00	-130.02	-0.00	
		5	1.976	203.87	-0.00	-24.98	-0.00	-175.45	0.00	
	CO3	19	0.000	-206.48	0.00	25.80	0.00	131.05	0.00	
		5	1.976	-206.73	0.00	21.87	0.00	178.27	-0.00	
	CO4	19	0.000	-51.55	0.00	-181.28	-0.00	167.14	0.00	
		5	1.976	-51.70	0.00	-183.05	-0.00	-193.01	-0.00	
20	LC1	8	0.000	128.00	-0.00	79.52	-0.00	8.42	-0.00	22 - RRO 300x200x12.5 | ALUKÖNIGSTAHL - EN 10210
		7	1.516	128.00	-0.00	79.52	-0.00	128.93	0.00	
	LC2	8	0.000	-128.00	0.00	-79.52	0.00	-8.42	0.00	
		7	1.516	-128.00	0.00	-79.52	0.00	-128.93	-0.00	
	LC3	8	0.000	-77.29	0.00	-212.04	0.00	185.27	0.00	
		7	1.516	-77.29	0.00	-212.04	0.00	-136.08	-0.00	
	LC4	8	0.000	77.29	-0.00	212.04	-0.00	-185.27	-0.00	
		7	1.516	77.29	-0.00	212.04	-0.00	136.08	0.00	
	LC5	8	0.000	0.00	0.00	-0.00	0.00	-0.00	0.00	
		7	1.516	0.00	0.00	-0.00	0.00	-0.00	0.00	
	LC6	8	0.000	-0.00	0.00	0.00	0.00	0.00	0.00	

		7	1.516	-0.00	0.00	0.00	0.00	0.00	0.00	
	LC7	8	0.000	-0.80	0.00	-0.63	0.00	0.81	0.00	
		7	1.516	-0.80	0.00	-2.02	0.00	-1.20	-0.00	
	CO1	8	0.000	49.58	-0.00	-133.08	0.00	194.39	-0.00	
		7	1.516	50.22	-0.00	-134.24	0.00	-8.09	0.00	
	CO2	8	0.000	205.23	-0.00	290.02	-0.00	-175.45	-0.00	
		7	1.516	204.59	-0.00	289.08	-0.00	262.63	0.00	
	CO3	8	0.000	-205.33	0.00	-293.13	0.00	178.27	0.00	
		7	1.516	-205.99	0.00	-294.06	0.00	-267.44	-0.00	
	CO4	8	0.000	-51.84	0.00	131.95	-0.00	-193.01	0.00	
		7	1.516	-51.22	0.00	130.80	-0.00	6.18	-0.00	
21	LC1	5	0.000	128.00	0.00	79.52	0.00	8.42	0.00	22 - RRO 300x200x12.5 | ALUKÖNIGSTAHL - EN 10210
		3	1.516	128.00	0.00	79.52	0.00	128.93	-0.00	
	LC2	5	0.000	-128.00	-0.00	-79.52	-0.00	-8.42	-0.00	
		3	1.516	-128.00	-0.00	-79.52	-0.00	-128.93	0.00	
	LC3	5	0.000	-77.29	-0.00	-212.04	-0.00	185.27	-0.00	
		3	1.516	-77.29	-0.00	-212.04	-0.00	-136.08	0.00	
	LC4	5	0.000	77.29	0.00	212.04	0.00	-185.27	0.00	
		3	1.516	77.29	0.00	212.04	0.00	136.08	-0.00	
	LC5	5	0.000	0.00	0.00	-0.00	0.00	-0.00	0.00	
		3	1.516	0.00	0.00	-0.00	0.00	-0.00	0.00	
	LC6	5	0.000	-0.00	0.00	0.00	0.00	0.00	0.00	
		3	1.516	-0.00	0.00	0.00	0.00	0.00	0.00	
	LC7	5	0.000	-0.80	-0.00	-0.63	-0.00	0.81	-0.00	
		3	1.516	-0.80	-0.00	-2.02	-0.00	-1.20	0.00	
	CO1	5	0.000	49.58	0.00	-133.08	-0.00	194.39	-0.00	
		3	1.516	50.22	0.00	-134.24	-0.00	-8.09	-0.00	
	CO2	5	0.000	205.23	0.00	290.02	0.00	-175.45	0.00	
		3	1.516	204.59	0.00	289.08	0.00	262.63	-0.00	
	CO3	5	0.000	-205.33	-0.00	-293.13	-0.00	178.27	-0.00	
		3	1.516	-205.99	-0.00	-294.06	-0.00	-267.44	0.00	
	CO4	5	0.000	-51.84	-0.00	131.95	0.00	-193.01	-0.00	
		3	1.516	-51.22	-0.00	130.80	0.00	6.18	0.00	
22	LC1	50	0.000	0.61	-0.00	1.42	-0.00	0.93	0.00	1 - BOX(A) 500/19/12/176/600/500/19/0/0
		11	1.516	11.33	-0.00	199.16	0.00	37.62	0.00	
	LC2	50	0.000	-0.61	0.00	-1.42	0.00	-0.93	-0.00	
		11	1.516	-11.33	0.00	-199.16	-0.00	-37.62	-0.00	
	LC3	50	0.000	0.68	-0.00	-2.48	0.00	-1.60	0.00	
		11	1.516	11.81	-0.00	92.73	-0.00	-0.73	0.00	
	LC4	50	0.000	-0.68	0.00	2.48	-0.00	1.60	-0.00	
		11	1.516	-11.81	0.00	-92.73	0.00	0.73	-0.00	
	LC5	50	0.000	0.00	0.00	-533.21	0.00	60.17	0.00	
		11	1.516	0.05	-0.00	3.31	0.00	-2.02	0.00	
	LC6	50	0.000	-0.00	0.00	533.21	-0.00	-60.17	0.00	
		11	1.516	-0.05	0.00	-3.31	-0.00	2.02	-0.00	
	LC7	50	0.000	-0.00	0.00	-0.02	0.00	-0.03	0.00	
		11	1.516	-0.02	-0.00	3.95	0.00	0.44	0.00	
	CO1	50	0.000	1.29	-0.00	532.12	-0.00	-60.88	0.00	
		11	1.516	23.27	-0.00	292.14	0.00	39.20	0.00	
	CO2	50	0.000	-0.07	-0.00	-529.33	0.00	62.67	0.00	
		11	1.516	-0.57	-0.00	111.88	0.00	36.49	0.00	
	CO3	50	0.000	0.05	0.00	529.30	-0.00	-62.73	-0.00	
		11	1.516	0.29	0.00	-107.68	-0.00	-36.16	-0.00	
	CO4	50	0.000	-1.27	0.00	-532.19	0.00	60.81	-0.00	
		11	1.516	-22.93	0.00	-285.01	-0.00	-38.63	-0.00	
23	LC1	74	0.000	601.28	-0.00	63.83	-0.00	-129.18	-0.00	21 - RRO 350x300x16 | ALUKÖNIGSTAHL - EN 10210
		72	1.912	601.28	-0.00	63.83	-0.00	-7.11	0.00	
	LC2	74	0.000	-601.28	0.00	-63.83	0.00	129.18	0.00	
		72	1.912	-601.28	0.00	-63.83	0.00	7.11	-0.00	
	LC3	74	0.000	39.48	-0.00	-2.47	-0.00	-21.07	0.00	
		72	1.912	39.48	-0.00	-2.47	-0.00	-25.79	0.00	
	LC4	74	0.000	-39.48	0.00	2.47	0.00	21.07	-0.00	
		72	1.912	-39.48	0.00	2.47	0.00	25.79	-0.00	
	LC5	74	0.000	-0.02	0.00	-0.01	0.00	0.00	-0.00	
		72	1.912	-0.02	0.00	-0.01	0.00	-0.03	-0.00	
	LC6	74	0.000	0.02	-0.00	0.01	0.00	-0.00	0.00	
		72	1.912	0.02	-0.00	0.01	0.00	0.03	0.00	
	LC7	74	0.000	-4.93	0.00	0.17	-0.00	-0.30	0.00	
		72	1.912	-7.86	0.00	0.17	-0.00	0.02	-0.00	
	CO1	74	0.000	636.12	-0.00	62.54	-0.00	-150.84	-0.00	
		72	1.912	633.34	-0.00	61.00	-0.00	-33.13	0.00	
	CO2	74	0.000	556.80	-0.00	66.19	-0.00	-107.39	-0.00	
		72	1.912	553.95	-0.00	65.53	-0.00	18.18	0.00	
	CO3	74	0.000	-566.76	0.00	-66.39	0.00	108.86	0.00	
		72	1.912	-569.61	0.00	-67.06	0.00	-19.15	-0.00	
	CO4	74	0.000	-645.48	0.00	-60.22	0.00	149.69	0.00	

		72	1.912	-648.26	0.00	-61.78	0.00	32.61	-0.00	
24	LC1	15	0.000	48.59	-0.00	-104.73	-0.00	16.36	-0.00	1 - BOX(A) 500/19/12/176/600/500/19/0/0
		72	1.200	28.39	-0.00	-290.04	0.00	-30.80	0.00	
	LC2	15	0.000	-48.59	0.00	104.73	0.00	-16.36	0.00	
		72	1.200	-28.39	0.00	290.04	-0.00	30.80	-0.00	
	LC3	15	0.000	56.90	-0.00	-117.56	-0.00	15.53	-0.00	
		72	1.200	5.52	-0.00	-1.50	0.00	9.79	0.00	
	LC4	15	0.000	-56.90	0.00	117.56	0.00	-15.53	0.00	
		72	1.200	-5.52	0.00	1.50	-0.00	-9.79	-0.00	
	LC5	15	0.000	-0.01	0.00	-0.04	0.00	-0.02	0.00	
		72	1.200	-0.01	0.00	-0.29	-0.00	-0.18	-0.00	
	LC6	15	0.000	0.01	-0.00	0.04	0.00	0.02	0.00	
		72	1.200	0.01	-0.00	0.29	0.00	0.18	0.00	
	LC7	15	0.000	0.67	-0.00	-2.09	0.00	0.31	0.00	
		72	1.200	0.14	-0.00	3.84	-0.00	0.43	0.00	
	CO1	15	0.000	106.13	-0.00	-224.75	-0.00	32.38	-0.00	
		72	1.200	33.86	-0.00	-287.48	0.00	-20.27	0.00	
	CO2	15	0.000	-7.63	-0.00	10.84	0.00	1.10	-0.00	
		72	1.200	22.67	-0.00	-284.67	-0.00	-40.10	0.00	
	CO3	15	0.000	8.99	0.00	-14.73	-0.00	-0.53	0.00	
		72	1.200	-23.07	0.00	292.98	0.00	41.44	-0.00	
	CO4	15	0.000	-104.87	0.00	219.80	0.00	-31.46	0.00	
		72	1.200	-33.99	0.00	295.06	-0.00	21.39	-0.00	
25	LC1	75	0.000	159.03	-0.00	-256.00	0.00	154.93	-0.00	21 - RRO 350x300x16 | ALUKÖNIGSTAHL - EN 10210
		13	1.612	159.03	-0.00	-256.00	0.00	-257.87	0.00	
	LC2	75	0.000	-159.03	0.00	256.00	-0.00	-154.93	0.00	
		13	1.612	-159.03	0.00	256.00	-0.00	257.87	-0.00	
	LC3	75	0.000	-424.08	0.00	154.58	0.00	22.91	0.00	
		13	1.612	-424.08	0.00	154.58	0.00	272.17	0.00	
	LC4	75	0.000	424.08	-0.00	-154.58	-0.00	-22.91	-0.00	
		13	1.612	424.08	-0.00	-154.58	-0.00	-272.17	-0.00	
	LC5	75	0.000	-0.00	0.00	-0.00	0.00	0.01	0.00	
		13	1.612	-0.00	0.00	-0.00	0.00	0.01	0.00	
	LC6	75	0.000	0.00	-0.00	0.00	-0.00	-0.01	-0.00	
		13	1.612	0.00	-0.00	0.00	-0.00	-0.01	0.00	
	LC7	75	0.000	-6.97	0.00	1.61	-0.00	-0.20	0.00	
		13	1.612	-4.50	0.00	1.61	-0.00	2.40	-0.00	
	CO1	75	0.000	-271.62	0.00	-99.86	0.00	177.87	0.00	
		13	1.612	-268.94	0.00	-100.43	0.00	16.19	0.00	
	CO2	75	0.000	577.01	-0.00	-406.65	0.00	130.85	-0.00	
		13	1.612	577.69	-0.00	-409.18	0.00	-525.26	-0.00	
	CO3	75	0.000	-589.19	0.00	414.61	-0.00	-133.26	0.00	
		13	1.612	-588.57	0.00	411.97	-0.00	534.88	-0.00	
	CO4	75	0.000	258.46	-0.00	103.01	-0.00	-177.83	-0.00	
		13	1.612	261.15	-0.00	102.45	-0.00	-12.36	-0.00	
26	LC1	14	0.000	102.70	0.00	259.39	-0.00	-31.62	0.00	1 - BOX(A) 500/19/12/176/600/500/19/0/0
		2	0.800	14.59	-0.00	-0.02	0.00	0.01	0.00	
	LC2	14	0.000	-102.70	-0.00	-259.39	0.00	31.62	-0.00	
		2	0.800	-14.59	0.00	0.02	0.00	-0.01	-0.00	
	LC3	14	0.000	-44.54	-0.00	-105.66	0.00	13.63	-0.00	
		2	0.800	-6.33	-0.00	0.00	0.00	-0.03	0.00	
	LC4	14	0.000	44.54	0.00	105.66	-0.00	-13.63	0.00	
		2	0.800	6.33	0.00	-0.00	0.00	0.03	-0.00	
	LC5	14	0.000	0.05	0.00	0.56	-0.00	-0.23	0.00	
		2	0.800	0.01	0.00	0.00	0.00	0.01	0.00	
	LC6	14	0.000	-0.05	-0.00	-0.56	0.00	0.23	0.00	
		2	0.800	-0.01	0.00	-0.00	0.00	-0.01	0.00	
	LC7	14	0.000	-0.60	-0.00	-1.69	-0.00	0.09	-0.00	
		2	0.800	-0.08	0.00	0.00	0.00	-0.01	0.00	
	CO1	14	0.000	57.50	0.00	151.38	-0.00	-17.67	-0.00	
		2	0.800	8.17	-0.00	-0.01	0.00	-0.03	0.00	
	CO2	14	0.000	146.22	0.00	362.38	-0.00	-45.29	0.00	
		2	0.800	20.78	-0.00	-0.02	0.00	0.04	0.00	
	CO3	14	0.000	-148.38	-0.00	-368.90	0.00	45.66	-0.00	
		2	0.800	-21.08	0.00	0.02	0.00	-0.05	-0.00	
	CO4	14	0.000	-58.72	-0.00	-154.98	0.00	17.85	0.00	
		2	0.800	-8.34	0.00	0.02	0.00	0.01	-0.00	
27	LC1	15	0.000	-247.16	0.00	10.08	-0.00	-2.92	0.00	17 - RRO 200x150x16 | ALUKÖNIGSTAHL - EN 10210
		74	2.258	-247.16	0.00	10.08	-0.00	19.83	-0.00	
	LC2	15	0.000	247.16	-0.00	-10.08	0.00	2.92	-0.00	
		74	2.258	247.16	-0.00	-10.08	0.00	-19.83	0.00	
	LC3	15	0.000	-288.71	-0.00	1.57	0.00	1.20	0.00	
		74	2.258	-288.71	-0.00	1.57	0.00	4.76	0.00	
	LC4	15	0.000	288.71	0.00	-1.57	-0.00	-1.20	-0.00	
		74	2.258	288.71	0.00	-1.57	-0.00	-4.76	-0.00	
	LC5	15	0.000	0.02	0.00	0.00	0.00	-0.00	0.00	

		74	2.258	0.02	0.00	0.00	0.00	0.00	0.00	
	LC6	15	0.000	-0.02	0.00	-0.00	0.00	0.00	0.00	
		74	2.258	-0.02	0.00	-0.00	0.00	-0.00	0.00	
	LC7	15	0.000	-4.16	-0.00	0.51	-0.00	-0.21	-0.00	
		74	2.258	-2.67	-0.00	-0.42	-0.00	-0.11	0.00	
	CO1	15	0.000	-540.55	0.00	12.50	-0.00	-2.11	0.00	
		74	2.258	-539.09	0.00	10.25	-0.00	24.18	0.00	
	CO2	15	0.000	37.38	0.00	8.90	-0.00	-4.25	0.00	
		74	2.258	38.86	0.00	8.01	-0.00	14.81	-0.00	
	CO3	15	0.000	-45.78	-0.00	-8.12	0.00	4.01	-0.00	
		74	2.258	-44.30	-0.00	-9.00	0.00	-15.34	0.00	
	CO4	15	0.000	531.32	-0.00	-10.81	0.00	1.33	-0.00	
		74	2.258	532.77	-0.00	-13.04	0.00	-25.00	-0.00	
28	LC1	75	0.000	596.38	-0.00	10.82	-0.00	-22.58	-0.00	17 - RRO 200x150x16 | ALUKÖNIGSTAHL - EN 10210
		14	2.258	596.38	-0.00	10.82	-0.00	1.85	-0.00	
	LC2	75	0.000	-596.38	0.00	-10.82	0.00	22.58	0.00	
		14	2.258	-596.38	0.00	-10.82	0.00	-1.85	0.00	
	LC3	75	0.000	-243.00	0.00	1.58	-0.00	-1.50	0.00	
		14	2.258	-243.00	0.00	1.58	-0.00	2.07	0.00	
	LC4	75	0.000	243.00	-0.00	-1.58	0.00	1.50	-0.00	
		14	2.258	243.00	-0.00	-1.58	0.00	-2.07	-0.00	
	LC5	75	0.000	0.26	0.00	-0.01	0.00	0.01	0.00	
		14	2.258	0.26	0.00	-0.01	0.00	-0.00	-0.00	
	LC6	75	0.000	-0.26	-0.00	0.01	0.00	-0.01	0.00	
		14	2.258	-0.26	-0.00	0.01	0.00	0.00	0.00	
	LC7	75	0.000	-2.67	0.00	0.42	-0.00	-0.11	0.00	
		14	2.258	-4.16	0.00	-0.51	-0.00	-0.21	-0.00	
	CO1	75	0.000	350.22	0.00	13.45	-0.00	-24.41	0.00	
		14	2.258	348.76	0.00	11.76	-0.00	3.63	0.00	
	CO2	75	0.000	833.22	-0.00	10.88	0.00	-21.40	-0.00	
		14	2.258	831.76	-0.00	8.07	0.00	-0.74	-0.00	
	CO3	75	0.000	-846.22	0.00	-7.54	-0.00	20.72	0.00	
		14	2.258	-847.68	0.00	-10.41	-0.00	-0.31	0.00	
	CO4	75	0.000	-356.08	-0.00	-11.35	0.00	23.77	-0.00	
		14	2.258	-357.54	-0.00	-13.05	0.00	-4.21	-0.00	

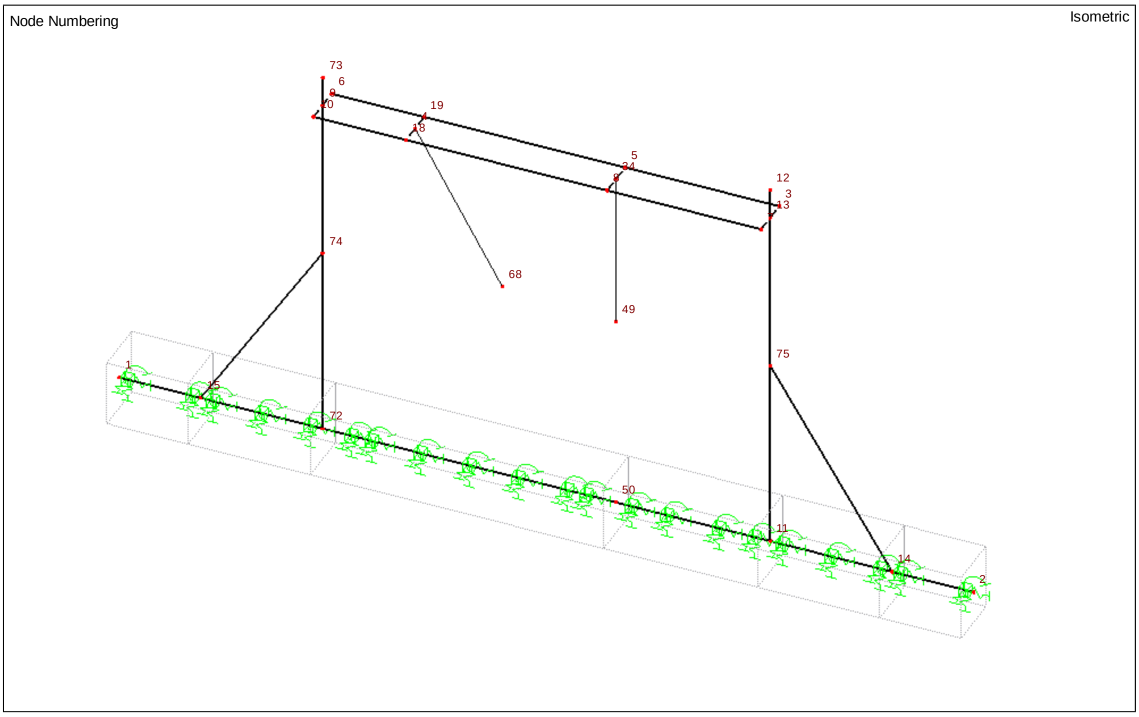
Members - Contact Forces

Member		Node	Location	Contact Forces [kN/m]			Moments	
No.	LC/CO	No.	x [m]	p_x	p_y	p_z	m_x [kNm/m]	Section
1	LC1	1	0.000	-42.675	0.000	-24.668	0.000	1 - BOX(A) 500/19/12/176/600/500/19/0/0
		15	0.800	-105.274	0.000	358.526	0.000	
	LC2	1	0.000	42.675	0.000	24.668	0.000	
		15	0.800	105.274	0.000	-358.526	0.000	
	LC3	1	0.000	-54.739	0.000	1.643	0.000	
		15	0.800	-136.676	0.000	409.019	0.000	
	LC4	1	0.000	54.739	0.000	-1.643	0.000	
		15	0.800	136.676	0.000	-409.019	0.000	
	LC5	1	0.000	0.005	0.000	-0.105	0.000	
		15	0.800	0.011	0.000	-0.096	0.000	
	LC6	1	0.000	-0.005	0.000	0.105	0.000	
		15	0.800	-0.011	0.000	0.096	0.000	
	LC7	1	0.000	-0.635	0.000	1.818	0.000	
		15	0.800	-1.581	0.000	8.774	0.000	
	CO1	1	0.000	-98.058	0.000	-43.313	0.000	
		15	0.800	-243.563	0.000	777.485	0.000	
	CO2	1	0.000	11.368	0.000	-4.480	0.000	
		15	0.800	29.653	0.000	-41.770	0.000	
	CO3	1	0.000	-12.769	0.000	8.826	0.000	
		15	0.800	-33.178	0.000	59.401	0.000	
	CO4	1	0.000	96.791	0.000	45.104	0.000	
		15	0.800	240.387	0.000	-757.909	0.000	
8	LC1	72	0.000	45.160	0.000	-965.906	0.001	1 - BOX(A) 500/19/12/176/600/500/19/0/0
		50	2.884	1.262	0.000	2.786	0.000	
	LC2	72	0.000	-45.160	0.000	965.906	-0.001	
		50	2.884	-1.262	0.000	-2.786	0.000	
	LC3	72	0.000	-13.638	0.000	-66.645	0.000	
		50	2.884	1.187	0.000	-4.537	0.000	
	LC4	72	0.000	13.638	0.000	66.645	0.000	
		50	2.884	-1.187	0.000	4.537	0.000	
	LC5	72	0.000	-0.010	0.000	-0.548	0.000	
		50	2.884	0.005	0.000	1716.930	0.000	
	LC6	72	0.000	0.010	0.000	0.548	0.000	
		50	2.884	-0.005	0.000	-1716.930	0.000	

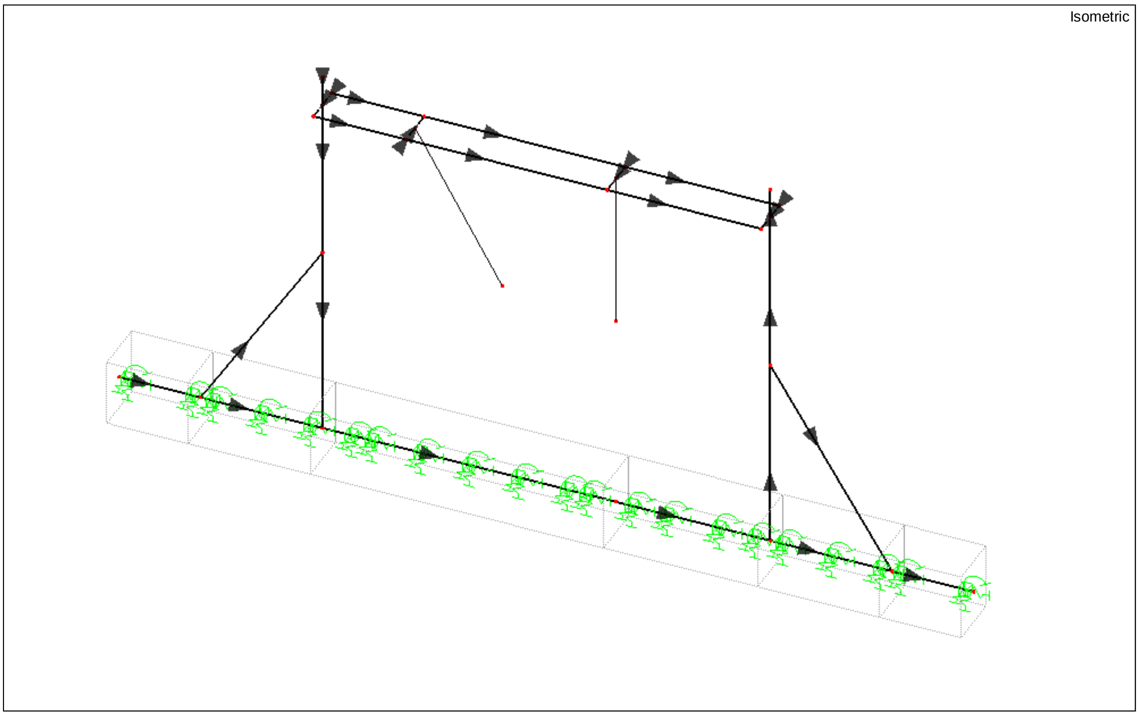
	LC7	72	0.000	0.008	0.000	15.190	0.000	
		50	2.884	-0.002	0.000	2.511	0.000	
	CO1	72	0.000	31.063	0.000	-1017.480	0.001	
		50	2.884	2.462	0.000	-1716.200	0.000	
	CO2	72	0.000	58.013	0.000	-884.712	0.000	
		50	2.884	0.066	0.000	1726.750	0.000	
	CO3	72	0.000	-59.589	0.000	914.898	0.000	
		50	2.884	-0.096	0.000	-1721.750	0.000	
	CO4	72	0.000	-32.024	0.000	1046.620	-0.001	
		50	2.884	-2.428	0.000	1721.160	0.000	
9	LC1	11	0.000	34.861	0.000	589.156	0.000	1 - BOX(A) 500/19/12/176/600/500/19/0/0
		14	1.200	-272.165	0.000	-849.855	0.000	
	LC2	11	0.000	-34.861	0.000	-589.156	0.000	
		14	1.200	272.165	0.000	849.855	0.000	
	LC3	11	0.000	31.236	0.000	362.811	0.000	
		14	1.200	118.959	0.000	340.759	0.000	
	LC4	11	0.000	-31.236	0.000	-362.811	0.000	
		14	1.200	-118.959	0.000	-340.759	0.000	
	LC5	11	0.000	0.114	0.000	-4.899	0.000	
		14	1.200	-0.118	0.000	-0.983	0.000	
	LC6	11	0.000	-0.114	0.000	4.899	0.000	
		14	1.200	0.118	0.000	0.983	0.000	
	LC7	11	0.000	-0.056	0.000	15.668	0.000	
		14	1.200	1.581	0.000	8.774	0.000	
	CO1	11	0.000	52.606	0.000	971.844	0.000	
		14	1.200	-151.467	0.000	-498.871	0.000	
	CO2	11	0.000	-10.345	0.000	231.395	-0.001	
		14	1.200	-388.412	0.000	-1176.950	0.000	
	CO3	11	0.000	9.838	0.000	-211.698	0.001	
		14	1.200	394.129	0.000	1206.460	0.000	
	CO4	11	0.000	-51.702	0.000	-941.953	0.000	
		14	1.200	154.729	0.000	517.438	0.000	
22	LC1	50	0.000	1.262	0.000	2.786	0.000	1 - BOX(A) 500/19/12/176/600/500/19/0/0
		11	1.516	21.020	0.000	589.156	0.000	
	LC2	50	0.000	-1.262	0.000	-2.786	0.000	
		11	1.516	-21.020	0.000	-589.156	0.000	
	LC3	50	0.000	1.187	0.000	-4.537	0.000	
		11	1.516	31.236	0.000	362.811	0.000	
	LC4	50	0.000	-1.187	0.000	4.537	0.000	
		11	1.516	-31.236	0.000	-362.811	0.000	
	LC5	50	0.000	0.005	0.000	1716.930	0.000	
		11	1.516	0.114	0.000	-4.899	0.000	
	LC6	50	0.000	-0.005	0.000	-1716.930	0.000	
		11	1.516	-0.114	0.000	4.899	0.000	
	LC7	50	0.000	-0.002	0.000	2.511	0.000	
		11	1.516	-0.007	0.000	15.668	0.000	
	CO1	50	0.000	2.462	0.000	-1716.200	0.000	
		11	1.516	52.606	0.000	971.844	0.000	
	CO2	50	0.000	0.053	0.000	1726.750	0.000	
		11	1.516	-10.345	0.000	231.395	-0.001	
	CO3	50	0.000	-0.096	0.000	-1721.750	0.000	
		11	1.516	9.838	0.000	-211.698	0.001	
	CO4	50	0.000	-2.428	0.000	1721.160	0.000	
		11	1.516	-51.702	0.000	-941.953	0.000	
24	LC1	15	0.000	-105.274	0.000	358.526	0.000	1 - BOX(A) 500/19/12/176/600/500/19/0/0
		72	1.200	45.160	0.000	-965.906	0.001	
	LC2	15	0.000	105.274	0.000	-358.526	0.000	
		72	1.200	-45.160	0.000	965.906	-0.001	
	LC3	15	0.000	-136.676	0.000	409.019	0.000	
		72	1.200	-13.638	0.000	-66.645	0.000	
	LC4	15	0.000	136.676	0.000	-409.019	0.000	
		72	1.200	13.638	0.000	66.645	0.000	
	LC5	15	0.000	0.011	0.000	-0.096	0.000	
		72	1.200	-0.010	0.000	-0.548	0.000	
	LC6	15	0.000	-0.011	0.000	0.096	0.000	
		72	1.200	0.010	0.000	0.548	0.000	
	LC7	15	0.000	-1.581	0.000	8.774	0.000	
		72	1.200	0.055	0.000	15.190	0.000	
	CO1	15	0.000	-243.563	0.001	777.485	0.000	
		72	1.200	31.063	0.000	-1017.480	0.001	
	CO2	15	0.000	29.653	0.000	-41.770	0.000	
		72	1.200	58.013	0.000	-884.712	0.000	
	CO3	15	0.000	-33.178	0.000	59.401	0.000	
		72	1.200	-59.589	0.000	914.898	0.000	
	CO4	15	0.000	240.387	-0.001	-757.909	0.000	
		72	1.200	-32.024	0.000	1046.620	-0.001	
26	LC1	14	0.000	-272.165	0.000	-849.855	0.000	1 - BOX(A) 500/19/12/176/600/500/19/0/0
		2	0.800	-109.447	0.000	55.636	0.000	

	LC2	14	0.000	272.165	0.000	849.855	0.000	
		2	0.800	109.447	0.000	-55.636	0.000	
	LC3	14	0.000	118.959	0.000	340.759	0.000	
		2	0.800	47.470	0.000	1.345	0.000	
	LC4	14	0.000	-118.959	0.000	-340.759	0.000	
		2	0.800	-47.470	0.000	-1.345	0.000	
	LC5	14	0.000	-0.118	0.000	-0.983	0.000	
		2	0.800	-0.048	0.000	-1.047	0.000	
	LC6	14	0.000	0.118	0.000	0.983	0.000	
		2	0.800	0.048	0.000	1.047	0.000	
	LC7	14	0.000	1.581	0.000	8.774	0.000	
		2	0.800	0.635	0.000	1.815	0.000	
	CO1	14	0.000	-151.467	0.000	-498.871	0.000	
		2	0.800	-61.281	0.000	41.632	0.000	
	CO2	14	0.000	-388.412	0.000	-1176.950	0.000	
		2	0.800	-155.827	0.000	71.031	0.000	
	CO3	14	0.000	394.129	0.000	1206.460	0.000	
		2	0.800	158.126	0.000	-70.724	0.000	
	CO4	14	0.000	154.729	0.000	517.438	0.000	
		2	0.800	62.583	0.000	-39.226	0.000	
Σ Supp.	LC1			-315.000	0.000	-545.596		
Σ Loads				-315.000	0.000	-545.596		
Σ Supp.	LC2			315.000	0.000	545.596		
Σ Loads				315.000	0.000	545.596		
Σ Supp.	LC3			0.000	0.000	630.000		
Σ Loads				0.000	0.000	630.000		
Σ Supp.	LC4			0.000	0.000	-630.000		
Σ Loads				0.000	0.000	-630.000		
Σ Supp.	LC5			0.000	0.000	1082.160		
Σ Loads				0.000	0.000	1082.160		
Σ Supp.	LC6			0.000	0.000	-1082.160		
Σ Loads				0.000	0.000	-1082.160		
Σ Supp.	LC7			0.000	0.000	44.725		
Σ Loads				0.000	0.000	44.725		
Σ Supp.	CO1			-315.000	0.000	-953.031		
Σ Loads				-315.000	0.000	-953.031		
Σ Supp.	CO2			-315.000	0.000	-48.711		
Σ Loads				-315.000	0.000	-48.711		
Σ Supp.	CO3			315.000	0.000	138.161		
Σ Loads				315.000	0.000	138.161		
Σ Supp.	CO4			315.000	0.000	1042.480		
Σ Loads				315.000	0.000	1042.480		

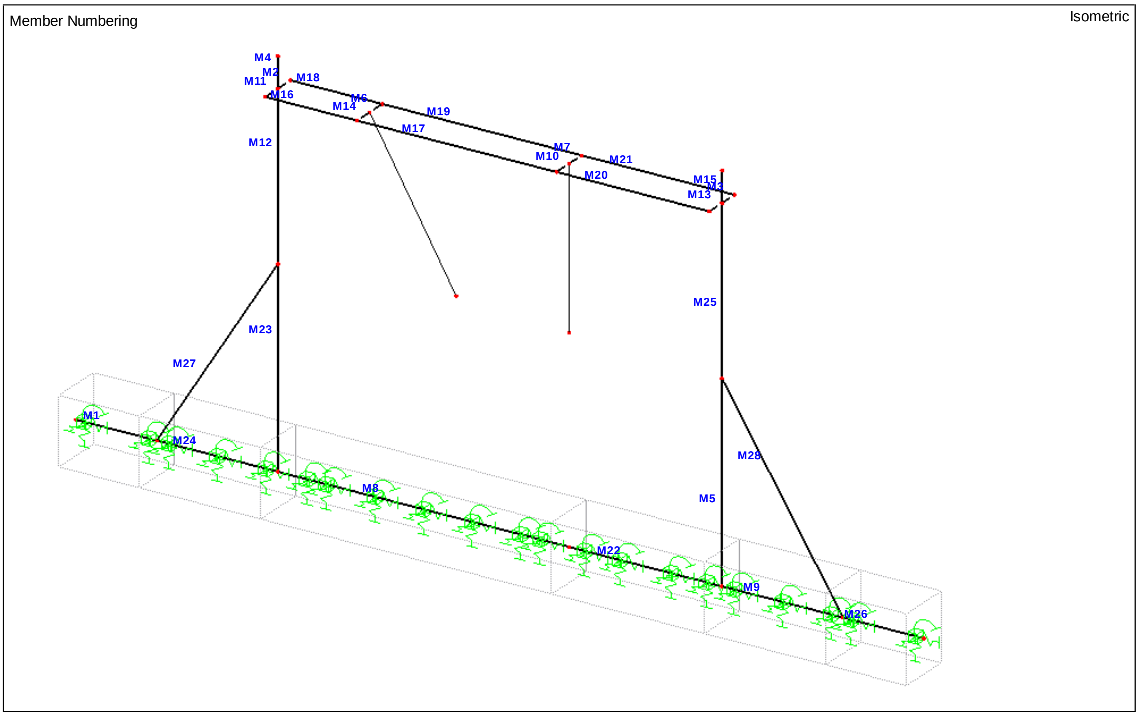
Node number



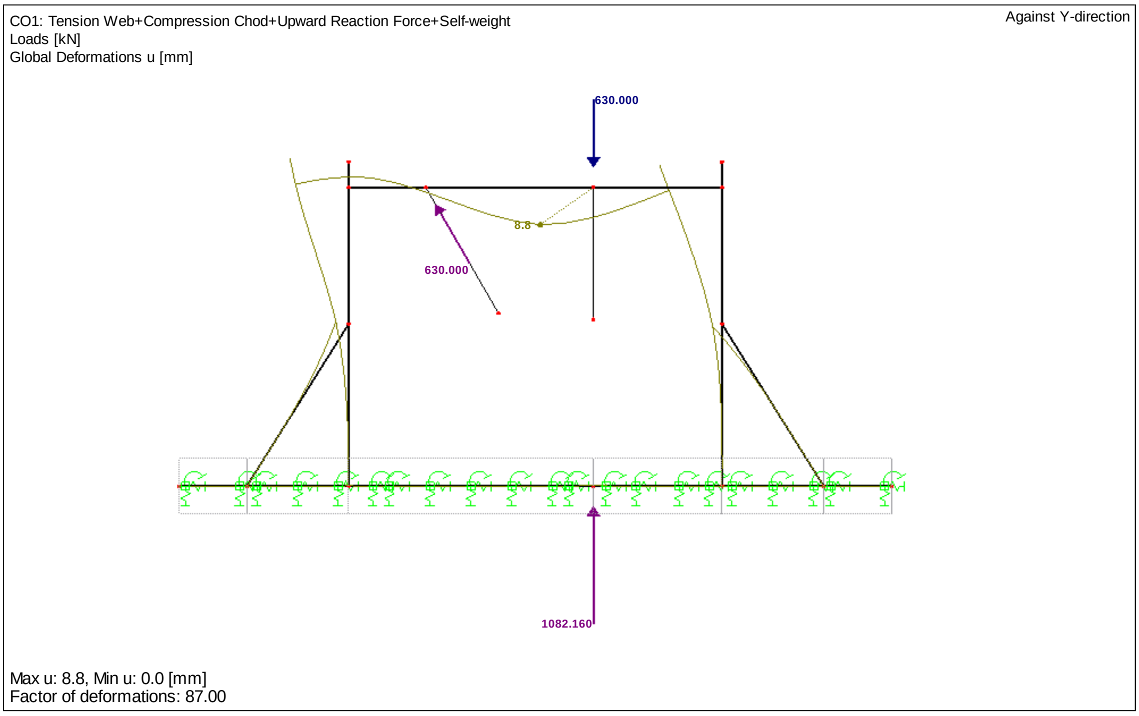
Member orientation

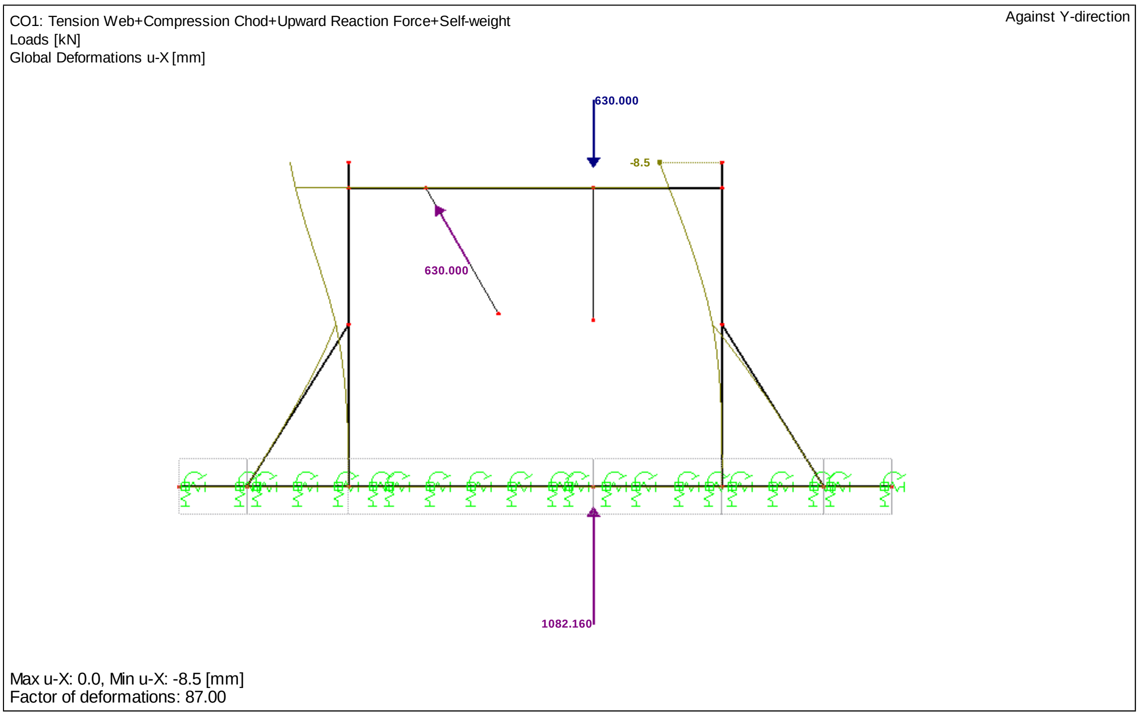


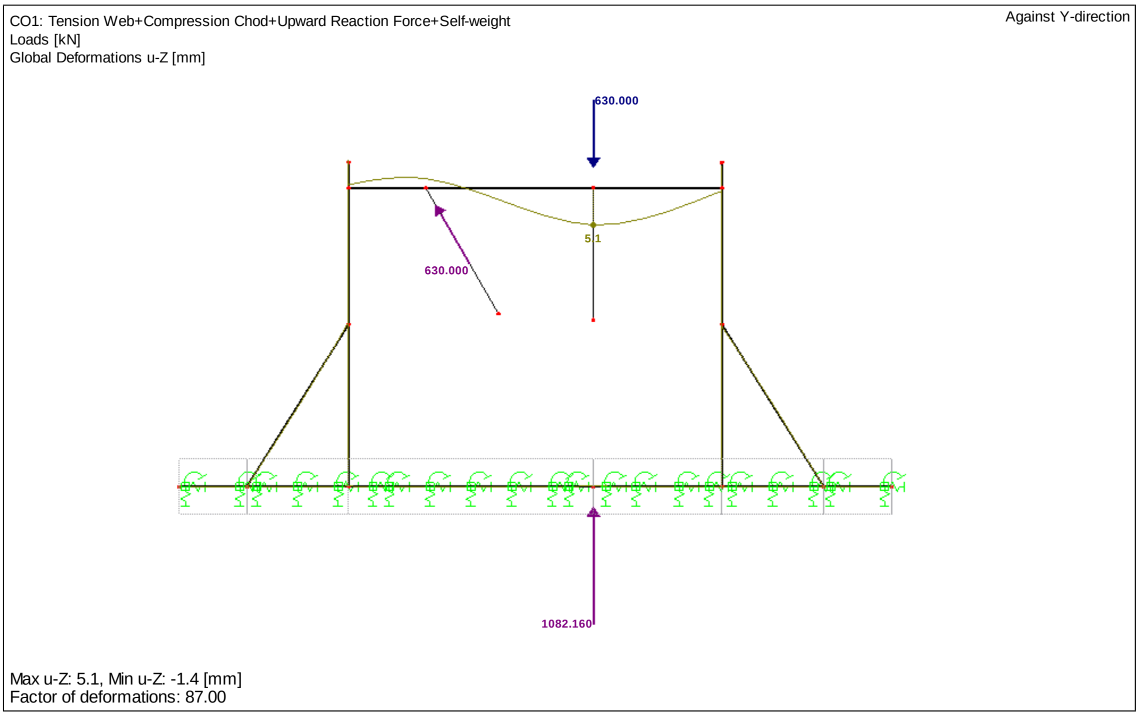
Member number

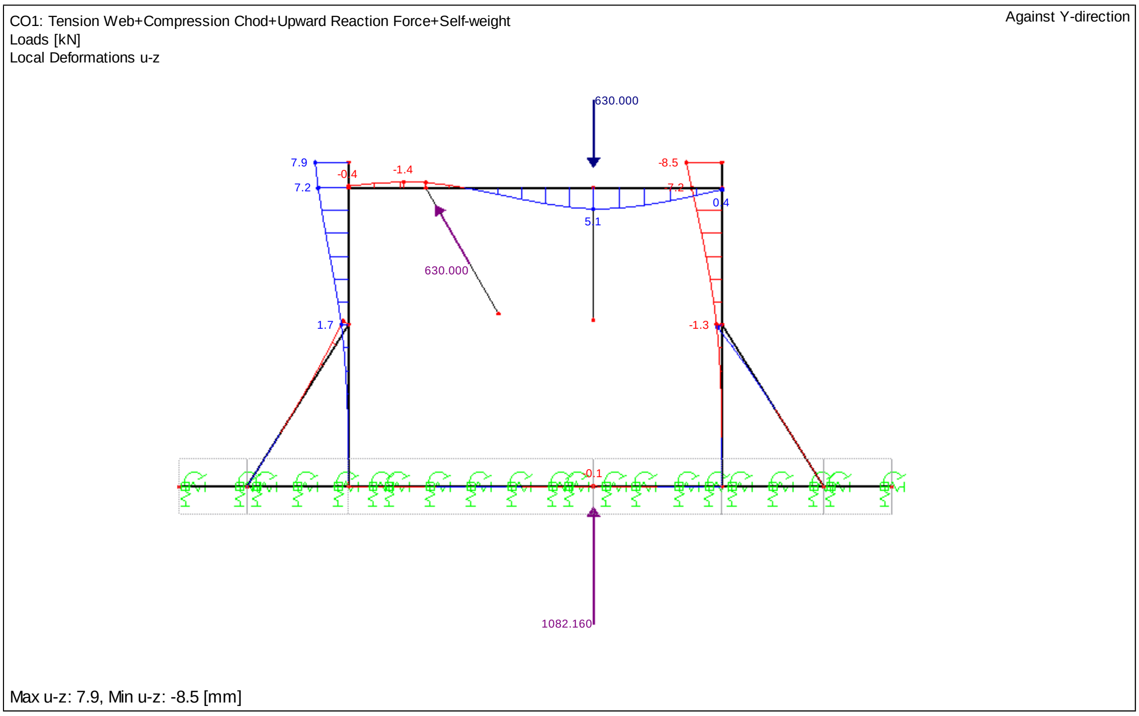


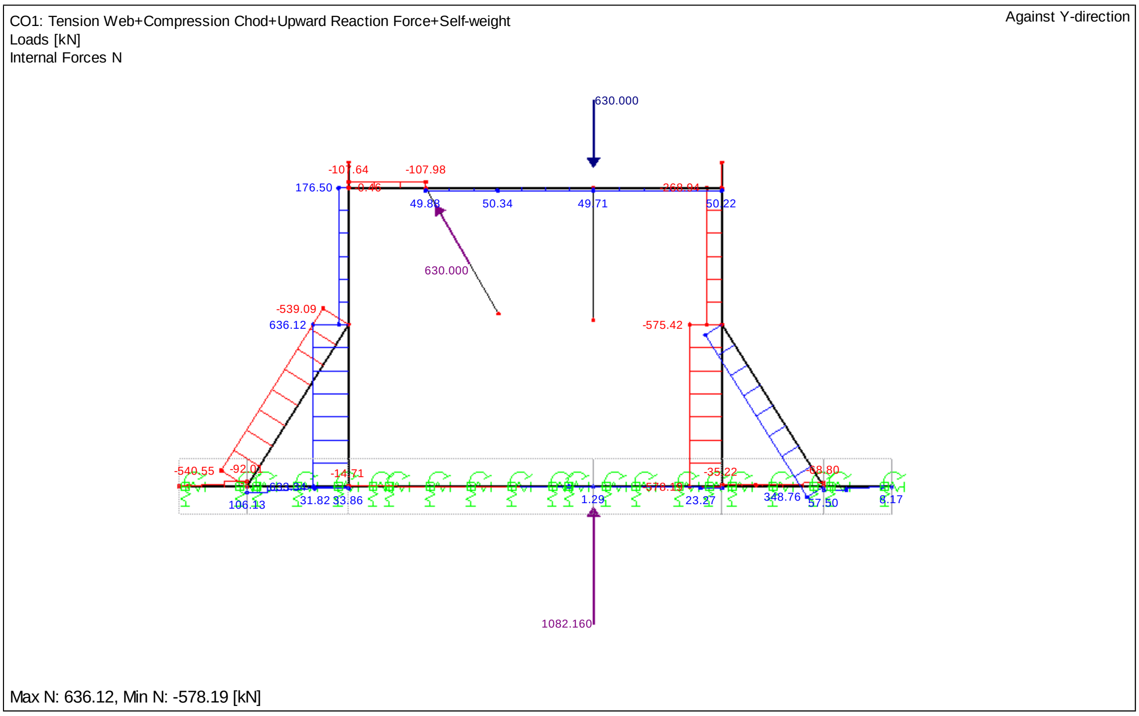
Load combination 1

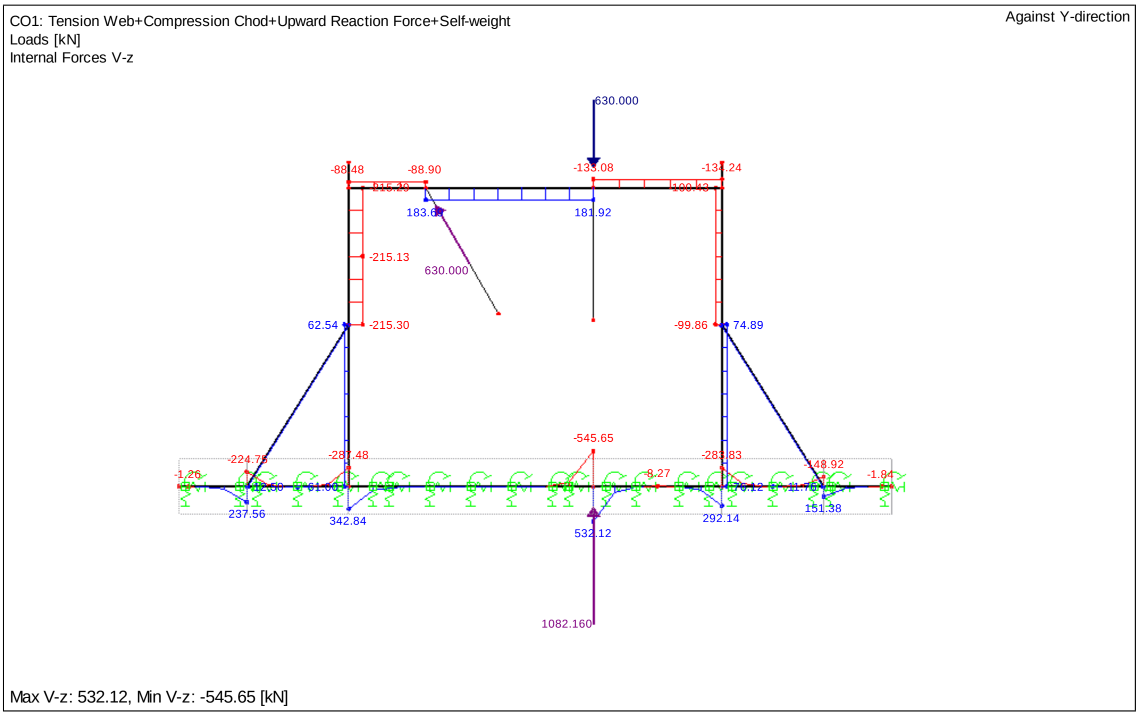


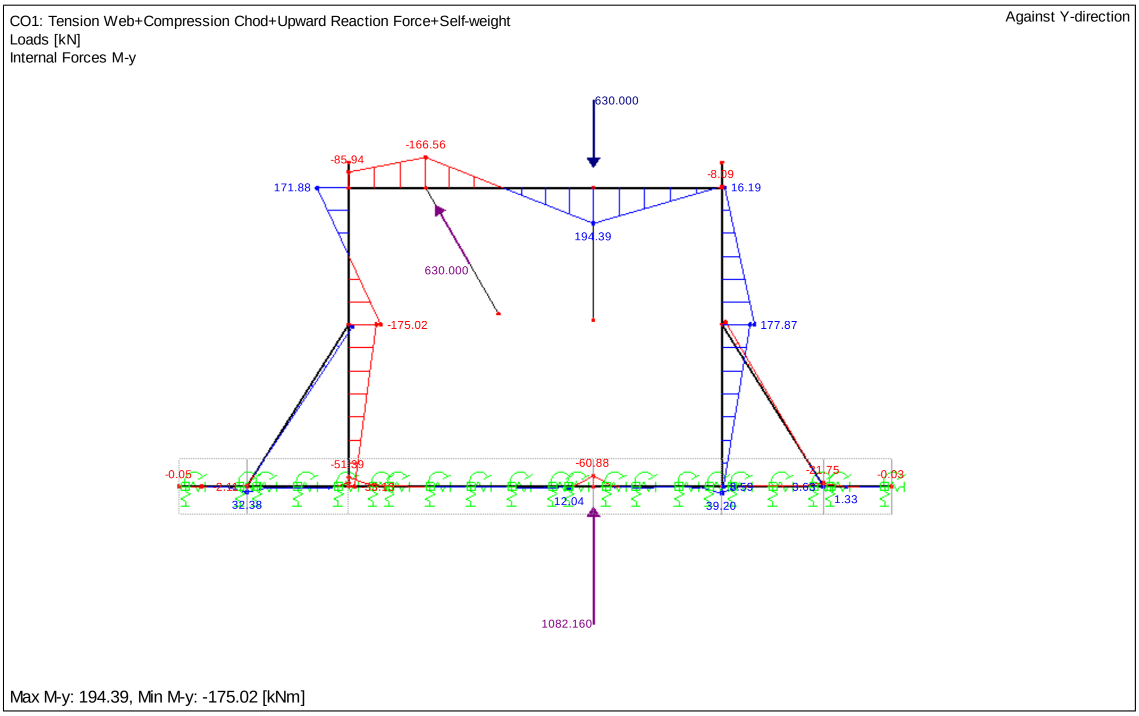

CO1: Tension Web+Compression Chod+Upward Reaction Force+Self-weight
Loads [kN]
Global Deformations u-X [mm]
Against Y-direction
630.000
-8.5
630.000
1082.160
Max u-X: 0.0, Min u-X: -8.5 [mm]
Factor of deformations: 87.00

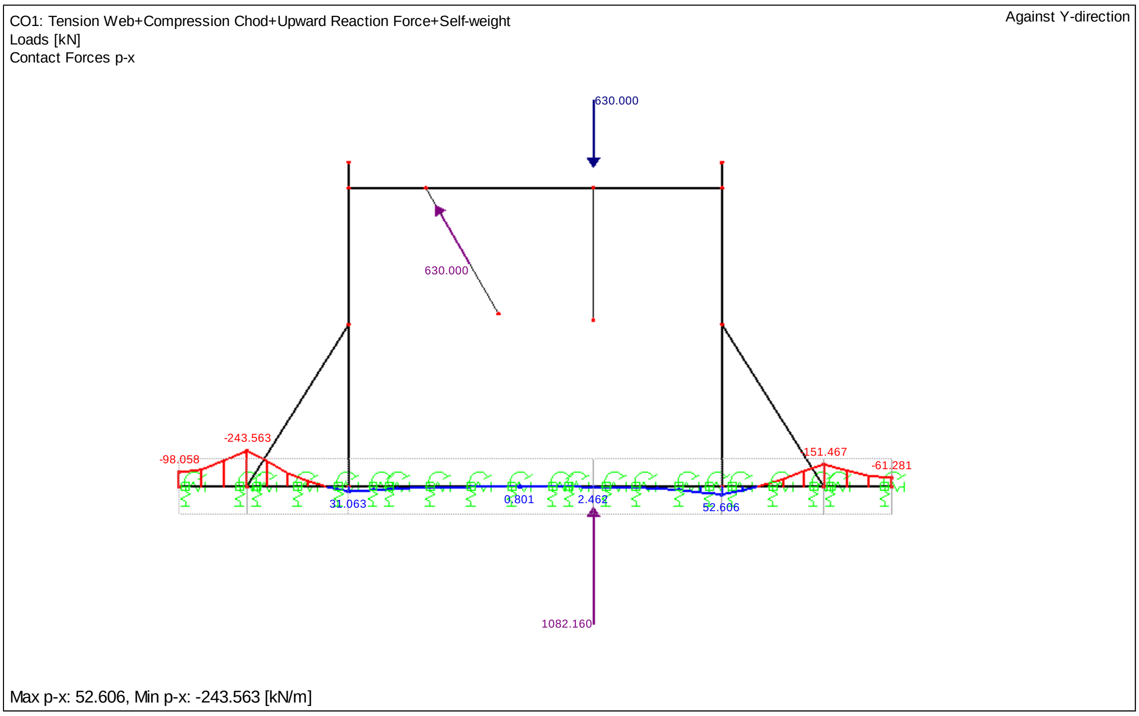

CO1: Tension Web+Compression Chod+Upward Reaction Force+Self-weight
Loads [kN]
Global Deformations u-Z [mm]
Against Y-direction
630.000
5.1
630.000
1082.160
Max u-Z: 5.1, Min u-Z: -1.4 [mm]
Factor of deformations: 87.00


CO1: Tension Web+Compression Chod+Upward Reaction Force+Self-weight
Loads [kN]
Local Deformations u-z
Against Y-direction
630.000
7.9
7.2
-0.4
-1.4
-8.5
7.2
0.4
5.1
630.000
1.7
-1.3
-0.1
1082.160
Max u-z: 7.9, Min u-z: -8.5 [mm]

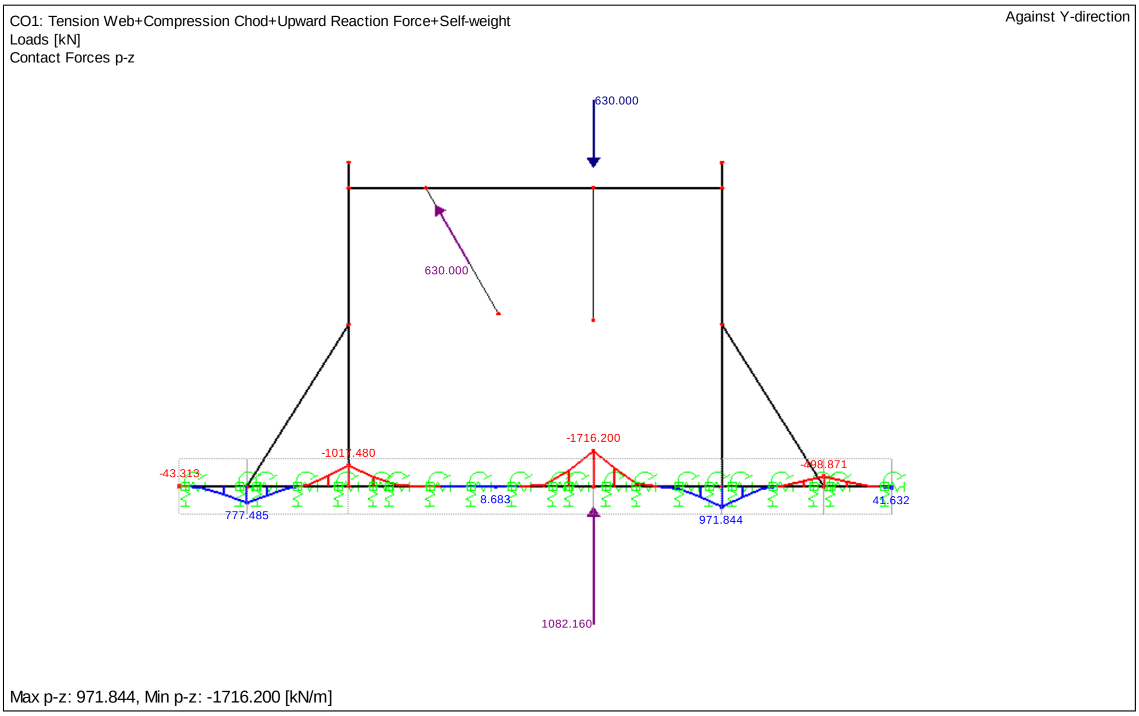

CO1: Tension Web+Compression Chod+Upward Reaction Force+Self-weight
Loads [kN]
Internal Forces N
Against Y-direction
630.000
-107.98
176.50
49.83
50.34
49.71
50.22
630.000
-539.09
636.12
-575.42
-540.55
-92.01
-14.71
-35.22
106.13
31.82
33.86
1.29
23.27
348.76
57.50
8.17
1082.160
Max N: 636.12, Min N: -578.19 [kN]


CO1: Tension Web+Compression Chod+Upward Reaction Force+Self-weight
Loads [kN]
Internal Forces V-z
Against Y-direction
630.000
-88.48
-88.90
-133.08
-134.24
183.68
181.92
-215.13
630.000
62.54
-215.30
-99.86
74.89
-545.65
-224.75
-281.48
-283.83
-148.92
-1.26
-8.27
-1.84
237.56
342.84
292.14
151.38
532.12
1082.160
Max V-z: 532.12, Min V-z: -545.65 [kN]

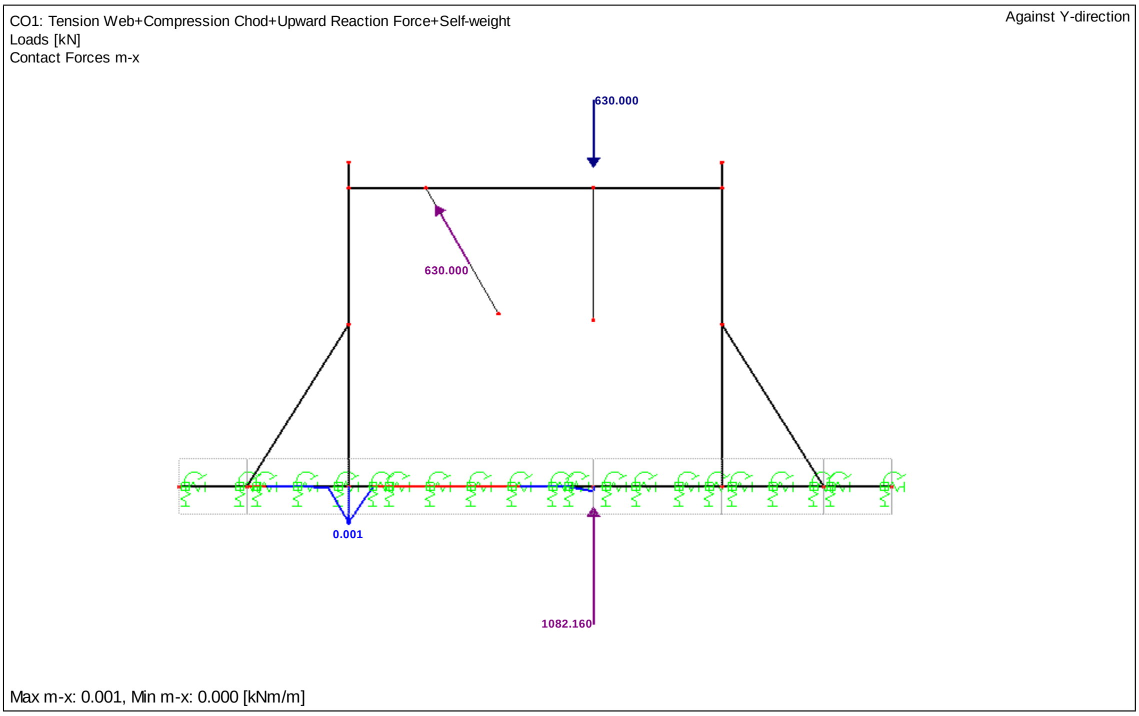

CO1: Tension Web+Compression Chod+Upward Reaction Force+Self-weight
Loads [kN]
Internal Forces M-y
Against Y-direction
630.000
-166.56
-85.94
171.88
-8.09
16.19
194.39
630.000
-175.02
177.87
-51.39
-60.88
-0.05
-0.03
32.38
12.04
39.20
1.33
1082.160
Max M-y: 194.39, Min M-y: -175.02 [kNm]



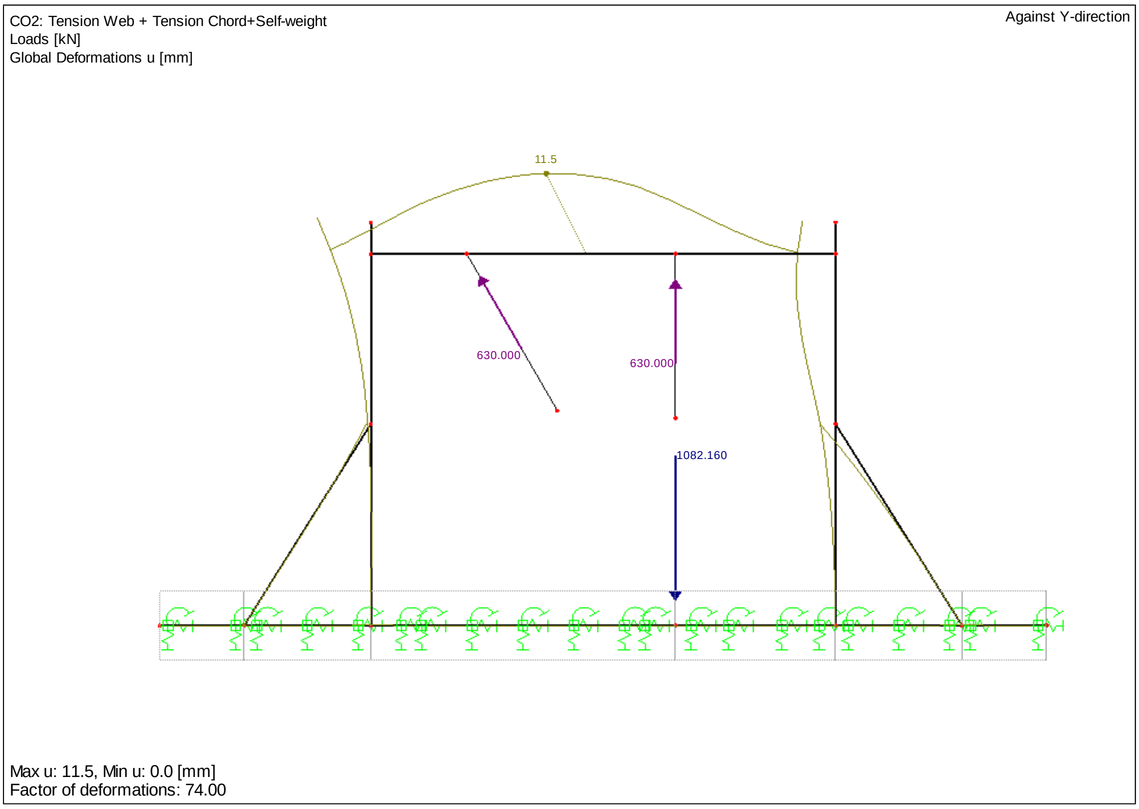
CO1: Tension Web+Compression Chod+Upward Reaction Force+Self-weight
Loads [kN]
Contact Forces p-x
Against Y-direction
630.000
630.000
-98.058
-243.563
31.063
0.801
2.462
52.606
151.467
-61.281
1082.160
Max p-x: 52.606, Min p-x: -243.563 [kN/m]

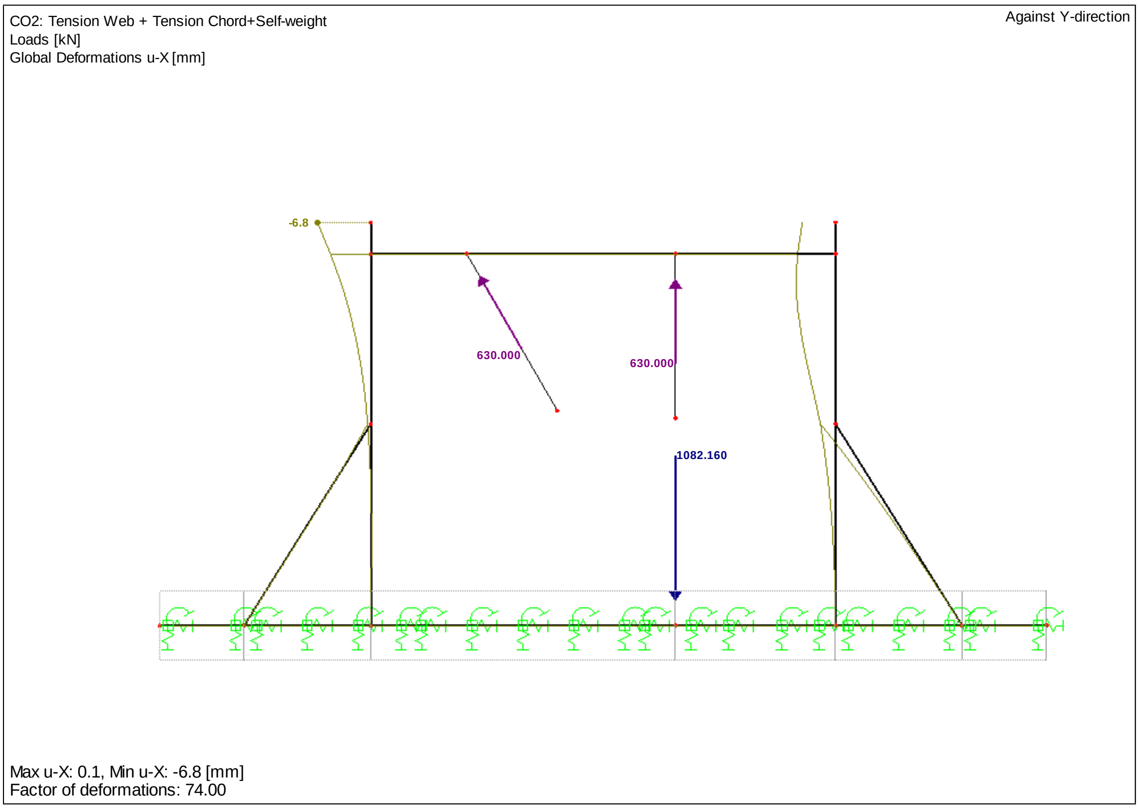


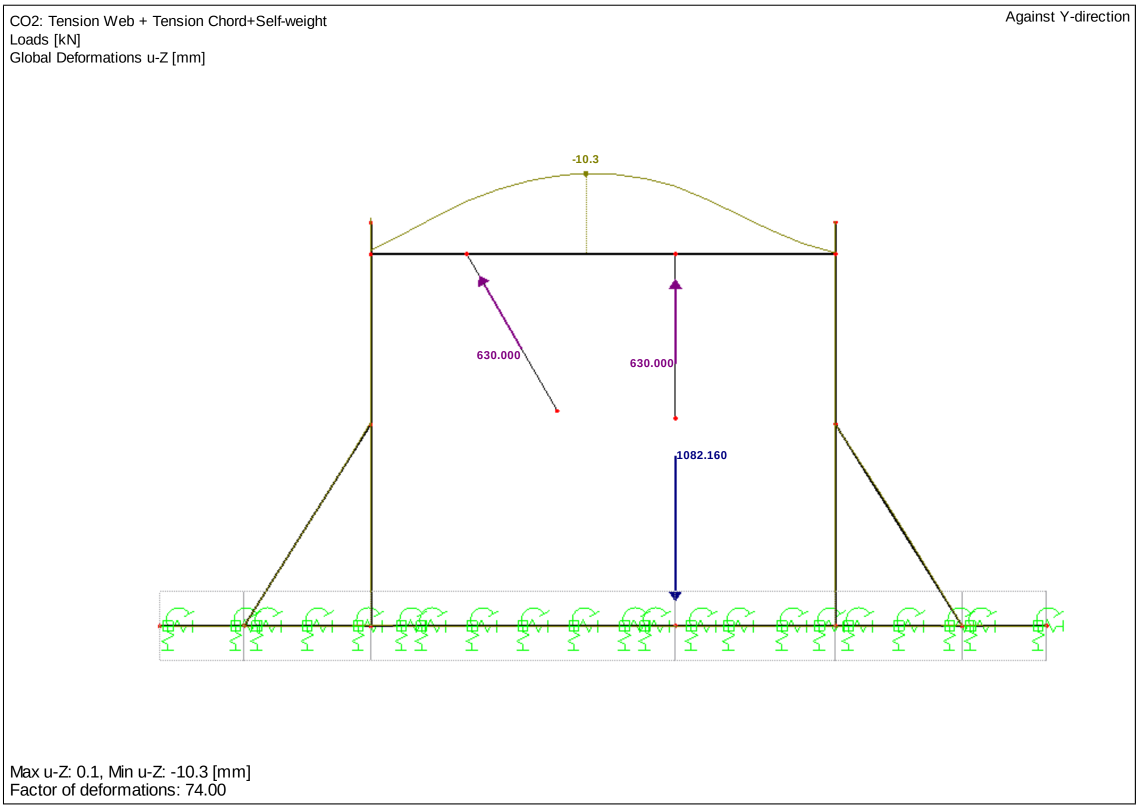
CO1: Tension Web+Compression Chod+Upward Reaction Force+Self-weight
Loads [kN]
Contact Forces p-z
Against Y-direction
630.000
630.000
-43.313
-1017.480
-1716.200
-498.871
777.485
8.683
971.844
41.632
1082.160
Max p-z: 971.844, Min p-z: -1716.200 [kN/m]

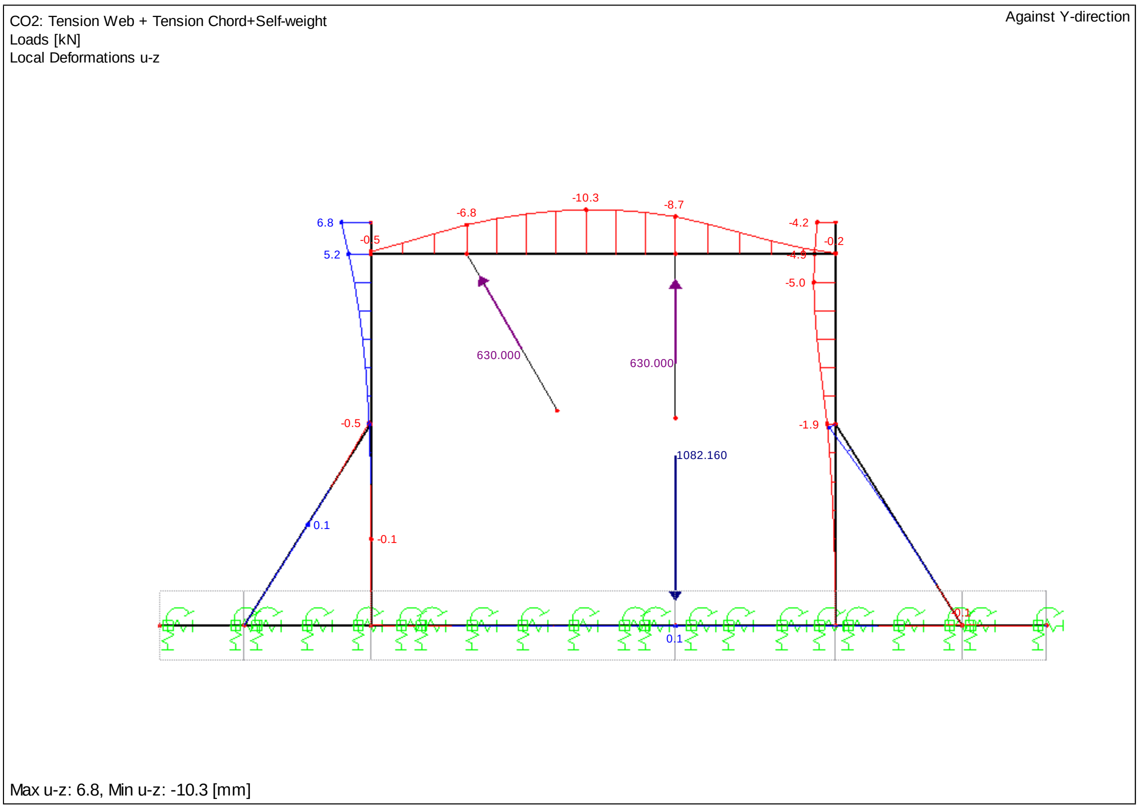


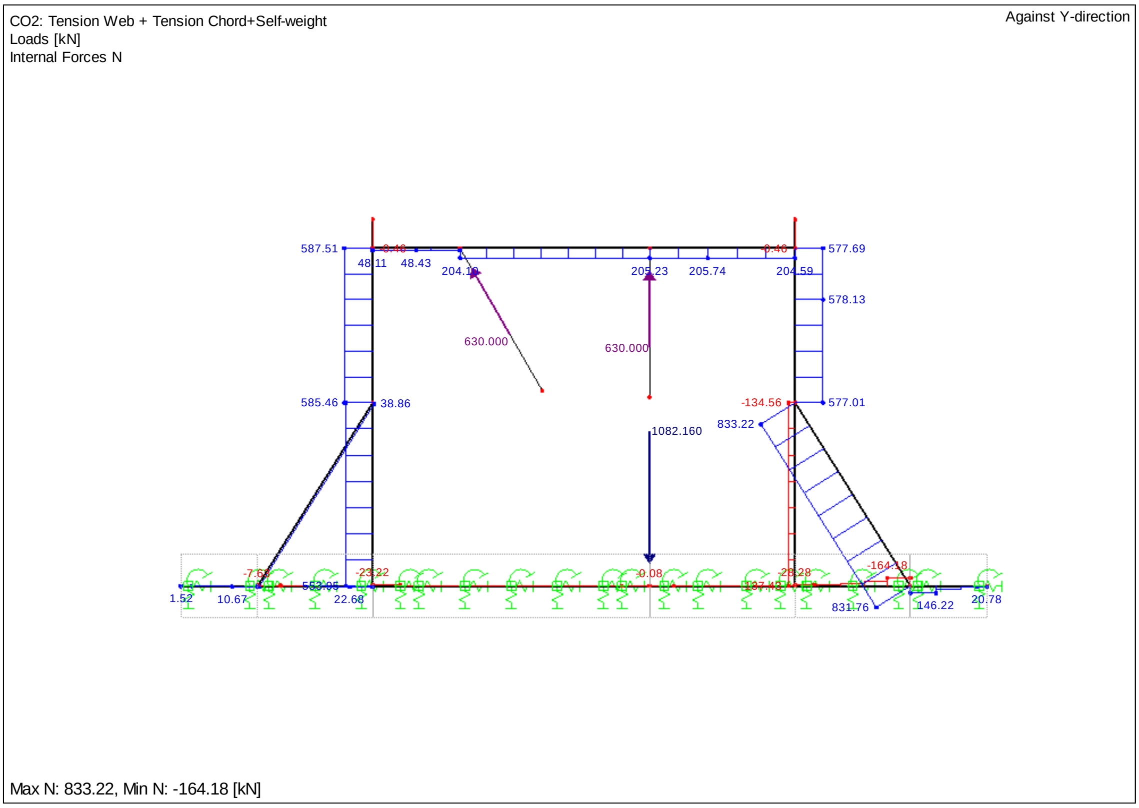
Load combination 2




CO2: Tension Web + Tension Chord+Self-weight
Loads [kN]
Global Deformations u-X [mm]
Against Y-direction
-6.8
630.000
630.000
1082.160
Max u-X: 0.1, Min u-X: -6.8 [mm]
Factor of deformations: 74.00

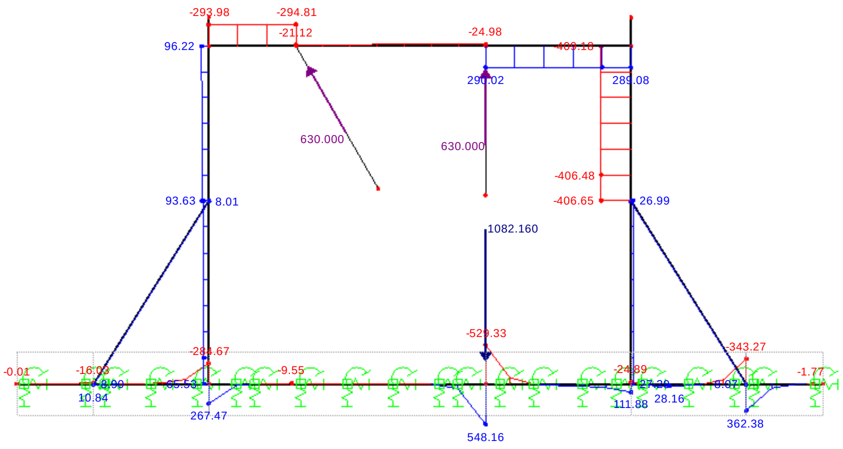

CO2: Tension Web + Tension Chord+Self-weight
Loads [kN]
Global Deformations u-Z [mm]
Against Y-direction
-10.3
630.000
630.000
1082.160
Max u-Z: 0.1, Min u-Z: -10.3 [mm]
Factor of deformations: 74.00


CO2: Tension Web + Tension Chord+Self-weight
Loads [kN]
Local Deformations u-z
Against Y-direction
6.8
5.2
-6.8
-10.3
-8.7
-4.2
-5.0
630.000
630.000
-0.5
-1.9
1082.160
0.1
-0.1
Max u-z: 6.8, Min u-z: -10.3 [mm]


CO2: Tension Web + Tension Chord+Self-weight
Loads [kN]
Internal Forces N
Against Y-direction
587.51
48.43
205.74
577.69
578.13
630.000
630.000
585.46
38.86
-134.56
577.01
833.22
1082.160
1.52
10.67
22.68
831.76
146.22
20.78
Max N: 833.22, Min N: -164.18 [kN]

CO2: Tension Web + Tension Chord+Self-weight
Loads [kN]
Internal Forces V-z

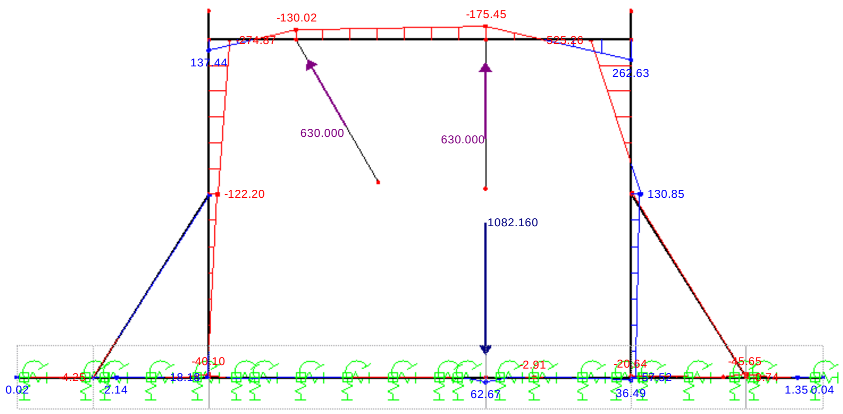
Against Y-direction



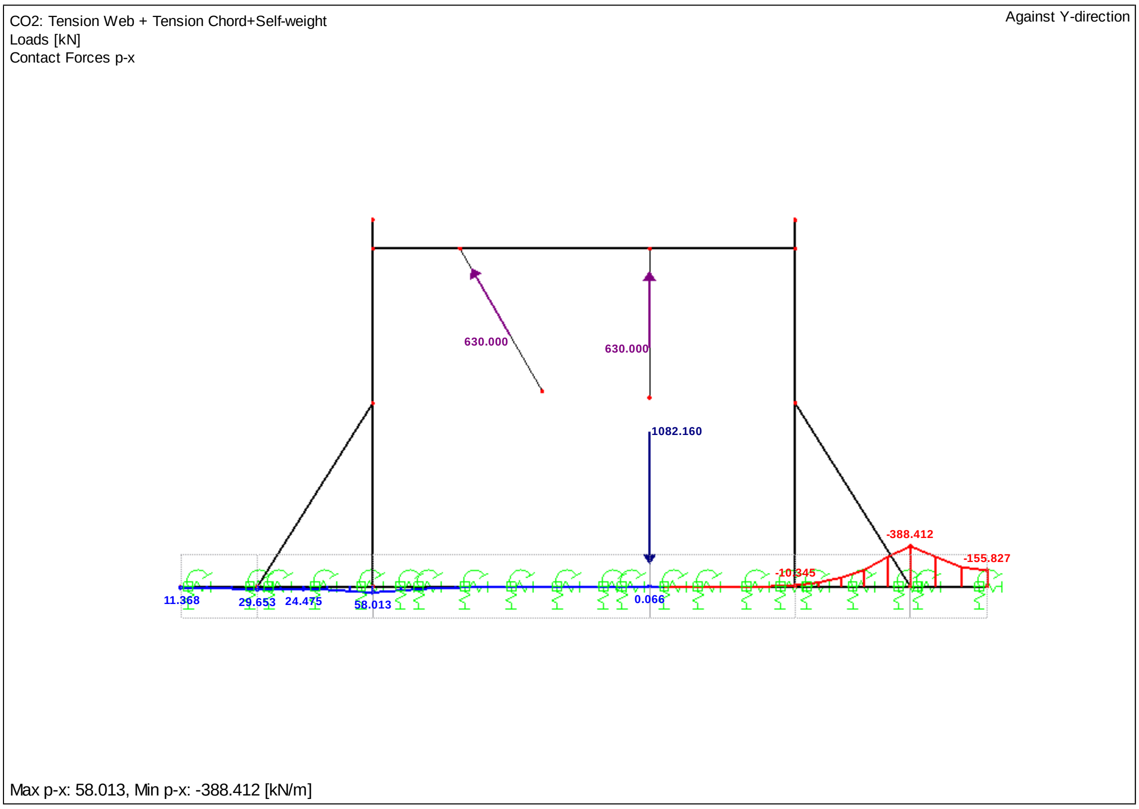
Max V-z: 548.16, Min V-z: -529.33 [kN]

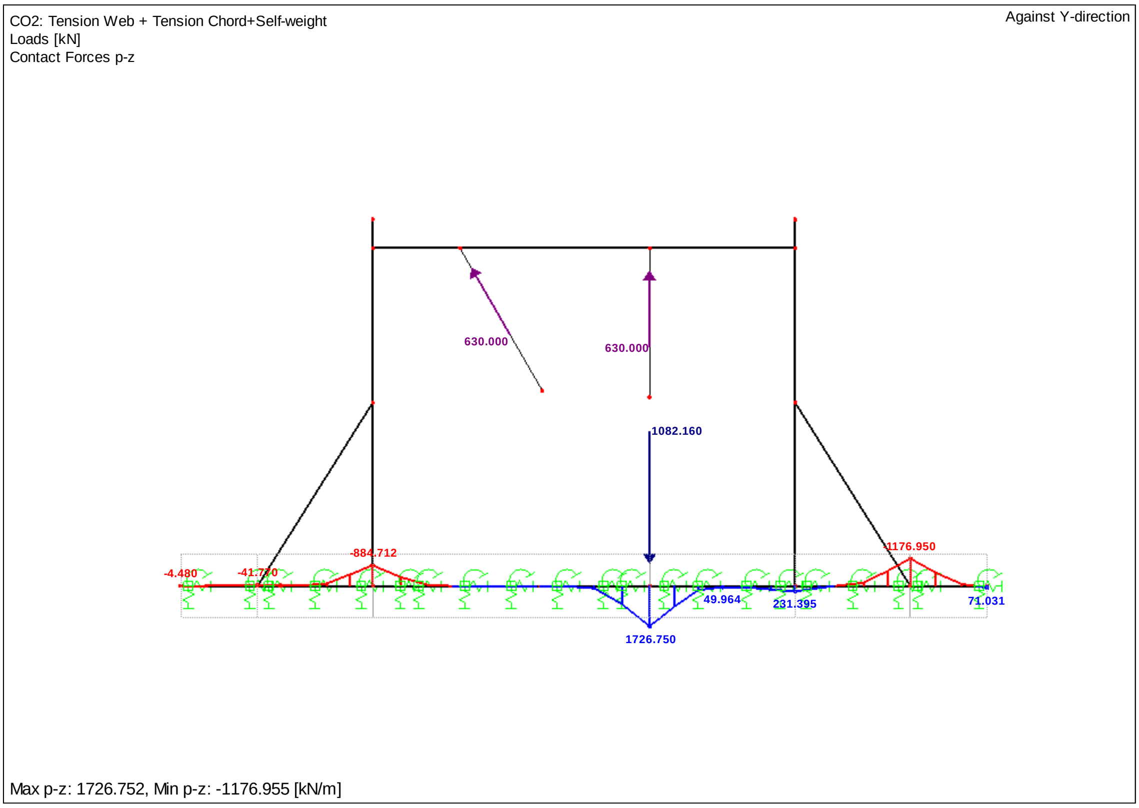
CO2: Tension Web + Tension Chord+Self-weight
Loads [kN]
Internal Forces M-y

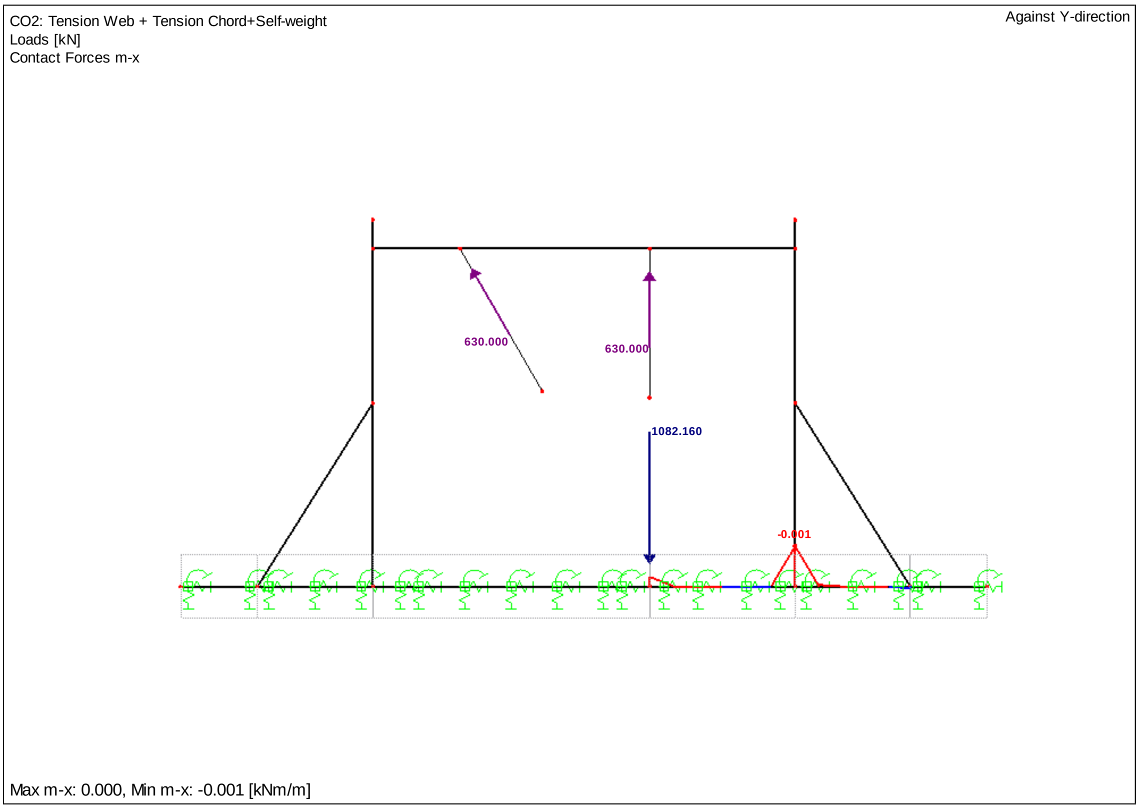
Against Y-direction



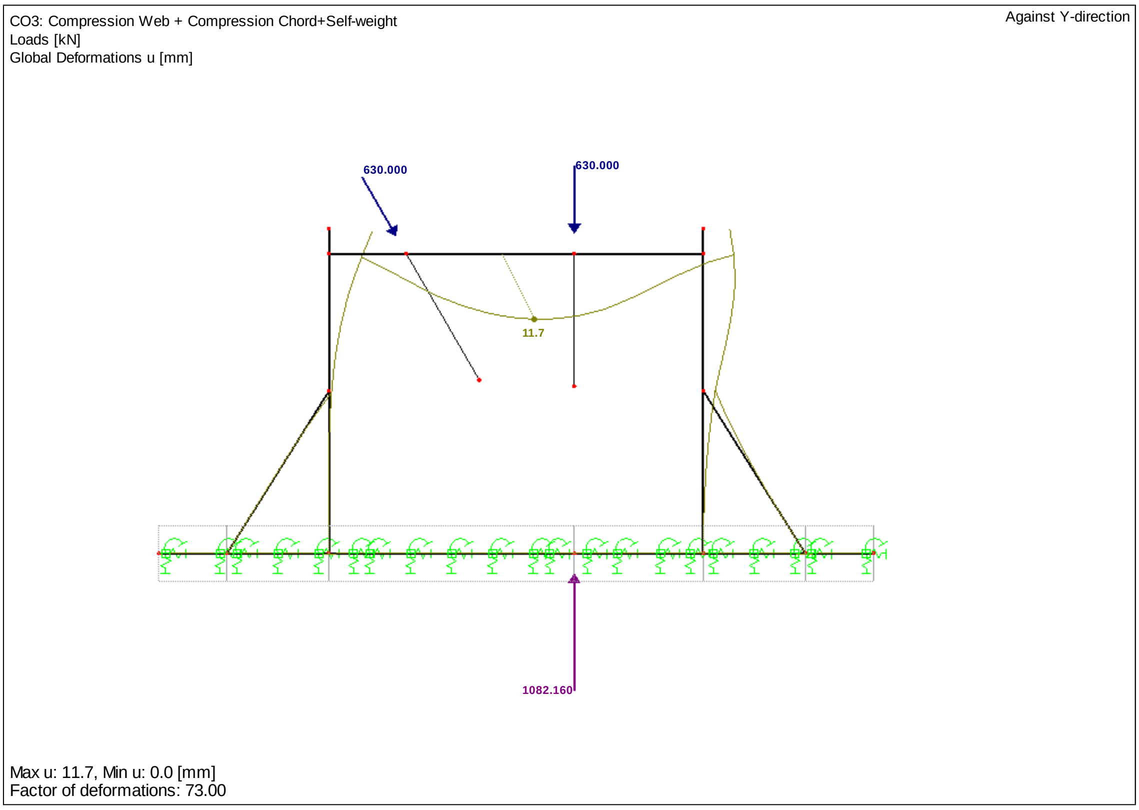
Max M-y: 262.63, Min M-y: -525.26 [kNm]

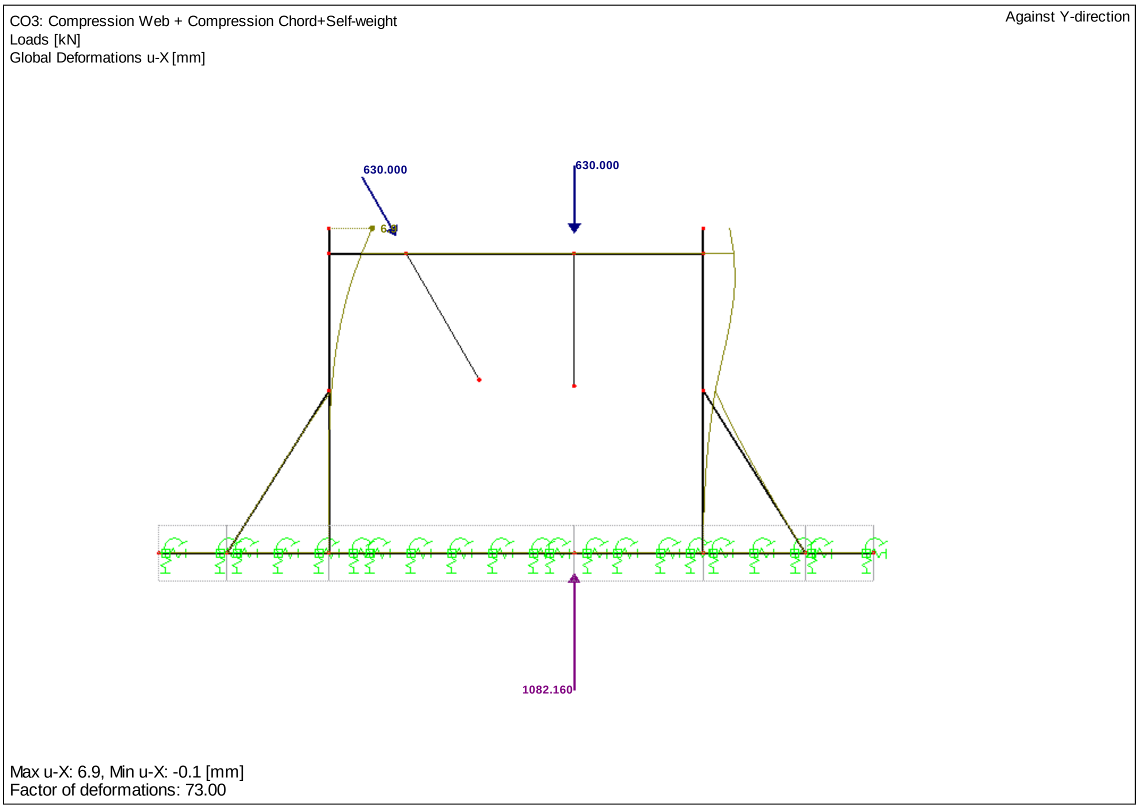

CO2: Tension Web + Tension Chord+Self-weight
Loads [kN]
Contact Forces p-x
Against Y-direction
630.000
630.000
1082.160
-388.412
-155.827
-10.345
11.368
29.653
24.475
58.013
0.066
Max p-x: 58.013, Min p-x: -388.412 [kN/m]

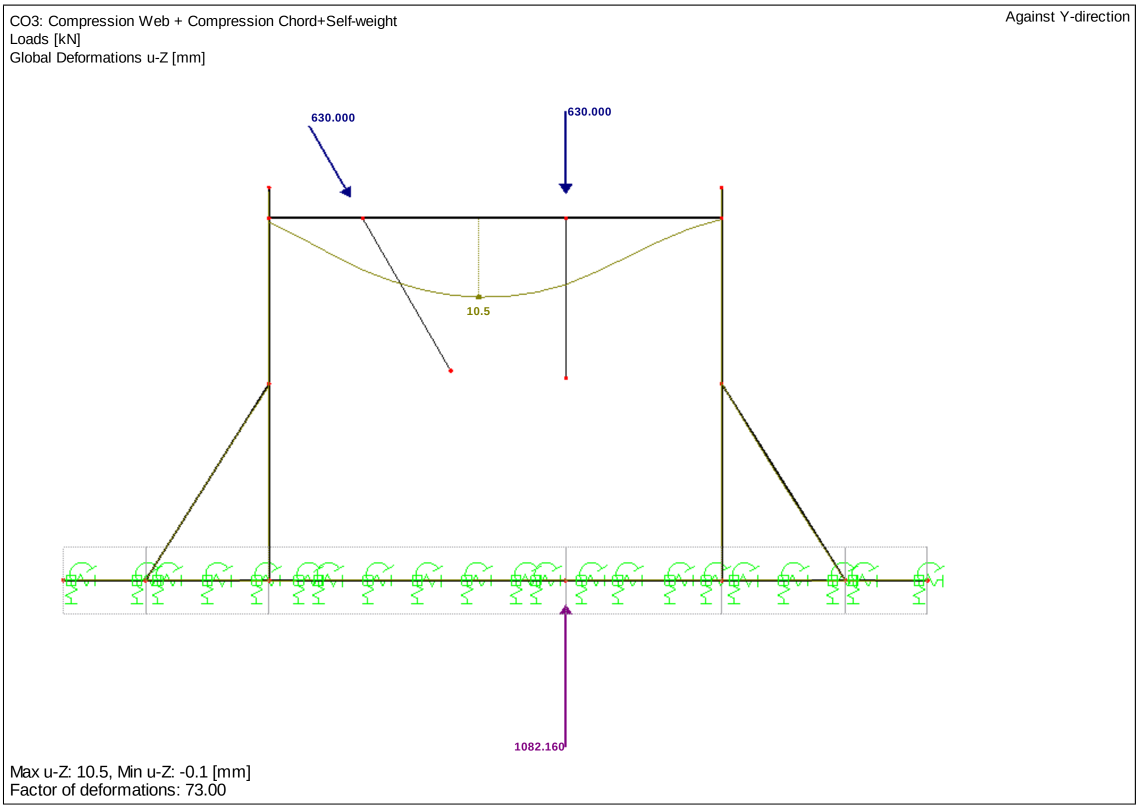

CO2: Tension Web + Tension Chord+Self-weight
Loads [kN]
Contact Forces p-z
Against Y-direction
630.000
630.000
1082.160
-884.712
-1176.950
-4.480
49.964
231.395
71.031
1726.750
Max p-z: 1726.752, Min p-z: -1176.955 [kN/m]



Load combination 3

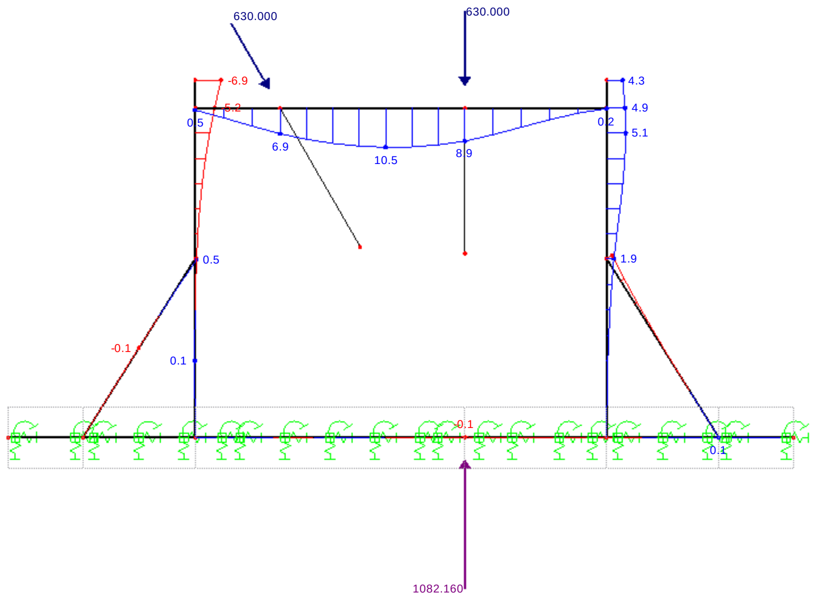



CO3: Compression Web + Compression Chord+Self-weight
Loads [kN]
Global Deformations u-X [mm]
Against Y-direction
630.000
630.000
1082.160
Max u-X: 6.9, Min u-X: -0.1 [mm]
Factor of deformations: 73.00


CO3: Compression Web + Compression Chord+Self-weight
Loads [kN]
Global Deformations u-Z [mm]
Against Y-direction
630.000
630.000
10.5
1082.160
Max u-Z: 10.5, Min u-Z: -0.1 [mm]
Factor of deformations: 73.00

CO3: Compression Web + Compression Chord+Self-weight
Loads [kN]
Local Deformations u-z

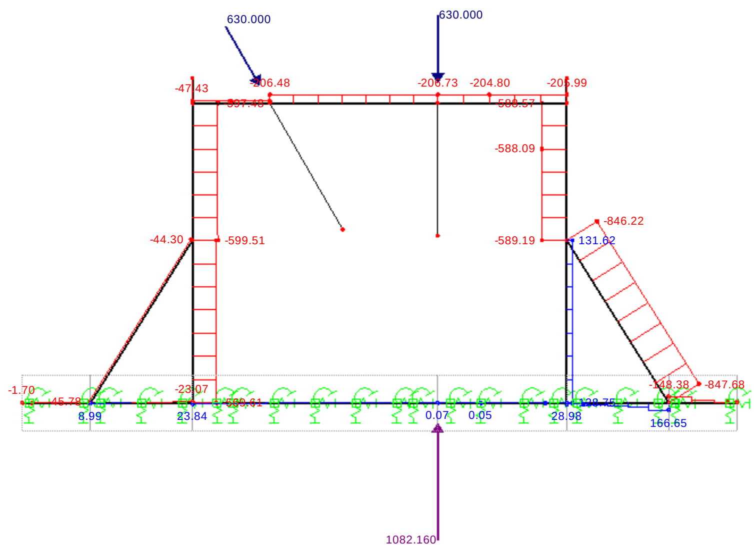
Against Y-direction



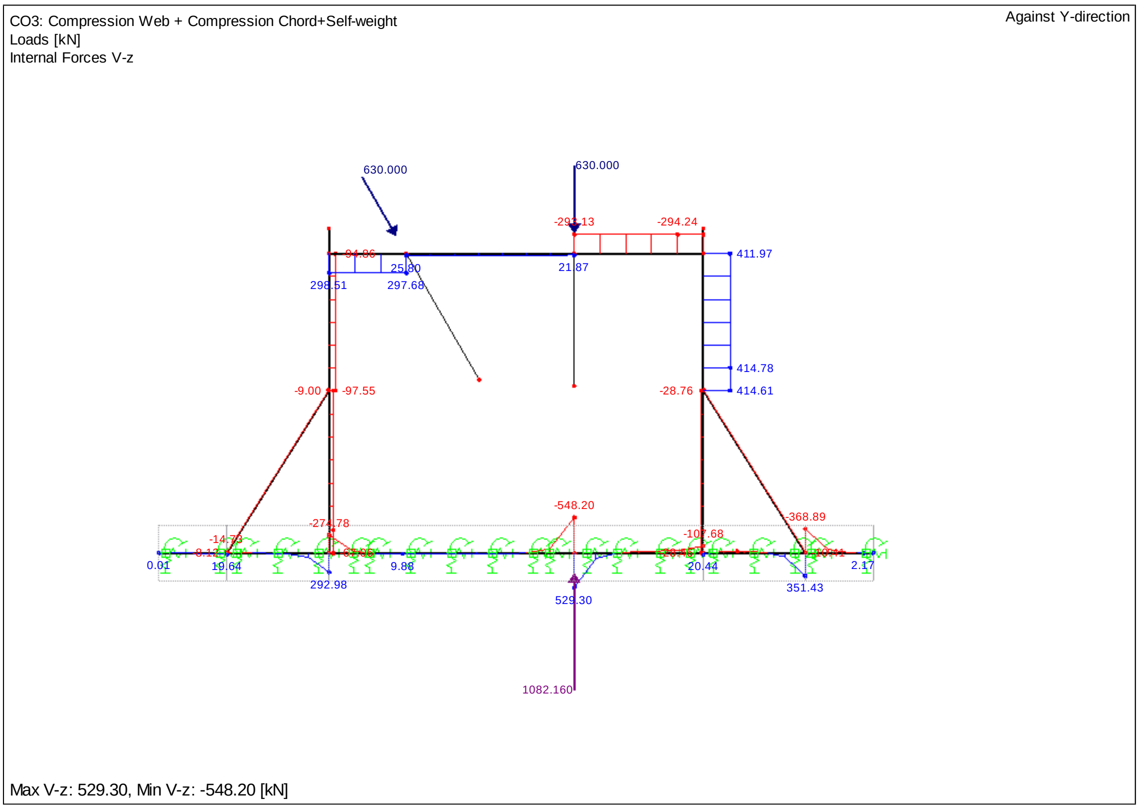
Max u-z: 10.5, Min u-z: -6.9 [mm]

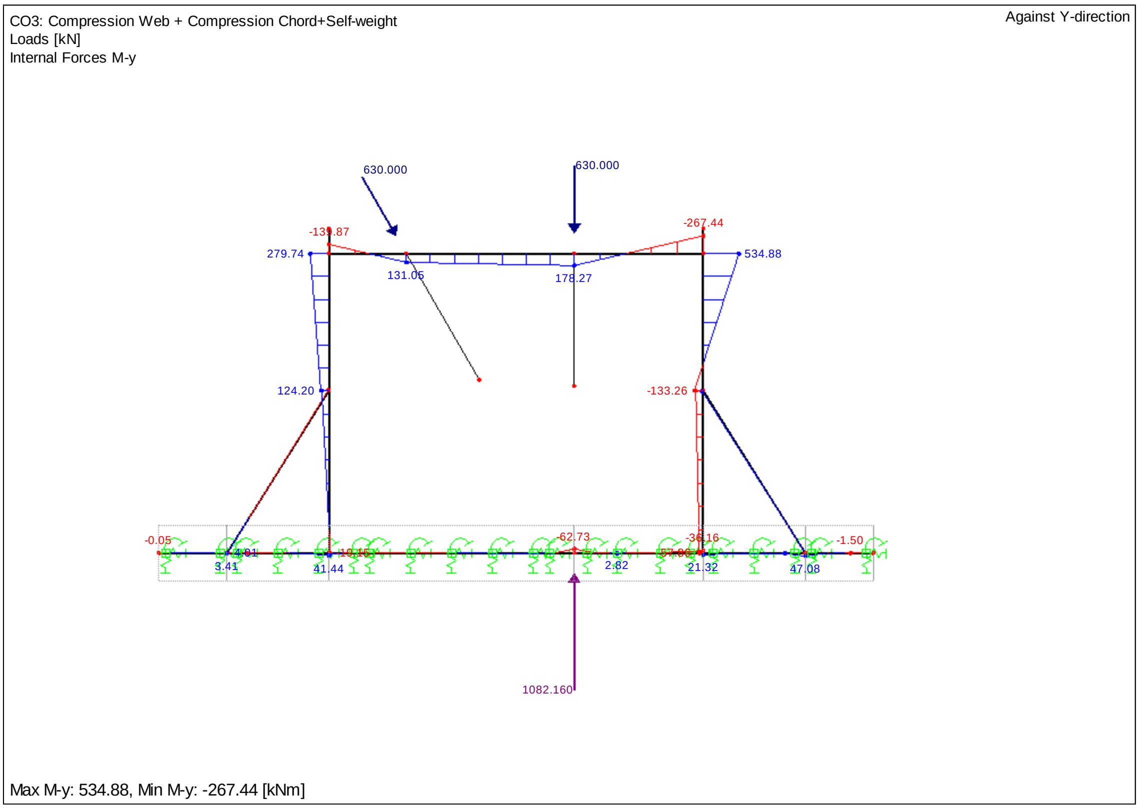
CO3: Compression Web + Compression Chord+Self-weight
Loads [kN]
Internal Forces N

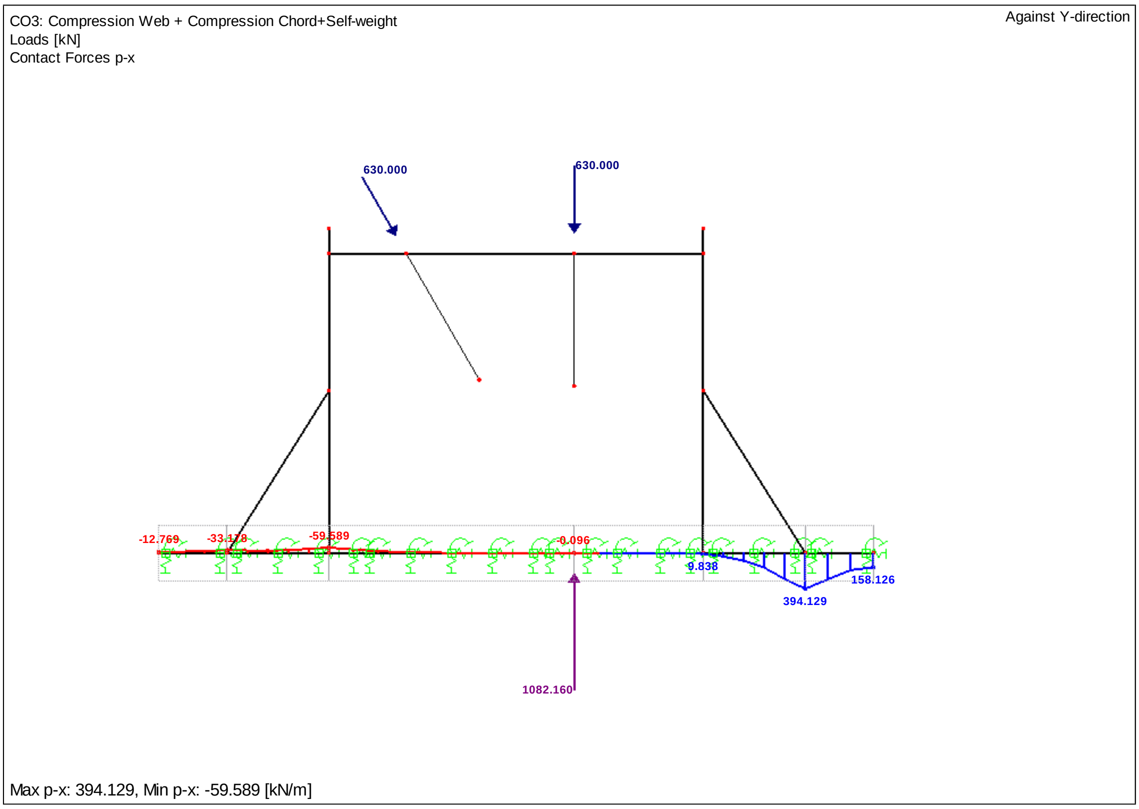
Against Y-direction

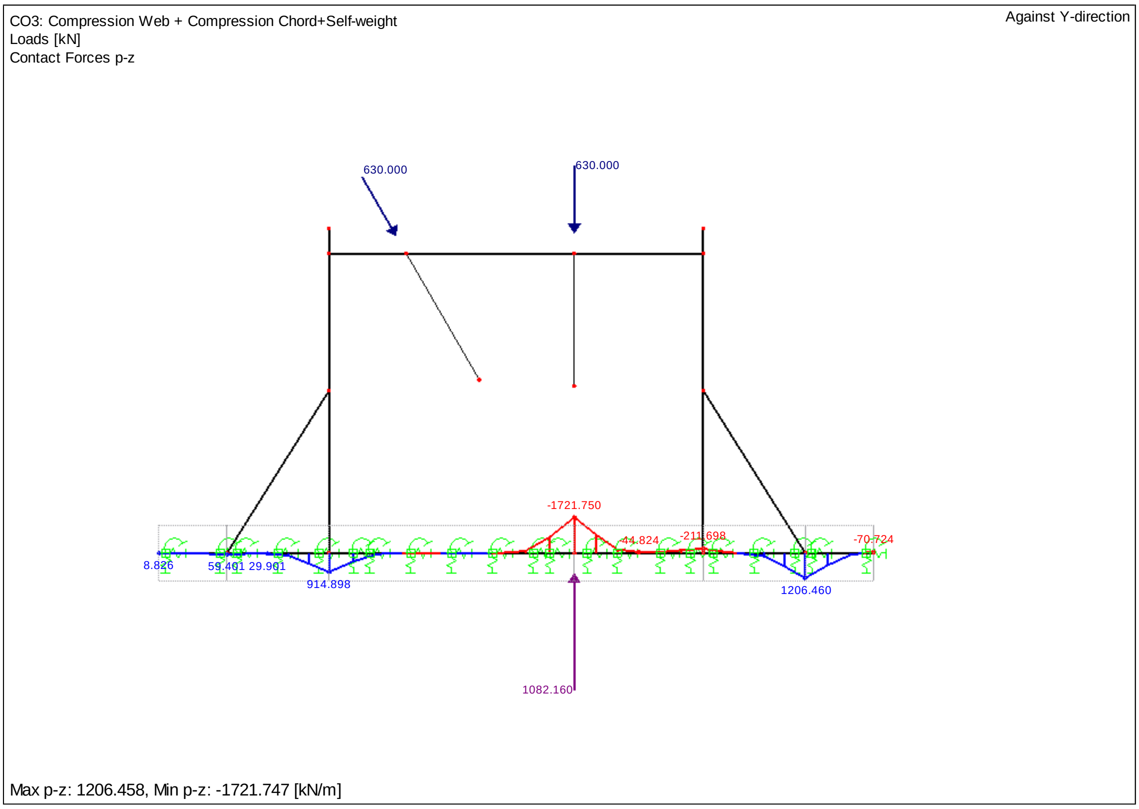


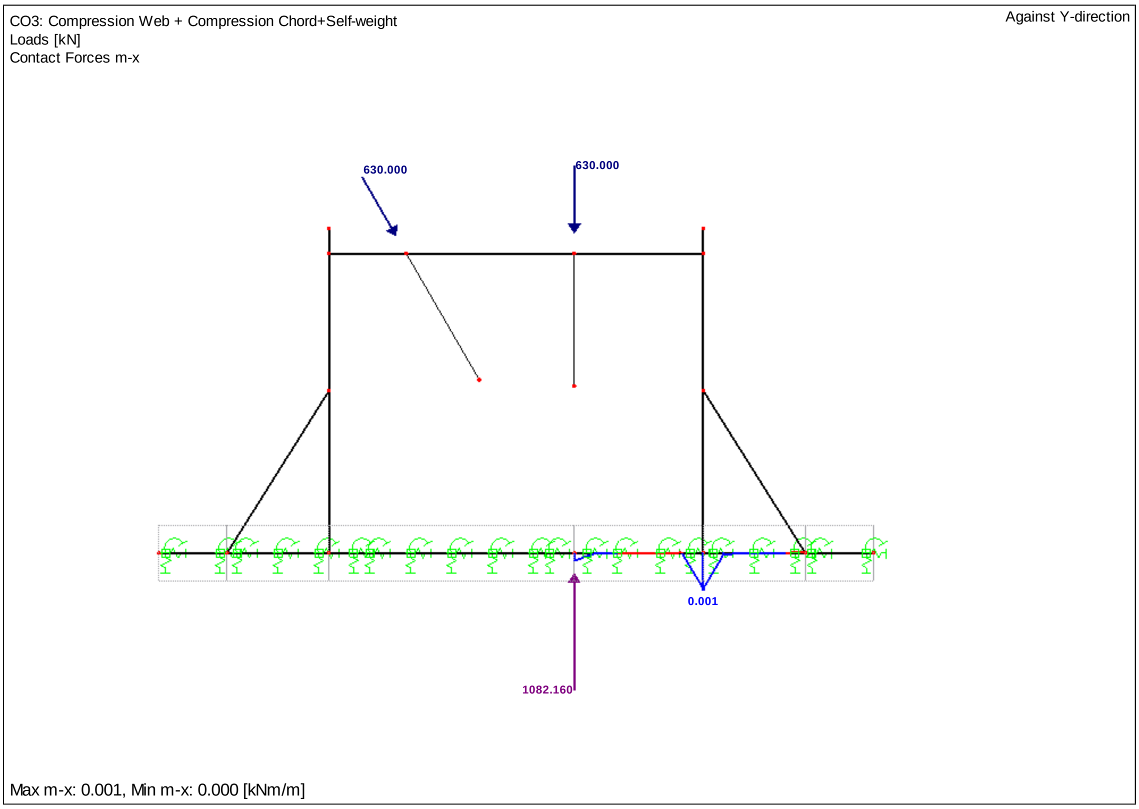
Max N: 166.65, Min N: -847.68 [kN]


CO3: Compression Web + Compression Chord+Self-weight
Loads [kN]
Internal Forces V-z
Against Y-direction
630.000
630.000
-294.24
411.97
21.87
297.68
414.78
414.61
-9.00
-97.55
-28.76
-548.20
-368.89
0.01
19.64
9.88
20.44
2.17
292.98
351.43
1082.160
Max V-z: 529.30, Min V-z: -548.20 [kN]

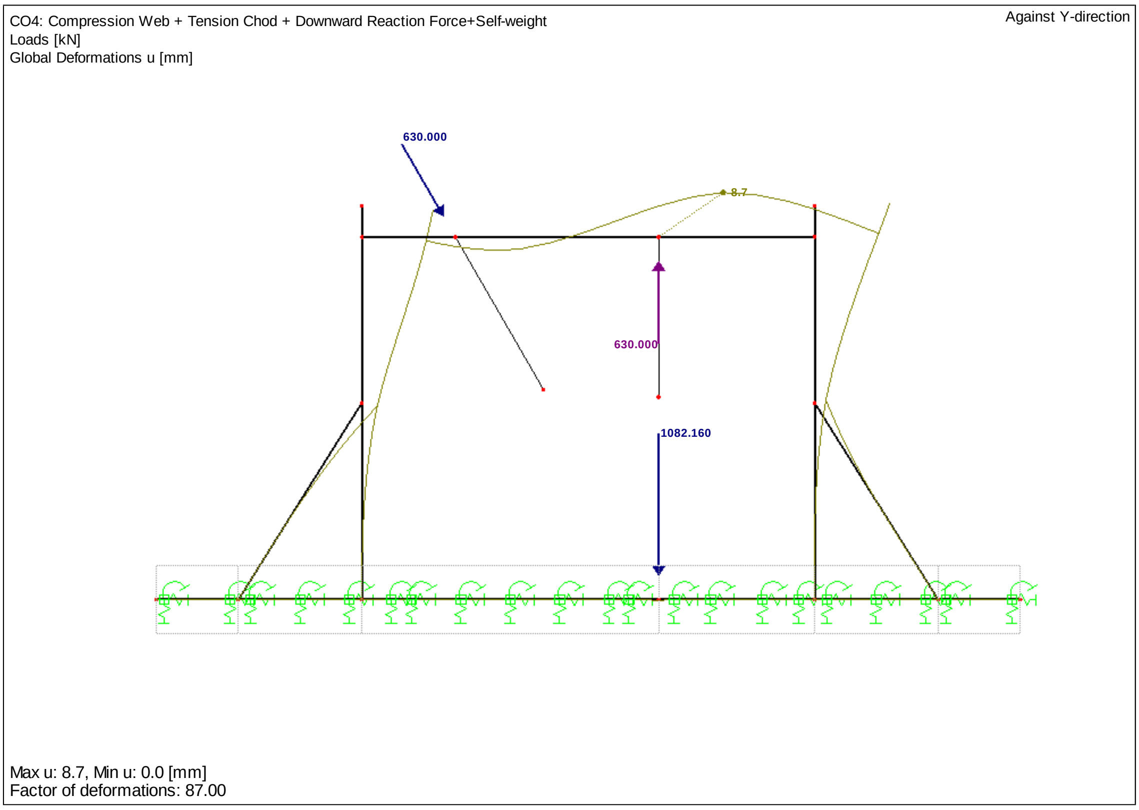

CO3: Compression Web + Compression Chord+Self-weight
Loads [kN]
Internal Forces M-y
Against Y-direction
630.000
630.000
-267.44
279.74
534.88
131.05
124.20
-133.26
-0.05
-1.50
41.44
21.32
47.08
1082.160
Max M-y: 534.88, Min M-y: -267.44 [kNm]


CO3: Compression Web + Compression Chord+Self-weight
Loads [kN]
Contact Forces p-x
Against Y-direction
630.000
630.000
-12.769
-33.178
-59.589
-0.096
9.838
158.126
394.129
1082.160
Max p-x: 394.129, Min p-x: -59.589 [kN/m]

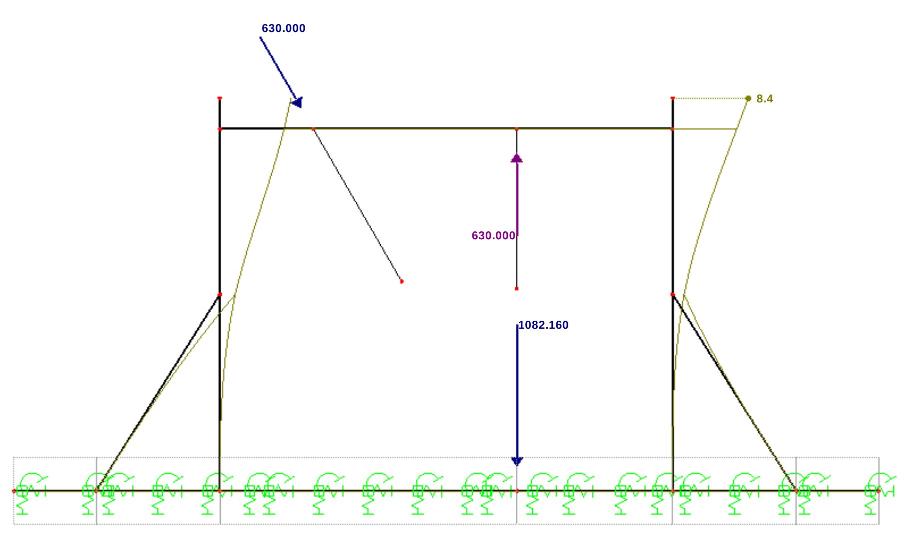

CO3: Compression Web + Compression Chord+Self-weight
Loads [kN]
Contact Forces p-z
Against Y-direction
630.000
630.000
-1721.750
-44.824
-211.698
-70.724
8.826
59.401
29.901
914.898
1206.460
1082.160
Max p-z: 1206.458, Min p-z: -1721.747 [kN/m]



Load combination 4

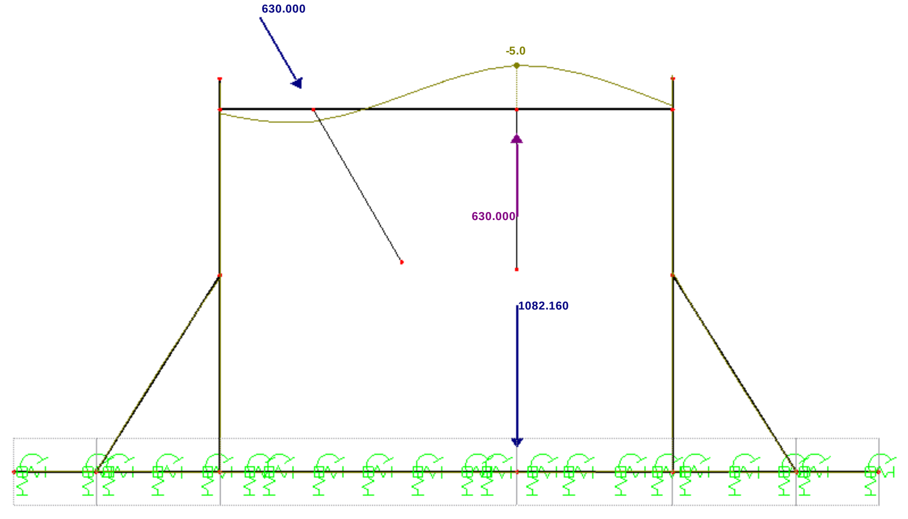


CO4: Compression Web + Tension Chod + Downward Reaction Force+Self-weight
Loads [kN]
Global Deformations u-X [mm]

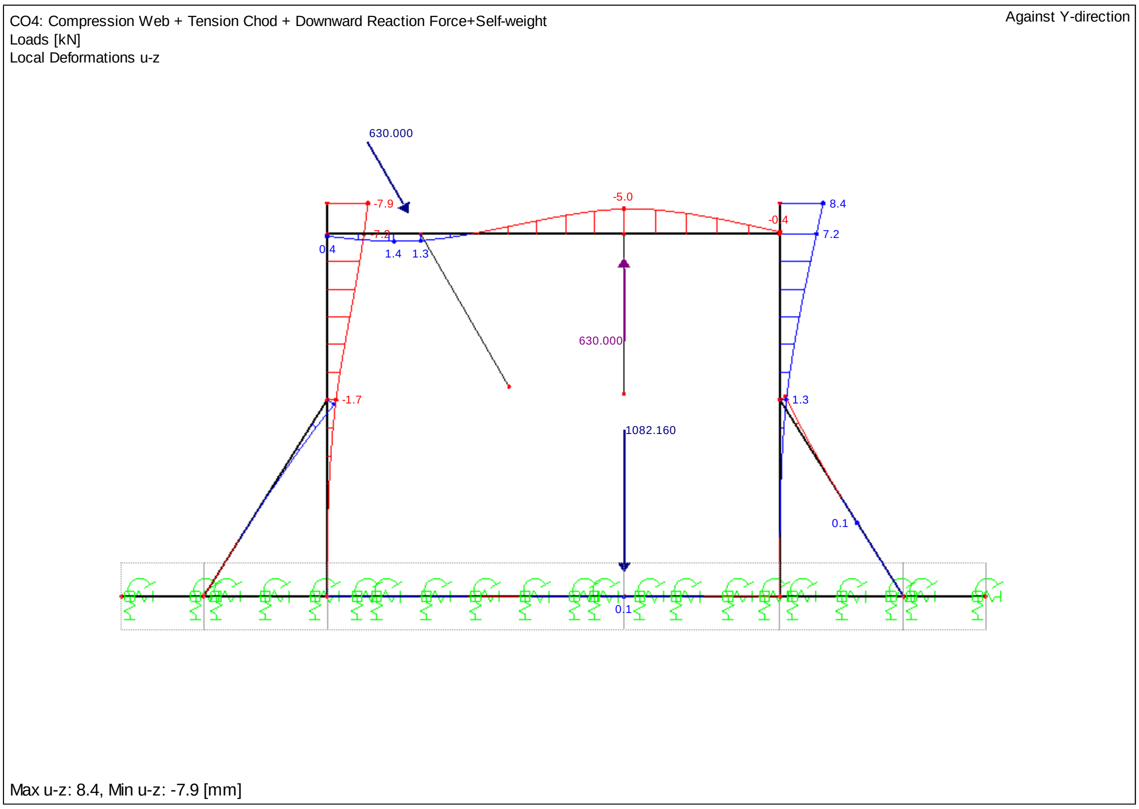


Max u-X: 8.4, Min u-X: 0.0 [mm]
Factor of deformations: 87.00

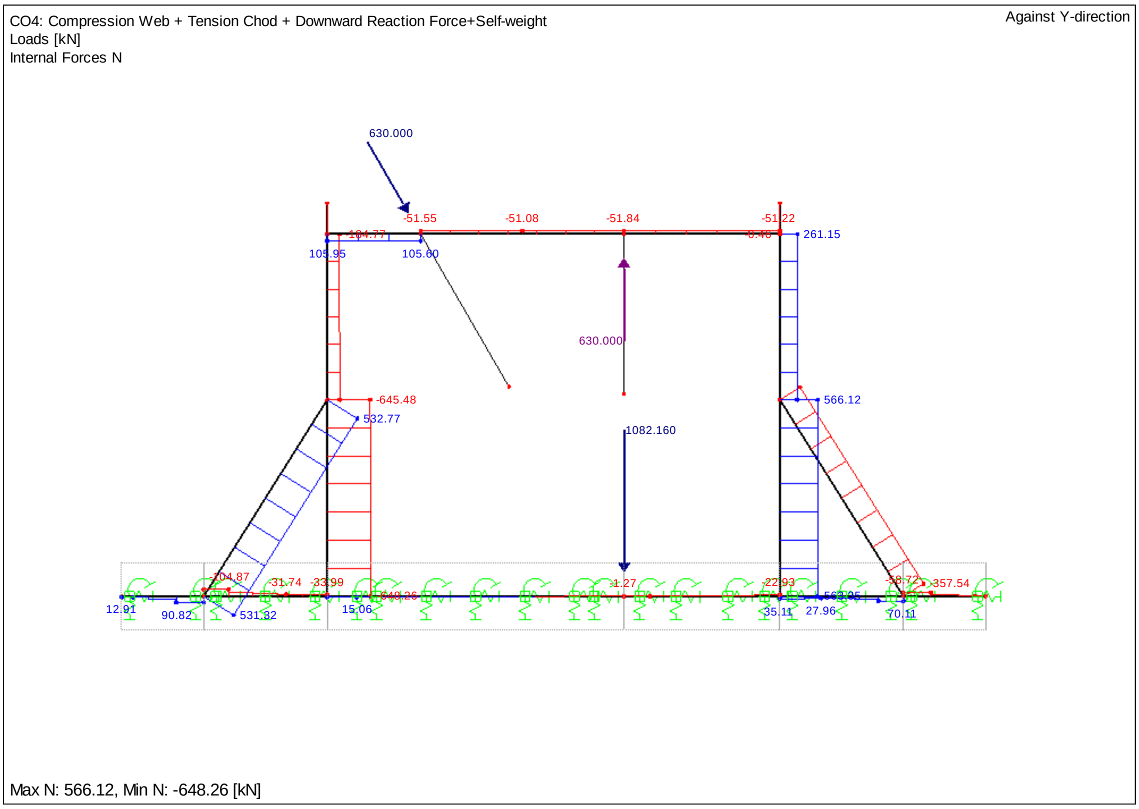
CO4: Compression Web + Tension Chod + Downward Reaction Force+Self-weight
Loads [kN]
Global Deformations u-Z [mm]



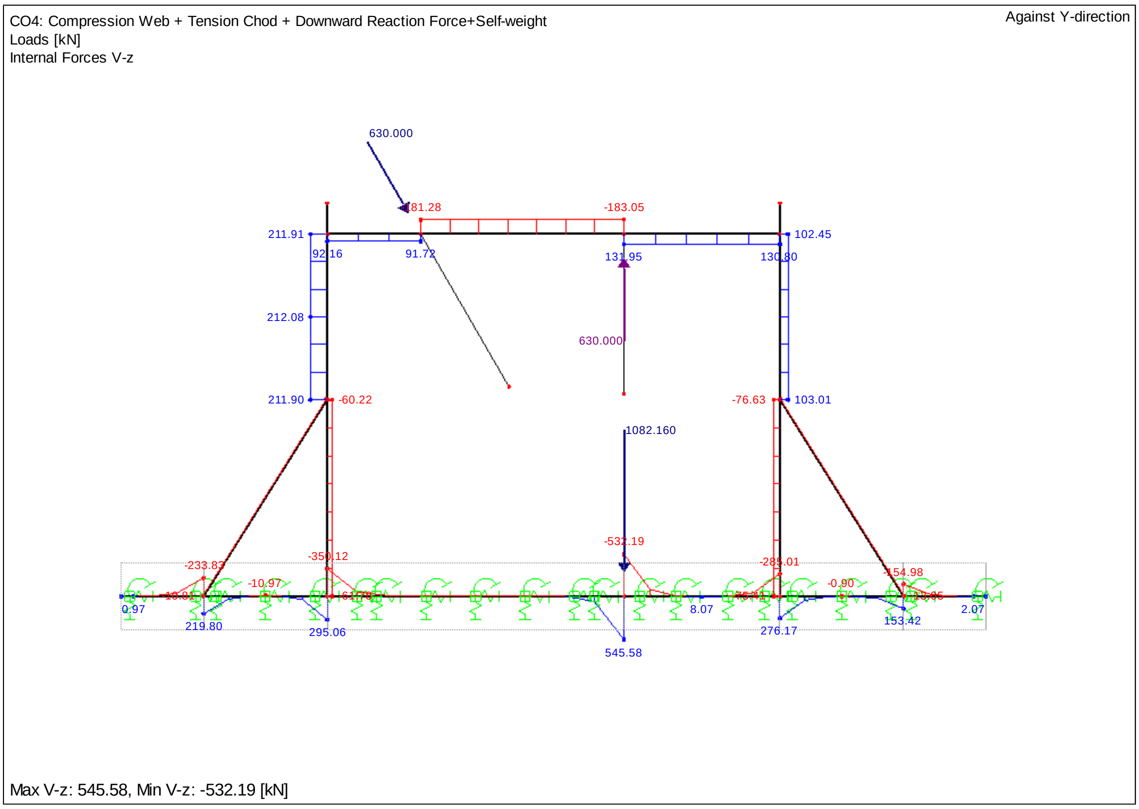
Max u-Z: 1.4, Min u-Z: -5.0 [mm]
Factor of deformations: 87.00

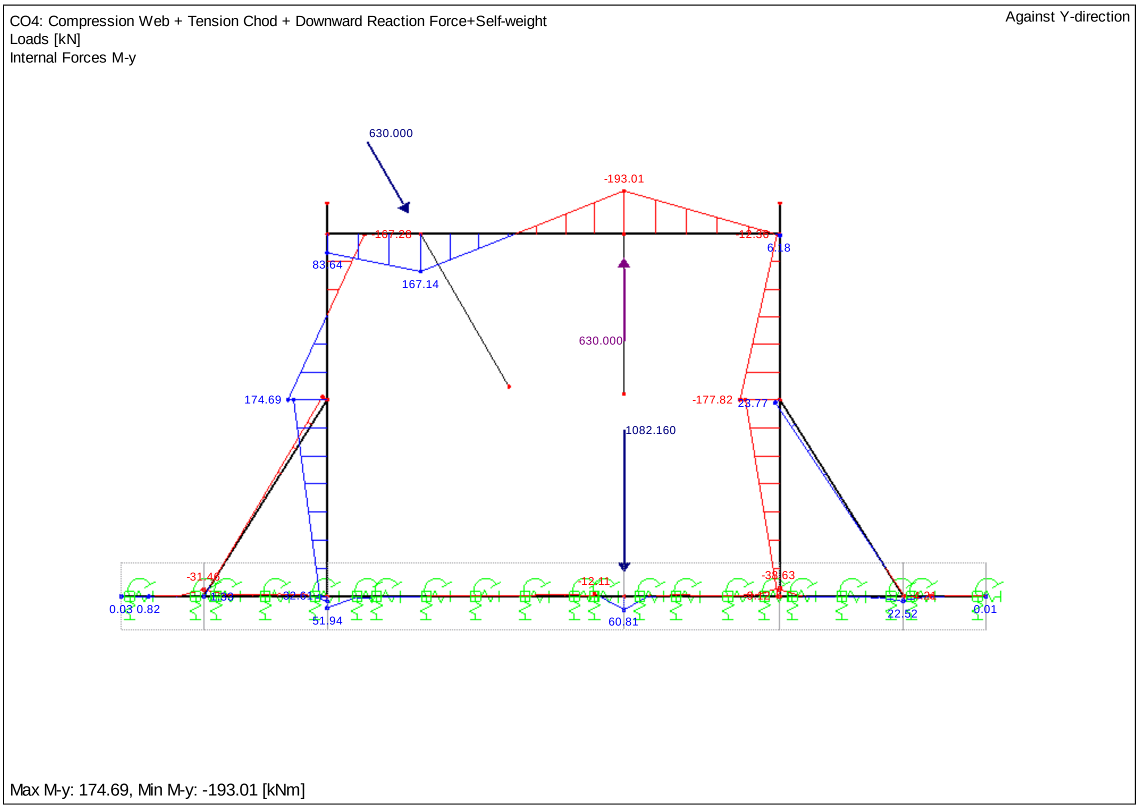


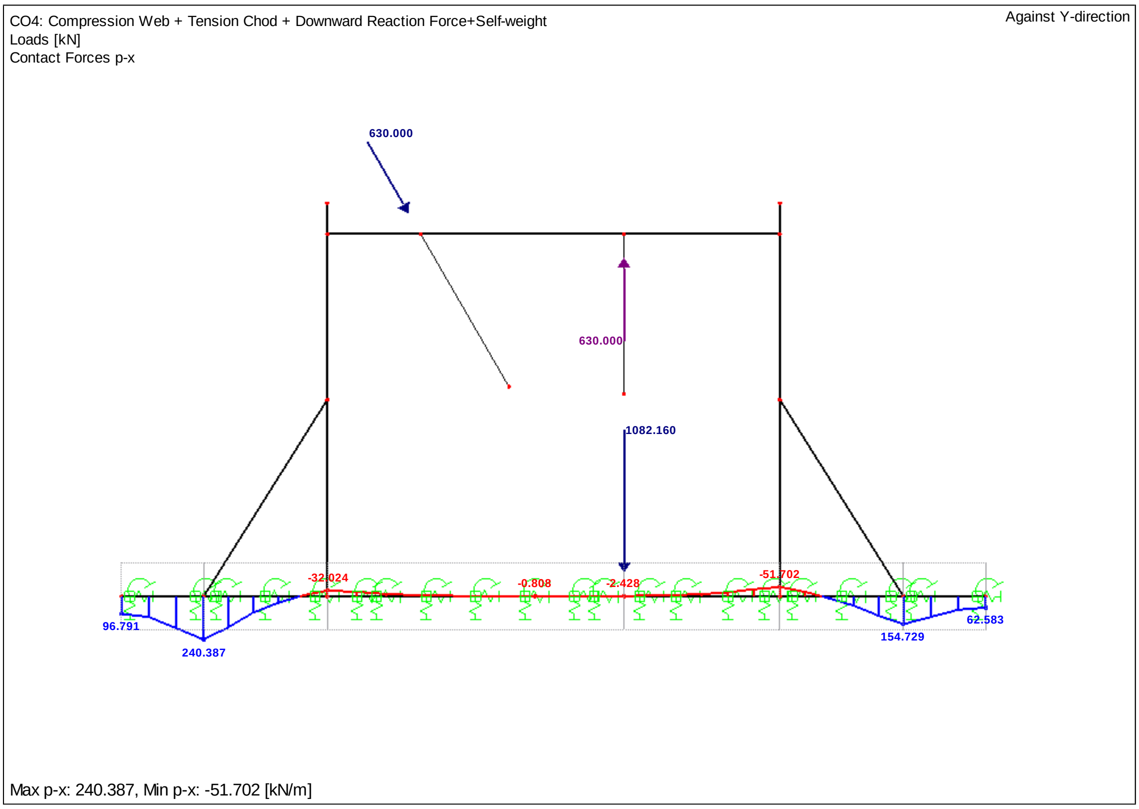
CO4: Compression Web + Tension Chod + Downward Reaction Force+Self-weight
Loads [kN]
Local Deformations u-z
Against Y-direction
630.000
-7.9
-5.0
8.4
7.2
0.4
1.4
1.3
630.000
-1.7
1.3
1082.160
0.1
0.1
Max u-z: 8.4, Min u-z: -7.9 [mm]

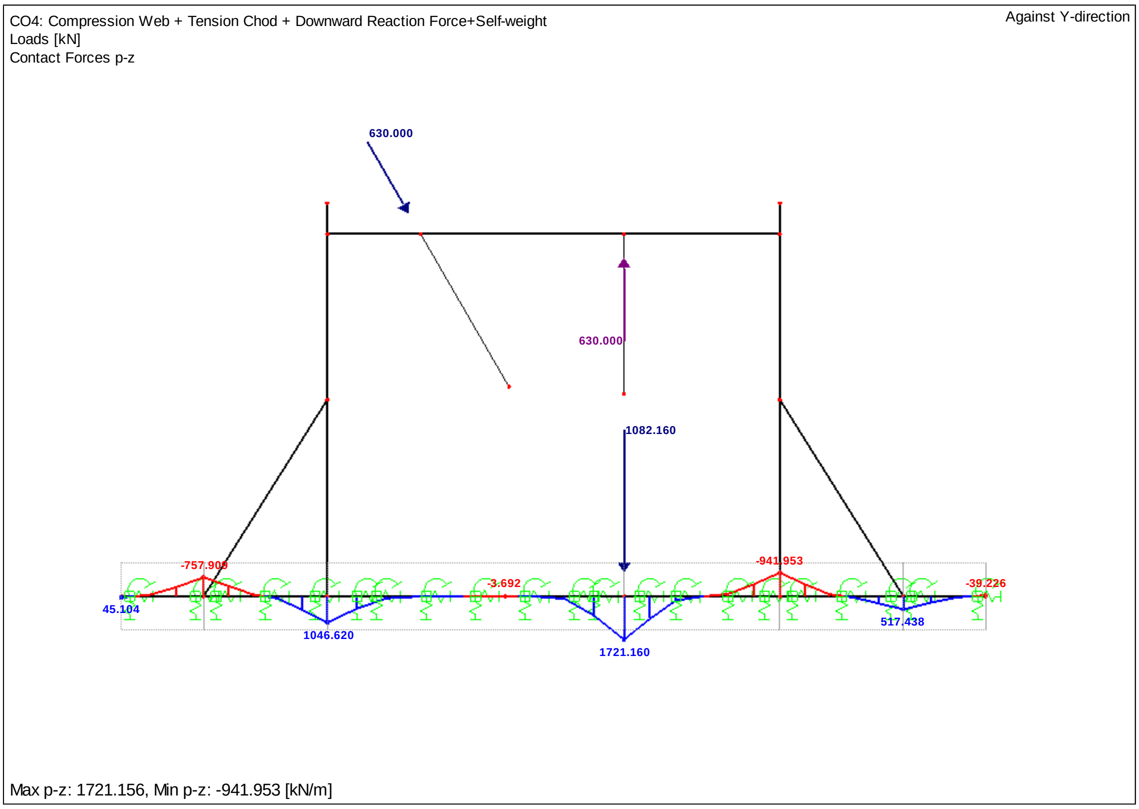


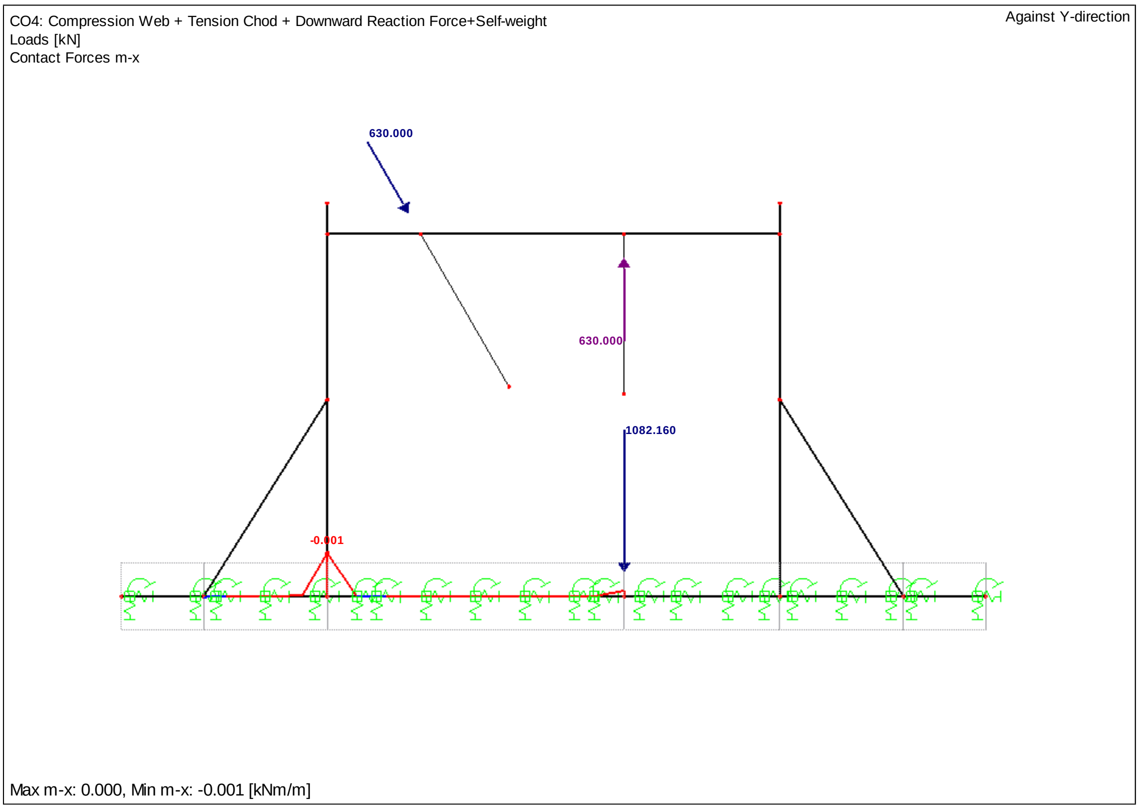
CO4: Compression Web + Tension Chod + Downward Reaction Force+Self-weight
Loads [kN]
Internal Forces N
Against Y-direction
630.000
-51.55
-51.08
-51.84
-51.22
261.15
105.60
630.000
-645.48
532.77
566.12
1082.160
-357.54
12.91
90.82
531.32
15.06
27.96
70.11
Max N: 566.12, Min N: -648.26 [kN]


CO4: Compression Web + Tension Chod + Downward Reaction Force+Self-weight
Loads [kN]
Internal Forces V-z
Against Y-direction
630.000
-183.05
211.91
102.45
91.72
131.95
130.80
212.08
630.000
211.90
-60.22
-76.63
103.01
1082.160
-532.19
-350.12
-233.83
-10.97
-285.01
-0.90
-154.98
0.97
219.80
295.06
545.58
8.07
276.17
153.42
2.07
Max V-z: 545.58, Min V-z: -532.19 [kN]


CO4: Compression Web + Tension Chod + Downward Reaction Force+Self-weight
Loads [kN]
Internal Forces M-y
Against Y-direction
630.000
-193.01
83.64
167.14
630.000
174.69
-177.82
23.77
1082.160
-31.46
-12.11
-38.63
0.03
0.82
51.94
60.81
22.52
0.01
Max M-y: 174.69, Min M-y: -193.01 [kNm]


CO4: Compression Web + Tension Chod + Downward Reaction Force+Self-weight
Loads [kN]
Contact Forces p-x
Against Y-direction
630.000
630.000
1082.160
-32.024
-0.808
-2.428
-51.702
96.791
240.387
154.729
62.583
Max p-x: 240.387, Min p-x: -51.702 [kN/m]


CO4: Compression Web + Tension Chod + Downward Reaction Force+Self-weight
Loads [kN]
Contact Forces p-z
Against Y-direction
630.000
630.000
1082.160
-757.908
-3.692
-941.953
-39.226
45.104
1046.620
1721.160
517.438
Max p-z: 1721.156, Min p-z: -941.953 [kN/m]



APPENDIX 2 DESIGN OF STRUCTURAL MEMBER IN DLUBAL RFEM

RF-STEEL EC3

CA1
Design of steel members
according to Eurocode 3

General Data

	Members to design:	All	
	Sets of members to design:		
	National Annex:	SFS	
	Ultimate Limit State Design		
	Load cases to design:	LC1	Tension Web
		LC2	Compression Web
		LC3	Compression Chord
		LC4	Tension Chord
		LC5	Downward reaction force
		LC6	Upward Reaction Force

	Load combinations to design:	CO1	Tension Web + Compression Chod +Upward Reaction Force + Reaction Force + Self-weight
		CO2	Tension Web + Tension Chord + Downward Reaction Force + Self-weight
		CO3	Compression Web + Compression Chord + Upward Reaction Force + Self-weight
		CO4	Compression Web + Tension Chod + Downward Reaction Force + Self-weight

Details

	Stability Analysis	
	Stability Check	x
	Bending About the Major y - Axis	
	Equivalent Member Method acc. to 6.3	x
	Include second-order effects acc. to 5.2.2(4) by increasing bending moment	-
	Bending About the Minor z - Axis	
	Equivalent Member Method acc. to 6.3	x
	Include second-order effects acc. to 5.2.2(4) by increasing bending moment	-
	Determination of elastic critical moment for lateral-torsional buckling	
	For members:	Automatically by Eigenvalue Method
	Load application of positive transverse loads:	On cross-section edge directed to shear center (e.g. top flange, destabilizing effect)
	Model type acc. to Table B.3	
	Sway y - y (C_{my} = 0.9)	-
	Sway z - z (C_{mz} = 0.9)	-
	Limit Values for Stability Analysis	
	Do not consider small moments and compression forces if:	
	$N_{c,Ed} / N_{pl} \leq$	0.01
	$M_{y,Ed} / M_{pl,y,Rd} \leq$	0.01
	$M_{z,Ed} / M_{pl,z,Rd} \leq$	0.01
	Limit shear stress due to torsion:	
	$\tau_{t,Ed} / \tau_{t,Rd} \leq$	0.05
	Stability analysis method for sets of members acc. to	General Method
	Classification of Cross-Sections	
	Type of determination of ψ and α acc. to Table 5.2:	Increase N_{Ed} and M_{Ed} uniformly
	For limit c/t of Class 3, increase material factor ε acc. to 5.5.2(9)	x
	Use SHAPE-THIN for classification of all supported cross-section types (only Classes 3 and 4 possible)	-
	Ignore classification of curved parts	x
	if c/t ≤	5.00
	Options	
	Elastic Design (also for cross-sections of Class 1 or 2)	x
	Stability Analyses with Second-Order Internal Forces	
	Use γ_{M1} for determination of the cross-section resistance	-
	Cross-section check for M+N	
	Use linear interaction acc. to 6.2.1(7)	-
	Cross-sections with Class 4 and torsion	
	$\tau_{t,Ed} / \tau_{t,Rd} \leq$	0.05
	Warping Torsion	
	Perform warping analysis (7 degrees of freedom)	-
	Plasticity	
	Perform advanced plastic design checks acc. to [1] and [2]	-
	Member Slenderness's	
	Members with	λ_{limit}
	Tension only:	300
	Compression / flexure:	200
	Design of Welds	
	Allow design of welds	-

National Annex

	Partial Factors acc. to 6.1, Note 2B	
	For resistance of cross-sections γ_{M0} :	1.00
	For resistance of members to buckling (assessed for checks in Clause 6.3) γ_{M1} :	1.00
	For resistance of cross-sections in tension to fracture γ_{M2} :	1.25
	Fire Properties	
	$\gamma_{M,fi}$	1.00
	Shear acc. to 6.2.6(3) and shear buckling acc. to EN 1993-1-5	
	Factor η :	1.20
	Parameters for Lateral-Torsional Buckling	
	Imperfection coefficients of lateral-torsional buckling curves acc. to Table 6.3	
	Buckling Curve a:	0.21
	Buckling Curve b:	0.34
	Buckling Curve c:	0.49
	Buckling Curve d:	0.76
	Use factor f for modification of χ_{LT} according to 6.3.2.3(2)	-
	Parameters for Φ_{LT} acc. to 6.3.2.3(1):	
	Rolled I-Sections	
	$\lambda_{LT,0}$:	0.40
	β :	0.75
	Welded I-Sections	
	$\lambda_{LT,0}$:	0.20
	β :	1.00
	Determine lateral-torsional buckling curves:	If possible, acc. to 6.3.2.3, Eq. (6.57), otherwise acc. to 6.3.2.2, Eq. (6.56)
	Determine interaction factors for 6.3.3(4) according to Method:	according to Annex B
	Serviceability Limits (Deflections) acc. to 7.2	
	Combination of actions (Table A1.4 of EN 1990):	

				Cantilevers
	SC :	Characteristic	L / 300	L_c / 150
	SF :	Frequent	L / 200	L_c / 100
	SQ :	Quasi-permanent	L / 200	L_c / 100

	General Method according to 6.3.4	
	Use General Method also for non-I-sections	x
	Always use General Method for stability design according to 6.3.4	-
	Use European lateral-torsional buckling curve according to [5]	-
	Use the method of Johannes Caspar Naumes for assessing the out-of-plane stability	-
	Use interpolation acc. to Eq. (6.66)	-
	Stainless Steel (EN 1993-1-4) Parameters	
	Partial Factors acc. to 5.1	
	For resistance of cross-sections	
	γ_{M0}	1.10
	For resistance of members to buckling (assessed for checks in Clause 6.3)	
	γ_{M1}	1.10
	For resistance of cross-sections to fracture due to tension	
	γ_{M2}	1.25
	Shear according to 5.6(2) and shear buckling	
	η	1.20
	Parameters for Stability Design	
	Imperfection Coefficient	α
	Buckling	
	Cold formed open sections	0.49
	Hollow sections (welded or seamless)	0.49
	Welded open sections (about the major axis)	0.49
	Welded open sections (about the minor axis)	0.76
	Torsional and Lateral-Torsional Buckling	
	All structural members	0.34
	Parameter for Φ	λ_0
	Buckling	

	Cold formed open sections	0.40
	Hollow sections (welded or seamless)	0.40
	Welded open sections (about the major axis)	0.20
	Welded open sections (about the minor axis)	0.20
	Torsional and Lateral-Torsional Buckling	
	All structural members	0.20
	Imperfection Coefficient	α_{LT}
	Cold formed sections and hollow sections (welded and seamless)	0.34
	Welded open sections and other sections	0.76

Materials

Matl.	Material	E- Modulus	Shear Modulus	Poisson's Ratio	Yield Stress	Max. Thickness
No.	Description	E [kN/cm²]	G [kN/cm²]	ν [-]	f_{yk} [kN/cm²]	t [mm]
4	Steel S 355 J2 | SFS EN 10025-2:2004-11	21000.00	8076.92	0.300	35.50	3.0
					35.50	16.0
					34.50	40.0
					33.50	63.0
					32.50	80.0
					31.50	100.0
					29.50	150.0
					28.50	200.0

Cross-Sections

Sect.	Matl.	Cross-Section	Cross-Section	Max Design	
No.	No.	Description	Type	Ratio	Comment
1	4	BOX(A) 500/19/12/176/600/500/19/0/0	General	0.21	WB600-12-19*500-150
17	4	RRO 200x150x16 | ALUKÖNIGSTAHL - EN 10210	Box rolled	0.36	
21	4	RRO 350x300x16 | ALUKÖNIGSTAHL - EN 10210	Box rolled	0.85	
22	4	RRO 300x200x12.5 | ALUKÖNIGSTAHL - EN 10210	Box rolled	0.84	

Design by Load Case

LC/CO/	Load Case or	Member	Location	Design		Equation	Description
RC	CO/RC Description	No.	x [m]			No.	
	Ultimate Limit State Design						
LC1	Tension Web	17	0.000	0.47	≤ 1	CS182)	PT
LC2	Compression Web	17	0.000	0.47	≤ 1	CS182)	PT
LC3	Compression Chord	17	1.976	0.57	≤ 1	CS182)	PT
LC4	Tension Chord	17	1.976	0.57	≤ 1	CS182)	PT
LC5	Downward reaction force	8	2.884	0.21	≤ 1	CS122)	PT
LC6	Upward Reaction Force	8	2.884	0.21	≤ 1	CS122)	PT
CO1	Tension Web + Compression Chod + Upward Reaction Force + Self-weight	17	1.976	0.59	≤ 1	CS182)	PT
CO2	Tension Web + Tension Chord + Downward Reaction Force + Self-weight	25	1.612	0.83	≤ 1	CS182)	PT
CO3	Compression Web + Compression Chord + Upward Reaction Force + Self-weight	25	1.612	0.85	≤ 1	CS182)	PT
CO4	Compression Web + Tension Chod + Downward Reaction Force + Self-weight	20	0.000	0.58	≤ 1	CS182)	PT

Design by Cross-Section

Sect.	Member	Location	LC/CO/	Design		Equation	Description
No.	No.	x [m]	RC			No.	
1	BOX(A) 500/19/12/176/600/500/19/0/0 - WB600-12-19*500-150						
	26	0.533	LC3	0.00	≤ 1	CS100)	Negligible internal forces
	9	1.200	CO3	0.01	≤ 1	CS101)	Cross-section check - Tension acc. to 6.2.3
	9	1.200	CO2	0.01	≤ 1	CS102)	Cross-section check - Compression acc. to 6.2.4
	9	0.960	CO2	0.02	≤ 1	CS103)	Cross-section check - Compression acc. to 6.2.4 - Class 4
	22	0.000	CO3	0.03	≤ 1	CS112)	Cross-section check - Bending about y-axis acc. to 6.2.5 - Class 3
	8	2.884	CO3	0.21	≤ 1	CS122)	Cross-section check - Shear force in z-axis acc. to 6.2.6(4) - Class 3 or 4
	22	0.000	CO3	0.03	≤ 1	CS143)	Cross-section check - Bending and shear force acc. to 6.2.9.2 and

							6.2.10 - Class 3 - General cross-section
	9	1.200	CO3	0.04	≤ 1	CS183)	Cross-section check - Bending, shear and axial force acc. to 6.2.9.2 - Class 3 - General cross-section
	9	0.960	CO2	0.01	≤ 1	CS191)	Cross-section check - Bending, shear and axial force acc. to 6.2.9.3 - Class 4
	9	0.960	CO2	0.04	≤ 1	ST354)	Stability analysis - Bending and compression acc. to 6.3.3, Method 1
17	RRO 200x150x16 | ALUKÖNIGSTAHL - EN 10210						
	28	0.000	LC5	0.00	≤ 1	CS100)	Negligible internal forces
	28	0.000	CO2	0.24	≤ 1	CS101)	Cross-section check - Tension acc. to 6.2.3
	28	2.258	CO3	0.24	≤ 1	CS102)	Cross-section check - Compression acc. to 6.2.4
	28	0.000	CO1	0.01	≤ 1	CS122)	Cross-section check - Shear force in z-axis acc. to 6.2.6(4) - Class 3 or 4
	27	0.000	LC1	0.00	≤ 1	CS126)	Cross-section check - Shear buckling acc. to 6.2.6(6)
	28	0.000	CO2	0.36	≤ 1	CS182)	Cross-section check - Bending, shear and axial force acc. to 6.2.9.2 - Class 3
	28	0.000	LC3	0.07	≤ 1	ST301)	Stability analysis - Flexural buckling about y-axis acc. to 6.3.1.1 and 6.3.1.2(4)
	28	0.000	LC3	0.08	≤ 1	ST311)	Stability analysis - Flexural buckling about z-axis acc. to 6.3.1.1 and 6.3.1.2(4)
	28	2.258	CO3	0.33	≤ 1	ST364)	Stability analysis - Bending and compression acc. to 6.3.3, Method 2
21	RRO 350x300x16 | ALUKÖNIGSTAHL - EN 10210						
	5	0.000	LC5	0.00	≤ 1	CS100)	Negligible internal forces
	23	0.000	CO1	0.09	≤ 1	CS101)	Cross-section check - Tension acc. to 6.2.3
	23	1.912	CO4	0.09	≤ 1	CS102)	Cross-section check - Compression acc. to 6.2.4
	25	0.269	CO3	0.21	≤ 1	CS122)	Cross-section check - Shear force in z-axis acc. to 6.2.6(4) - Class 3 or 4
	5	0.000	LC1	0.00	≤ 1	CS126)	Cross-section check - Shear buckling acc. to 6.2.6(6)
	25	1.612	CO3	0.85	≤ 1	CS182)	Cross-section check - Bending, shear and axial force acc. to 6.2.9.2 - Class 3
	25	0.000	CO3	0.47	≤ 1	ST364)	Stability analysis - Bending and compression acc. to 6.3.3, Method 2
22	RRO 300x200x12.5 | ALUKÖNIGSTAHL - EN 10210						
	20	1.516	LC5	0.00	≤ 1	CS100)	Negligible internal forces
	21	0.606	CO2	0.05	≤ 1	CS101)	Cross-section check - Tension acc. to 6.2.3
	17	1.976	CO3	0.05	≤ 1	CS102)	Cross-section check - Compression acc. to 6.2.4
	16	0.000	CO3	0.24	≤ 1	CS122)	Cross-section check - Shear force in z-axis acc. to 6.2.6(4) - Class 3 or 4
	16	0.000	LC1	0.00	≤ 1	CS126)	Cross-section check - Shear buckling acc. to 6.2.6(6)
	21	1.516	CO3	0.84	≤ 1	CS182)	Cross-section check - Bending, shear and axial force acc. to 6.2.9.2 - Class 3
	17	1.976	CO3	0.53	≤ 1	ST364)	Stability analysis - Bending and compression acc. to 6.3.3, Method 2

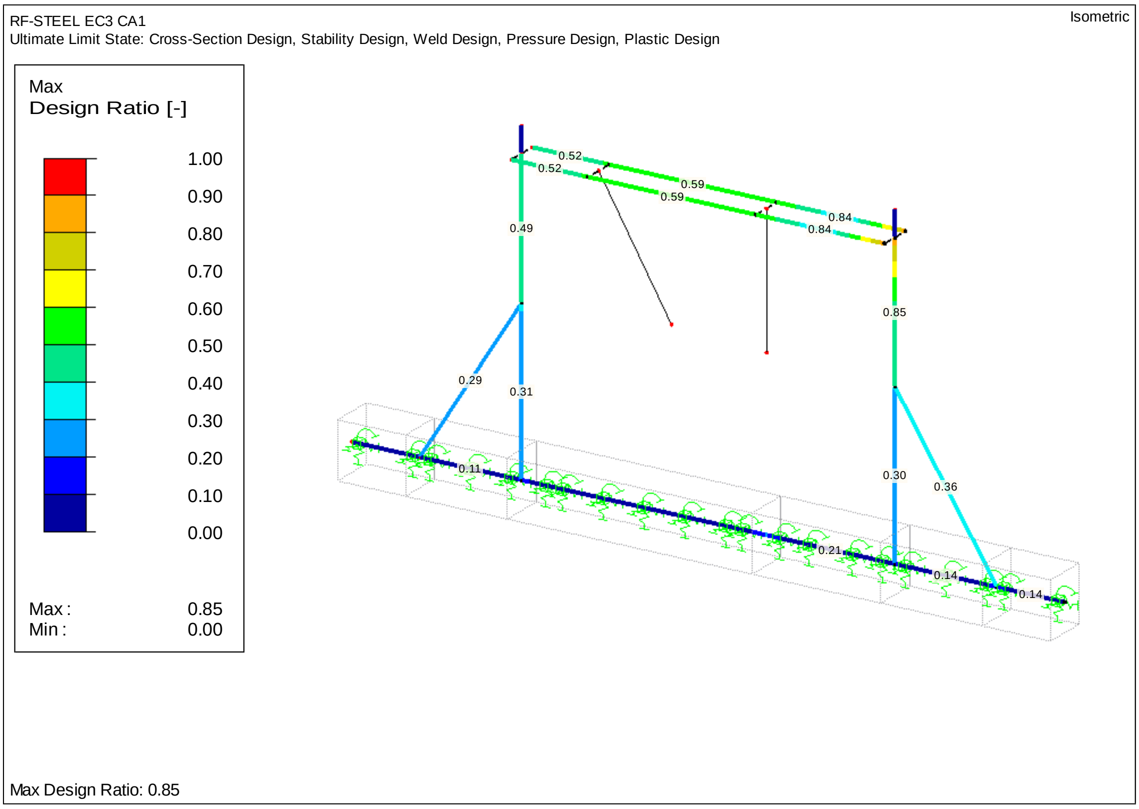
Design by Member

Member No.	Location x [m]	LC/CO/ RC	Design		Equation No.	Description
1	Cross-section No. 1 - BOX(A) 500/19/12/176/600/500/19/0/0					
	0.267	LC1	0.00	≤ 1	CS100)	Negligible internal forces
	0.533	CO4	0.01	≤ 1	CS101)	Cross-section check - Tension acc. to 6.2.3
	0.800	CO1	0.01	≤ 1	CS102)	Cross-section check - Compression acc. to 6.2.4
	0.533	CO1	0.01	≤ 1	CS103)	Cross-section check - Compression acc. to 6.2.4 - Class 4
	0.800	CO1	0.09	≤ 1	CS122)	Cross-section check - Shear force in z-axis acc. to 6.2.6(4) - Class 3 or 4
	0.800	CO1	0.02	≤ 1	CS183)	Cross-section check - Bending, shear and axial force acc. to 6.2.9.2 - Class 3 - General cross-section
4	Cross-section No. 21 - RRO 350x300x16 | ALUKÖNIGSTAHL - EN 10210					
	0.300	CO1	0.00	≤ 1	CS100)	Negligible internal forces
5	Cross-section No. 21 - RRO 350x300x16 | ALUKÖNIGSTAHL - EN 10210					
	0.000	LC5	0.00	≤ 1	CS100)	Negligible internal forces
	1.912	CO4	0.08	≤ 1	CS101)	Cross-section check - Tension acc. to 6.2.3
	0.000	CO1	0.08	≤ 1	CS102)	Cross-section check - Compression acc. to 6.2.4
	1.912	CO4	0.04	≤ 1	CS122)	Cross-section check - Shear force in z-axis acc. to 6.2.6(4) - Class 3 or 4
	0.000	LC1	0.00	≤ 1	CS126)	Cross-section check - Shear buckling acc. to 6.2.6(6)
	1.912	CO1	0.30	≤ 1	CS182)	Cross-section check - Bending, shear and axial force acc. to 6.2.9.2 - Class 3
	0.000	CO1	0.22	≤ 1	ST364)	Stability analysis - Bending and compression acc. to 6.3.3, Method 2
8	Cross-section No. 1 - BOX(A) 500/19/12/176/600/500/19/0/0					
	1.731	LC5	0.00	≤ 1	CS100)	Negligible internal forces
	0.000	CO3	0.00	≤ 1	CS101)	Cross-section check - Tension acc. to 6.2.3
	0.288	CO2	0.00	≤ 1	CS102)	Cross-section check - Compression acc. to 6.2.4
	2.884	CO3	0.03	≤ 1	CS112)	Cross-section check - Bending about y-axis acc. to 6.2.5 - Class 3
	2.884	CO3	0.21	≤ 1	CS122)	Cross-section check - Shear force in z-axis acc. to 6.2.6(4) - Class 3 or 4
	2.884	CO3	0.03	≤ 1	CS143)	Cross-section check - Bending and shear force acc. to 6.2.9.2 and 6.2.10 - Class 3

						- General cross-section
	0.000	CO3	0.01	≤ 1	CS183)	Cross-section check - Bending, shear and axial force acc. to 6.2.9.2 - Class 3 - General cross-section
9	Cross-section No. 1 - BOX(A) 500/19/12/176/600/500/19/0/0					
	0.720	LC3	0.00	≤ 1	CS100)	Negligible internal forces
	1.200	CO3	0.01	≤ 1	CS101)	Cross-section check - Tension acc. to 6.2.3
	1.200	CO2	0.01	≤ 1	CS102)	Cross-section check - Compression acc. to 6.2.4
	0.960	CO2	0.02	≤ 1	CS103)	Cross-section check - Compression acc. to 6.2.4 - Class 4
	0.000	LC3	0.01	≤ 1	CS112)	Cross-section check - Bending about y-axis acc. to 6.2.5 - Class 3
	1.200	CO3	0.14	≤ 1	CS122)	Cross-section check - Shear force in z-axis acc. to 6.2.6(4) - Class 3 or 4
	0.000	LC3	0.01	≤ 1	CS143)	Cross-section check - Bending and shear force acc. to 6.2.9.2 and 6.2.10 - Class 3 - General cross-section
	1.200	CO3	0.04	≤ 1	CS183)	Cross-section check - Bending, shear and axial force acc. to 6.2.9.2 - Class 3 - General cross-section
	0.960	CO2	0.01	≤ 1	CS191)	Cross-section check - Bending, shear and axial force acc. to 6.2.9.3 - Class 4
	0.960	CO2	0.04	≤ 1	ST354)	Stability analysis - Bending and compression acc. to 6.3.3, Method 1
12	Cross-section No. 21 - RRO 350x300x16 | ALUKÖNIGSTAHL - EN 10210					
	0.000	LC5	0.00	≤ 1	CS100)	Negligible internal forces
	0.000	CO2	0.08	≤ 1	CS101)	Cross-section check - Tension acc. to 6.2.3
	1.612	CO3	0.09	≤ 1	CS102)	Cross-section check - Compression acc. to 6.2.4
	1.612	CO1	0.11	≤ 1	CS122)	Cross-section check - Shear force in z-axis acc. to 6.2.6(4) - Class 3 or 4
	0.000	LC1	0.00	≤ 1	CS126)	Cross-section check - Shear buckling acc. to 6.2.6(6)
	0.000	CO3	0.49	≤ 1	CS182)	Cross-section check - Bending, shear and axial force acc. to 6.2.9.2 - Class 3
	1.612	CO3	0.40	≤ 1	ST364)	Stability analysis - Bending and compression acc. to 6.3.3, Method 2
15	Cross-section No. 21 - RRO 350x300x16 | ALUKÖNIGSTAHL - EN 10210					
	0.000	CO2	0.00	≤ 1	CS100)	Negligible internal forces
16	Cross-section No. 22 - RRO 300x200x12.5 | ALUKÖNIGSTAHL - EN 10210					
	0.000	LC5	0.00	≤ 1	CS100)	Negligible internal forces
	0.000	CO4	0.03	≤ 1	CS101)	Cross-section check - Tension acc. to 6.2.3
	0.909	CO1	0.03	≤ 1	CS102)	Cross-section check - Compression acc. to 6.2.4
	0.000	CO3	0.24	≤ 1	CS122)	Cross-section check - Shear force in z-axis acc. to 6.2.6(4) - Class 3 or 4
	0.000	LC1	0.00	≤ 1	CS126)	Cross-section check - Shear buckling acc. to 6.2.6(6)
	0.909	CO4	0.52	≤ 1	CS182)	Cross-section check - Bending, shear and axial force acc. to 6.2.9.2 - Class 3
	0.909	CO1	0.42	≤ 1	ST364)	Stability analysis - Bending and compression acc. to 6.3.3, Method 2
17	Cross-section No. 22 - RRO 300x200x12.5 | ALUKÖNIGSTAHL - EN 10210					
	1.976	LC5	0.00	≤ 1	CS100)	Negligible internal forces
	0.000	CO2	0.05	≤ 1	CS101)	Cross-section check - Tension acc. to 6.2.3
	1.976	CO3	0.05	≤ 1	CS102)	Cross-section check - Compression acc. to 6.2.4
	0.000	CO1	0.14	≤ 1	CS122)	Cross-section check - Shear force in z-axis acc. to 6.2.6(4) - Class 3 or 4
	0.000	LC1	0.00	≤ 1	CS126)	Cross-section check - Shear buckling acc. to 6.2.6(6)
	1.976	CO1	0.59	≤ 1	CS182)	Cross-section check - Bending, shear and axial force acc. to 6.2.9.2 - Class 3
	1.976	CO3	0.53	≤ 1	ST364)	Stability analysis - Bending and compression acc. to 6.3.3, Method 2
18	Cross-section No. 22 - RRO 300x200x12.5 | ALUKÖNIGSTAHL - EN 10210					
	0.000	LC5	0.00	≤ 1	CS100)	Negligible internal forces
	0.000	CO4	0.03	≤ 1	CS101)	Cross-section check - Tension acc. to 6.2.3
	0.909	CO1	0.03	≤ 1	CS102)	Cross-section check - Compression acc. to 6.2.4
	0.000	CO3	0.24	≤ 1	CS122)	Cross-section check - Shear force in z-axis acc. to 6.2.6(4) - Class 3 or 4
	0.000	LC1	0.00	≤ 1	CS126)	Cross-section check - Shear buckling acc. to 6.2.6(6)
	0.909	CO4	0.52	≤ 1	CS182)	Cross-section check - Bending, shear and axial force acc. to 6.2.9.2 - Class 3
	0.909	CO1	0.42	≤ 1	ST364)	Stability analysis - Bending and compression acc. to 6.3.3, Method 2
19	Cross-section No. 22 - RRO 300x200x12.5 | ALUKÖNIGSTAHL - EN 10210					
	1.976	LC5	0.00	≤ 1	CS100)	Negligible internal forces
	0.000	CO2	0.05	≤ 1	CS101)	Cross-section check - Tension acc. to 6.2.3
	1.976	CO3	0.05	≤ 1	CS102)	Cross-section check - Compression acc. to 6.2.4
	0.000	CO1	0.14	≤ 1	CS122)	Cross-section check - Shear force in z-axis acc. to 6.2.6(4) - Class 3 or 4
	0.000	LC1	0.00	≤ 1	CS126)	Cross-section check - Shear buckling acc. to 6.2.6(6)
	1.976	CO1	0.59	≤ 1	CS182)	Cross-section check - Bending, shear and axial force acc. to 6.2.9.2 - Class 3
	1.976	CO3	0.53	≤ 1	ST364)	Stability analysis - Bending and compression acc. to 6.3.3, Method 2
20	Cross-section No. 22 - RRO 300x200x12.5 | ALUKÖNIGSTAHL - EN 10210					
	1.516	LC5	0.00	≤ 1	CS100)	Negligible internal forces
	0.606	CO2	0.05	≤ 1	CS101)	Cross-section check - Tension acc. to 6.2.3
	1.516	CO3	0.05	≤ 1	CS102)	Cross-section check - Compression acc. to 6.2.4
	1.212	CO3	0.23	≤ 1	CS122)	Cross-section check - Shear force in z-axis acc. to 6.2.6(4) - Class 3 or 4
	0.000	LC1	0.00	≤ 1	CS126)	Cross-section check - Shear buckling acc. to 6.2.6(6)
	1.516	CO3	0.84	≤ 1	CS182)	Cross-section check - Bending, shear and axial force acc. to 6.2.9.2 - Class 3
	1.516	CO3	0.37	≤ 1	ST364)	Stability analysis - Bending and compression acc. to 6.3.3, Method 2
21	Cross-section No. 22 - RRO 300x200x12.5 | ALUKÖNIGSTAHL - EN 10210					

	1.516	LC5	0.00	≤ 1	CS100)	Negligible internal forces
	0.606	CO2	0.05	≤ 1	CS101)	Cross-section check - Tension acc. to 6.2.3
	1.516	CO3	0.05	≤ 1	CS102)	Cross-section check - Compression acc. to 6.2.4
	1.212	CO3	0.23	≤ 1	CS122)	Cross-section check - Shear force in z-axis acc. to 6.2.6(4) - Class 3 or 4
	0.000	LC1	0.00	≤ 1	CS126)	Cross-section check - Shear buckling acc. to 6.2.6(6)
	1.516	CO3	0.84	≤ 1	CS182)	Cross-section check - Bending, shear and axial force acc. to 6.2.9.2 - Class 3
	1.516	CO3	0.37	≤ 1	ST364)	Stability analysis - Bending and compression acc. to 6.3.3, Method 2
22	Cross-section No. 1 - BOX(A) 500/19/12/176/600/500/19/0/0					
	1.263	LC5	0.00	≤ 1	CS100)	Negligible internal forces
	1.263	CO1	0.00	≤ 1	CS101)	Cross-section check - Tension acc. to 6.2.3
	1.516	CO4	0.00	≤ 1	CS102)	Cross-section check - Compression acc. to 6.2.4
	1.263	CO4	0.00	≤ 1	CS103)	Cross-section check - Compression acc. to 6.2.4 - Class 4
	0.000	CO3	0.03	≤ 1	CS112)	Cross-section check - Bending about y-axis acc. to 6.2.5 - Class 3
	0.000	LC5	0.21	≤ 1	CS122)	Cross-section check - Shear force in z-axis acc. to 6.2.6(4) - Class 3 or 4
	0.000	CO3	0.03	≤ 1	CS143)	Cross-section check - Bending and shear force acc. to 6.2.9.2 and 6.2.10 - Class 3 - General cross-section
	1.516	CO1	0.02	≤ 1	CS183)	Cross-section check - Bending, shear and axial force acc. to 6.2.9.2 - Class 3 - General cross-section
23	Cross-section No. 21 - RRO 350x300x16 | ALUKÖNIGSTAHL - EN 10210					
	1.912	LC5	0.00	≤ 1	CS100)	Negligible internal forces
	0.000	CO1	0.09	≤ 1	CS101)	Cross-section check - Tension acc. to 6.2.3
	1.912	CO4	0.09	≤ 1	CS102)	Cross-section check - Compression acc. to 6.2.4
	1.639	CO3	0.03	≤ 1	CS122)	Cross-section check - Shear force in z-axis acc. to 6.2.6(4) - Class 3 or 4
	0.000	LC1	0.00	≤ 1	CS126)	Cross-section check - Shear buckling acc. to 6.2.6(6)
	0.000	CO1	0.31	≤ 1	CS182)	Cross-section check - Bending, shear and axial force acc. to 6.2.9.2 - Class 3
	1.912	CO4	0.24	≤ 1	ST364)	Stability analysis - Bending and compression acc. to 6.3.3, Method 2
24	Cross-section No. 1 - BOX(A) 500/19/12/176/600/500/19/0/0					
	0.480	LC3	0.00	≤ 1	CS100)	Negligible internal forces
	0.000	CO1	0.01	≤ 1	CS101)	Cross-section check - Tension acc. to 6.2.3
	0.000	CO4	0.01	≤ 1	CS102)	Cross-section check - Compression acc. to 6.2.4
	0.240	CO4	0.01	≤ 1	CS103)	Cross-section check - Compression acc. to 6.2.4 - Class 4
	1.200	LC3	0.00	≤ 1	CS112)	Cross-section check - Bending about y-axis acc. to 6.2.5 - Class 3
	1.200	CO4	0.11	≤ 1	CS122)	Cross-section check - Shear force in z-axis acc. to 6.2.6(4) - Class 3 or 4
	1.200	LC3	0.00	≤ 1	CS143)	Cross-section check - Bending and shear force acc. to 6.2.9.2 and 6.2.10 - Class 3 - General cross-section
	0.000	CO1	0.02	≤ 1	CS183)	Cross-section check - Bending, shear and axial force acc. to 6.2.9.2 - Class 3 - General cross-section
	0.240	CO4	0.01	≤ 1	CS191)	Cross-section check - Bending, shear and axial force acc. to 6.2.9.3 - Class 4
25	Cross-section No. 21 - RRO 350x300x16 | ALUKÖNIGSTAHL - EN 10210					
	0.000	LC5	0.00	≤ 1	CS100)	Negligible internal forces
	1.075	CO2	0.08	≤ 1	CS101)	Cross-section check - Tension acc. to 6.2.3
	0.000	CO3	0.09	≤ 1	CS102)	Cross-section check - Compression acc. to 6.2.4
	0.269	CO3	0.21	≤ 1	CS122)	Cross-section check - Shear force in z-axis acc. to 6.2.6(4) - Class 3 or 4
	0.000	LC1	0.00	≤ 1	CS126)	Cross-section check - Shear buckling acc. to 6.2.6(6)
	1.612	CO3	0.85	≤ 1	CS182)	Cross-section check - Bending, shear and axial force acc. to 6.2.9.2 - Class 3
	0.000	CO3	0.47	≤ 1	ST364)	Stability analysis - Bending and compression acc. to 6.3.3, Method 2
26	Cross-section No. 1 - BOX(A) 500/19/12/176/600/500/19/0/0					
	0.533	LC3	0.00	≤ 1	CS100)	Negligible internal forces
	0.267	CO2	0.01	≤ 1	CS101)	Cross-section check - Tension acc. to 6.2.3
	0.000	CO3	0.01	≤ 1	CS102)	Cross-section check - Compression acc. to 6.2.4
	0.267	CO3	0.01	≤ 1	CS103)	Cross-section check - Compression acc. to 6.2.4 - Class 4
	0.000	CO3	0.14	≤ 1	CS122)	Cross-section check - Shear force in z-axis acc. to 6.2.6(4) - Class 3 or 4
	0.000	CO3	0.03	≤ 1	CS183)	Cross-section check - Bending, shear and axial force acc. to 6.2.9.2 - Class 3 - General cross-section
	0.267	CO3	0.03	≤ 1	ST354)	Stability analysis - Bending and compression acc. to 6.3.3, Method 1
27	Cross-section No. 17 - RRO 200x150x16 | ALUKÖNIGSTAHL - EN 10210					
	0.000	LC5	0.00	≤ 1	CS100)	Negligible internal forces
	2.258	CO4	0.15	≤ 1	CS101)	Cross-section check - Tension acc. to 6.2.3
	0.000	CO1	0.15	≤ 1	CS102)	Cross-section check - Compression acc. to 6.2.4
	2.258	CO4	0.01	≤ 1	CS122)	Cross-section check - Shear force in z-axis acc. to 6.2.6(4) - Class 3 or 4
	0.000	LC1	0.00	≤ 1	CS126)	Cross-section check - Shear buckling acc. to 6.2.6(6)
	2.258	CO4	0.29	≤ 1	CS182)	Cross-section check - Bending, shear and axial force acc. to 6.2.9.2 - Class 3
	0.000	CO1	0.24	≤ 1	ST364)	Stability analysis - Bending and compression acc. to 6.3.3, Method 2
28	Cross-section No. 17 - RRO 200x150x16 | ALUKÖNIGSTAHL - EN 10210					
	0.000	LC5	0.00	≤ 1	CS100)	Negligible internal forces
	0.000	CO2	0.24	≤ 1	CS101)	Cross-section check - Tension acc. to 6.2.3
	2.258	CO3	0.24	≤ 1	CS102)	Cross-section check - Compression acc. to 6.2.4
	0.000	CO1	0.01	≤ 1	CS122)	Cross-section check - Shear force in z-axis acc. to 6.2.6(4) - Class 3 or 4
	0.000	LC1	0.00	≤ 1	CS126)	Cross-section check - Shear buckling acc. to 6.2.6(6)

	0.000	CO2	0.36	≤ 1	CS182)	Cross-section check - Bending, shear and axial force acc. to 6.2.9.2 - Class 3
	0.000	LC3	0.07	≤ 1	ST301)	Stability analysis - Flexural buckling about y-axis acc. to 6.3.1.1 and 6.3.1.2(4)
	0.000	LC3	0.08	≤ 1	ST311)	Stability analysis - Flexural buckling about z-axis acc. to 6.3.1.1 and 6.3.1.2(4)
	2.258	CO3	0.33	≤ 1	ST364)	Stability analysis - Bending and compression acc. to 6.3.3, Method 2



Appendix 3

APPENDIX 3 STRUCTURE DRAWINGS

Assembly list of steel frame

Project Number:	
Project	HAMK Tech
Date	

Assembly Mark	No.	NAME	Profile	Net Area(m^2) for one	Net Area(m^2) for all	Net Weight(kg) for one	Net Weight(kg) for all
A/12	1	PLATE	PL30*550	3.55	3.55	406.01	406.01
A/13	1	PLATE	PL30*550	3.56	3.56	406.01	406.01
A/17	1	PLATE	PL20*250	3.98	3.98	359.20	359.20
B/1	2	BEAM	CFRHS150X10	0.72	1.44	51.16	102.33
B/2	1	BEAM	CFRHS250x15	1.65	1.65	164.96	164.96
B/4	2	BEAM	CFRHS100X80X6	0.90	1.81	44.22	88.44
B/6	2	BEAM	CFRHS300X200X12.5	4.68	9.36	466.09	932.18
C/1	1	Vertical pillar	CFRHS350x300x16	5.49	5.49	657.63	657.63
C/1	1	Vertical pillar	CFRHS350x300x16	5.49	5.49	657.63	657.63
C/2	4	Vertical pillar	CFRHS300X200X12.5	0.56	2.25	41.04	164.15
C/6	2	Base beam	WB600-12-19*500-150	10.54	21.08	624.83	1249.65
C/8	1	Base beam	WB600-12-19*500-150	35.98	35.98	2142.26	2142.26
Total for	19	assemblies:			95.62		7330.45

Part list of steel frame

Project Number:	
Project	HAMK Tech
Date	

PartPos	Profile	No.	Material	Length (mm)	Net Area(m^2) for one
1001	PL60*540	2	S355J0	1100	1.38
1002	PL60*540	1	S355J0	1100	1.38
1003	PL40*360	2	S355J0	540	0.46
1004	PL20*250	1	S355J0	250	0.14
1005	PL20*180	1	S355J0	180	0.08
1006	PL10*150	1	S355J0	150	0.05
1007	PL10*150	2	S355J0	150	0.05
1008	PL20*100	4	S355J0	150	0.04
1009	PL10*150	1	S355J0	150	0.05
1010	PL10*200	1	S235JR	253	0.08
1011	PL10*200	1	S235JR	253	0.08
1012	PL30*550	4	S235JR	600	0.73
1014	PL10*320	4	S235JR	120	0.09
1015	PL20*300	2	S235JR	300	0.20
1016	PL20*300	2	S235JR	300	0.20
1017	PL40*450	2	S235JR	550	0.58
1018	PL10*150	2	S235JR	250	0.08
P/1	CFRHS350x300x16	2	S355J0	3800	4.91
P/4	CFRHS300X200X12.5	2	S355J0	5000	4.68
P/18	CFRHS100X100X8	1	S355J0	1751	0.64
P/19	CFRHS80X80X6	2	S235JR	700	0.21
P/22	FL100*100	1	S235JR	1978	0.82
P/24	WB600-12-19*500-150	1	S235JR	500	1.41
P/25	WB600-12-19*500-150	2	S235JR	2450	10.54
P/26	CFRHS200X150X16	1	S235JR	2431	1.51
P/27	CFRHS200X150X16	1	S235JR	2431	1.52
P/29	CFRHS150X100X10	2	S355J0	942	0.43
P/30	CFRHS250*150*16	1	S355J0	1660	1.32
P/33	WB600-12-19*500-150	1	S235JR	8400	35.98
Total for		50	members		

Net Area(m^2) for all	Net Weight(kg) for one	Net Weight(kg) for all
2.77	279.77	559.54
1.38	279.77	279.77
0.92	61.04	122.08
0.14	9.81	9.81
0.08	5.09	5.09
0.05	1.77	1.77
0.10	1.77	3.53
0.16	2.35	9.42
0.05	1.77	1.77
0.08	2.74	2.74
0.08	2.74	2.74
2.92	77.71	310.86
0.34	3.01	12.06
0.41	14.13	28.26
0.41	14.13	28.26
1.15	77.72	155.43
0.17	2.94	5.89
9.82	579.92	1159.83
9.36	439.76	932.18
0.64	37.45	40.47
0.42	9.23	19.52
0.82	154.83	154.83
1.41	91.25	91.25
21.08	624.83	1249.65
1.51	172.86	172.86
1.52	172.86	172.86
0.86	31.48	68.04
1.32	153.45	153.45
35.98	2142.26	2142.26
95.97		**7896.22**

YLEISTIEDOT

TERÄSTIEDOT

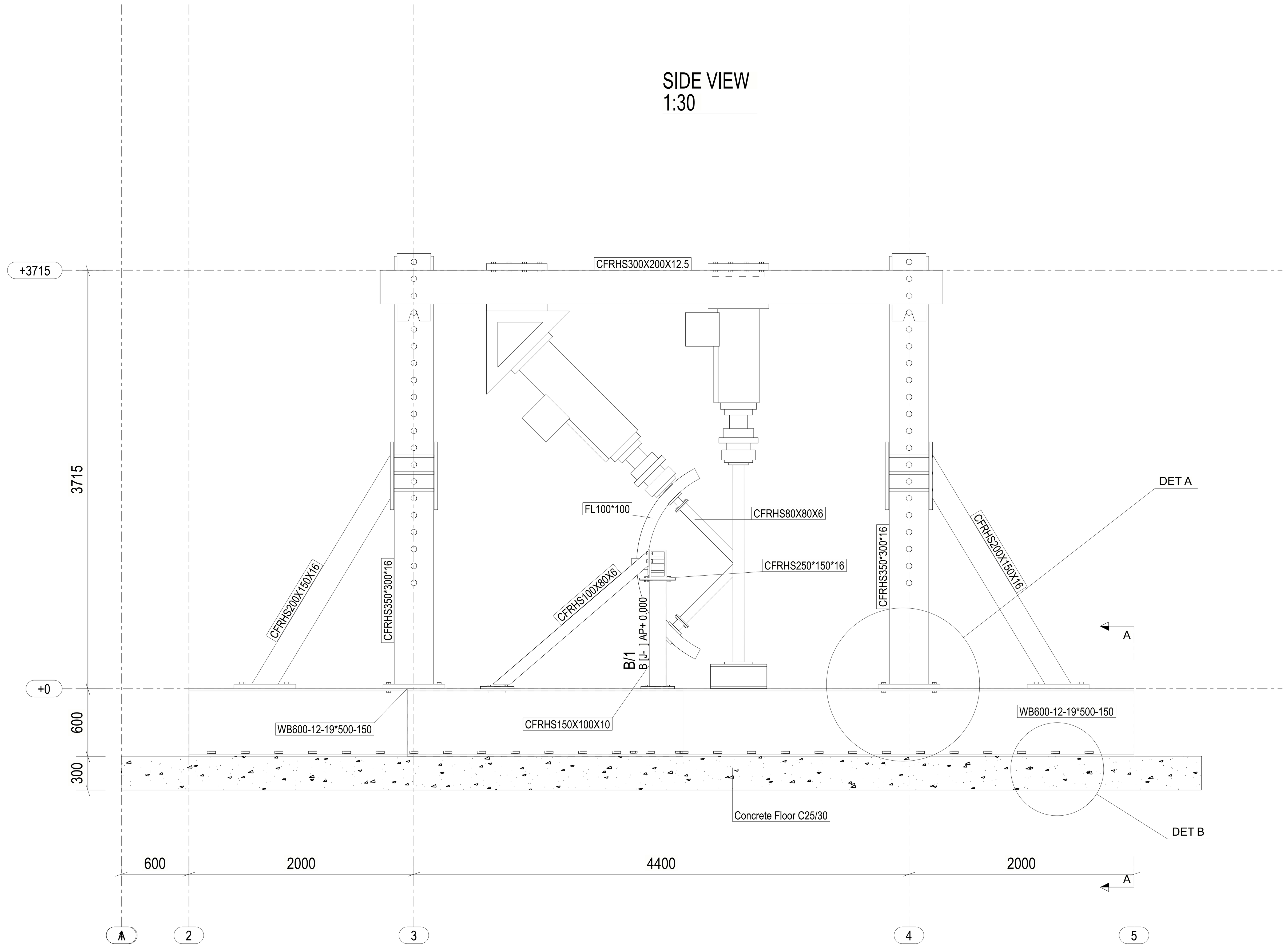
Toteutusluokka	EXC1
Seuraamusluokka	CC1
Käyttöluokka	SC1
Valmistusluokka	PC1

BETONITIEDOT

KUORMATIEDOT

LIITTYVÄT PIIRUSTUKSET

SIDE VIEW
1:30



3d
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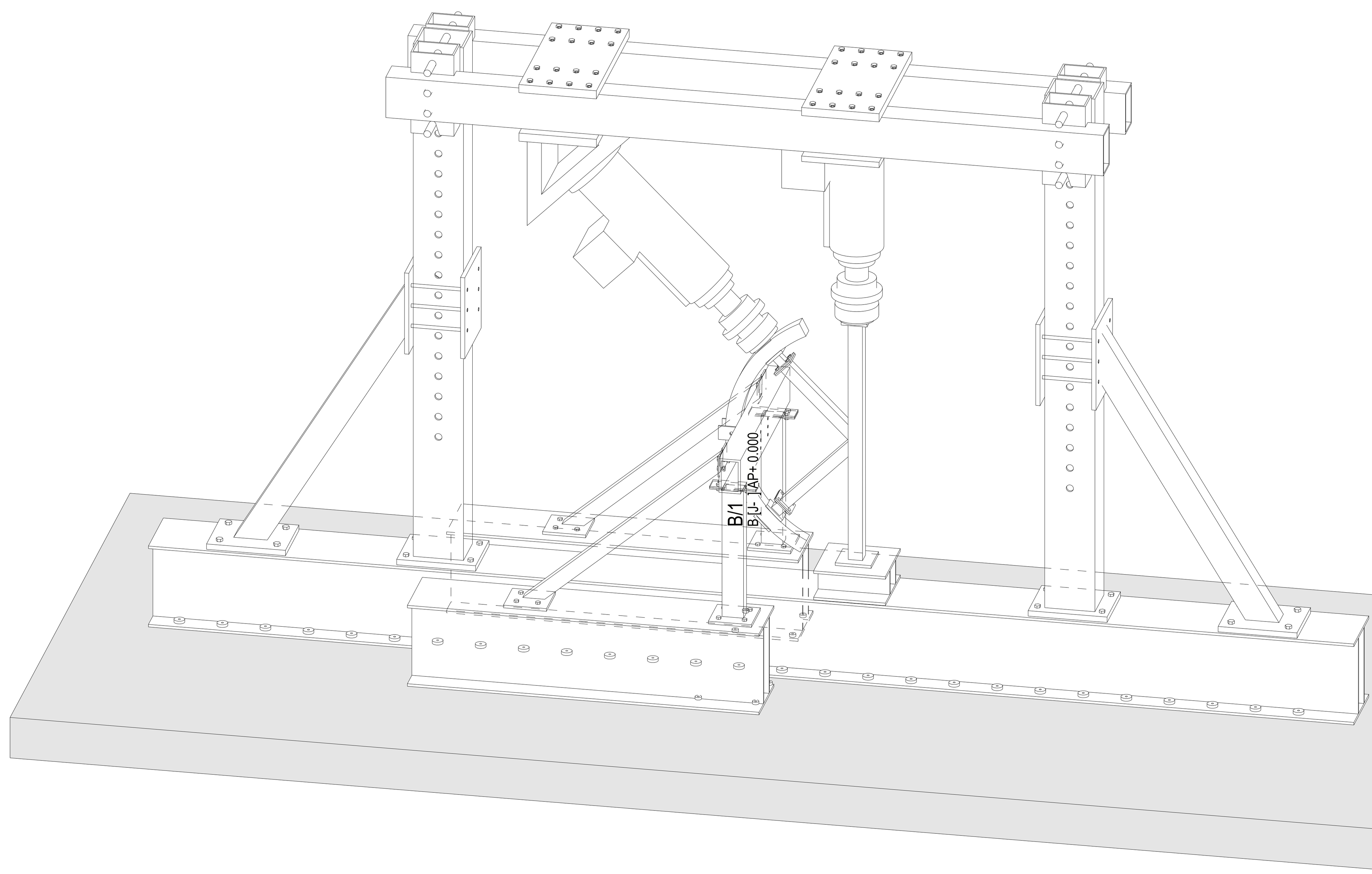

PLAN +0
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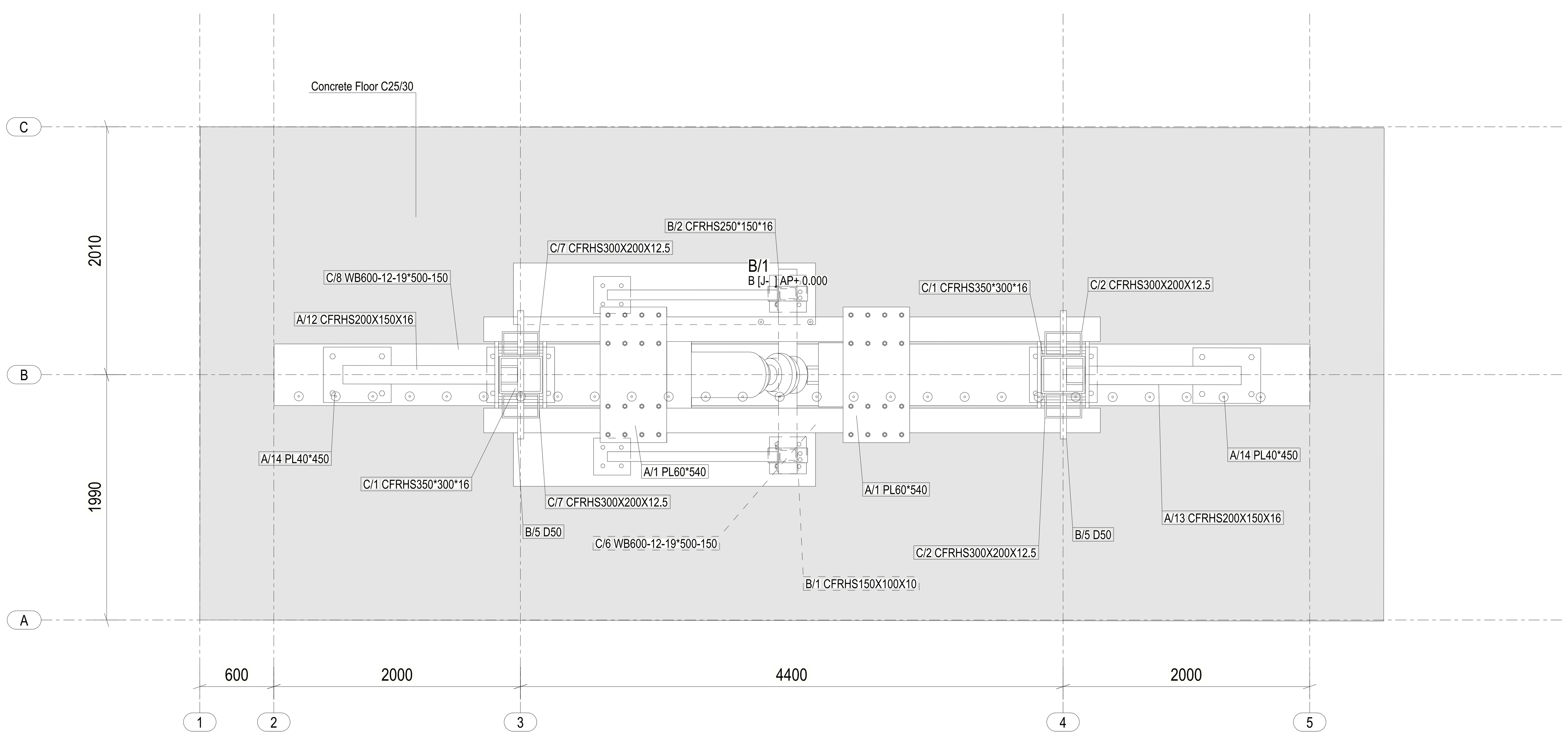
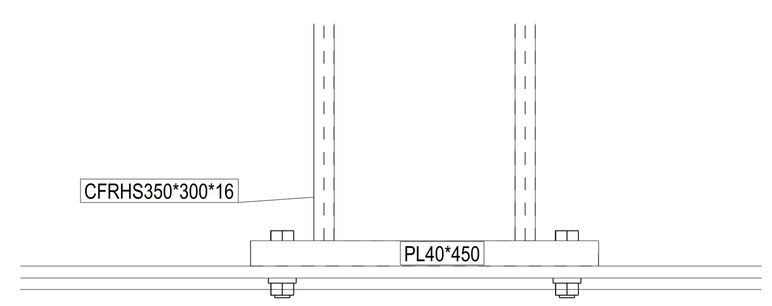


DETAIL A
1:10



A - A
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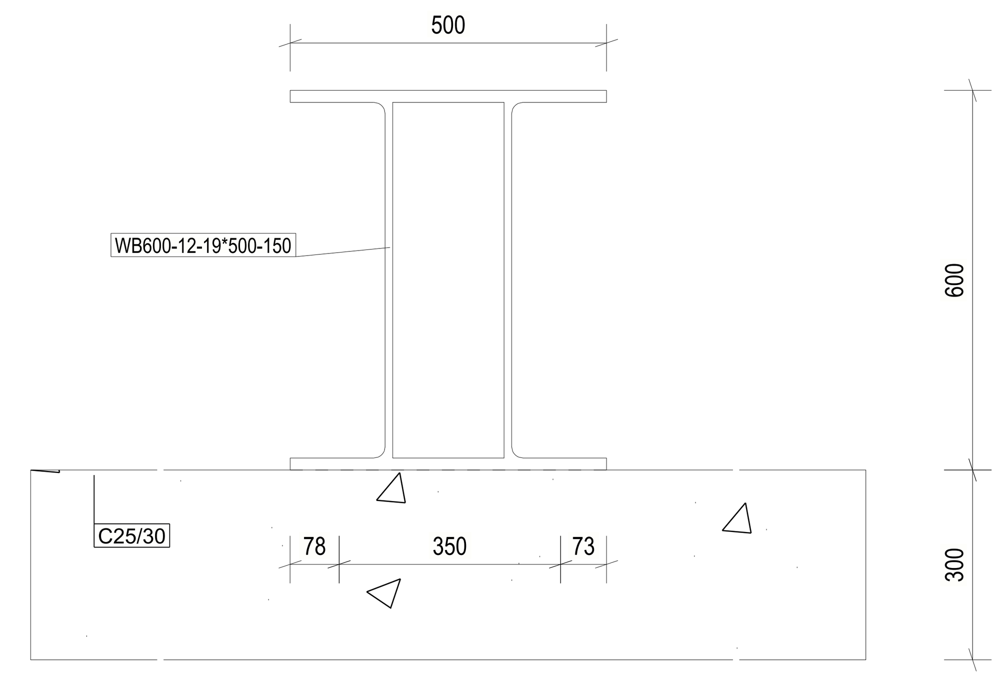

DETAIL B
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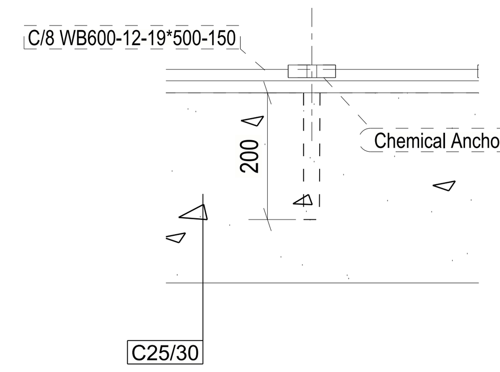

K.OSA/KYLÄ	KORTTELI/TILA	TONTTI/RNRO
VIRANOMAISTEN ARKISTOMERKINTÖJÄ VARTEN		
RAKENNUSTOIMENPIDE	PIIRUSTUSLAJI	JUOKSEVA NRO
KOHDE: SteeL Assembly Plan drawings	PIIRUSTUKSEN SISÄLTÖ: HAMK Tech Steel Reaction Frame	MITTAKAAVAT: 1:10 1:30
PIIRT: Aashish Rokka	SUUN: Aashish Rokka	
TARK: Zhongcheng Ma	HYV: Zhongcheng Ma	
TYÖNUMERO	ALANUMERO	PIIR. NRO: R-0-0-0-?-0
S.ALA: RAK	SIVU	PVM: 06.05.2021	MUUTOS

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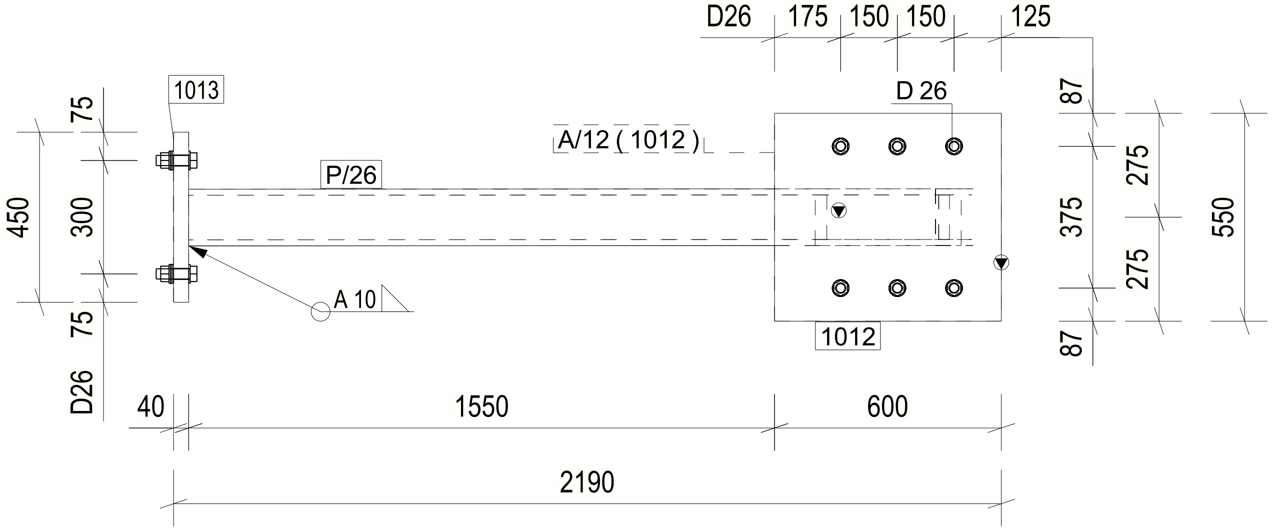
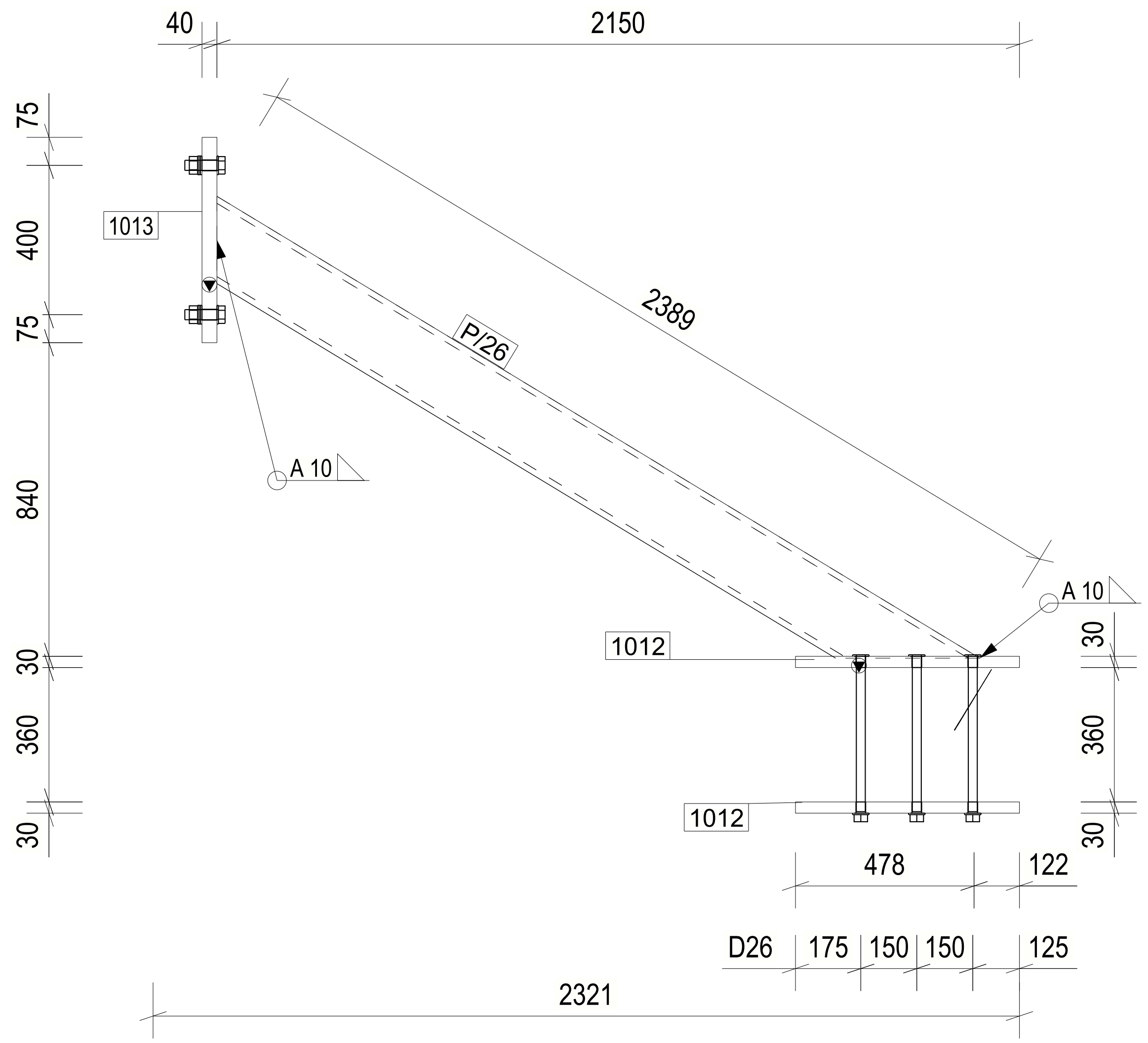
Tekla

Tekla Structures

1:20



A - A
1:20



OSALUETTELO KOKOONPANOLLE A/12, JOTA VALMISTETAAN 1 KAPPALETTA

OSA	PROFIILI	MATERIAALI	PITUUS [mm]	ALA [m2]	PAINO [kg]	LKM
ALIKOKOONPANO A/14 (ERILLINEN PIIRUSTUS)					77.7	1
1012	PL30*550	S235JR	600	1.5	77.7	2
P/26	CFRHS200X150X16	S235JR	2431	1.5	172.9	1
			YHTEENSÄ:	3.0	406.0	

KOKOONPANON KIINNIKELUETTELO

NIMIKE	HALK.	KOKO	STANDARDI	LUJUUS	MATER./PINTA	VÄRI	kg/YHT.	LKM
PULTTI	24	M24*468	DIN931	200HV			0.00	6
PULTTI	27	M27*90	DIN931	200HV			2.18	4
MUTTERI	24	M24	DIN934	200HV			0.65	6
MUTTERI	27	M27	DIN934	200HV			0.65	4
ALUSLEVY	25	M24	DIN125	200HV			0.39	12
ALUSLEVY	28	M27	DIN125	200HV			0.68	16
					YHTEENSÄ:		4.5	

K.OSA/KYLÄ	KORTTELI/TILA	TONTTI/RNRO

VIRANOMAISTEN ARKISTOMERKINTÖJÄ VARTEN

RAKENNUSTOIMENPIDE

PIIRUSTUSLAJI

JUOKSEVA NRO

KOHDE

PIIRUSTUKSEN SISÄLTÖ
HAMK Tech
A/12, Steel Reaction Frame

MITTAKAAVAT
1:20

PIIRT.
Aashish Rokka

SUUN.
Aashish Rokka

TARK.
Zhongcheng Ma

HYV.
Zhongcheng Ma

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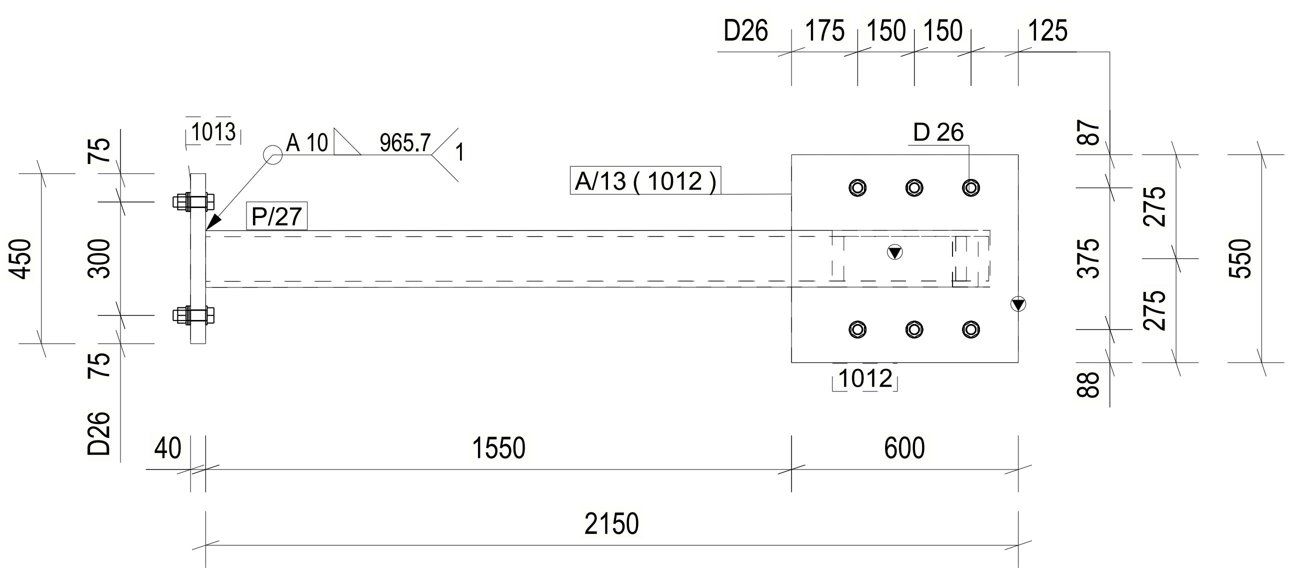
Tekla

TYÖNUMERO	ALANUMERO	PIIR. NRO.	
		A/12	
S.ALA	SIVU	PVM	MUUTOS
RAK			

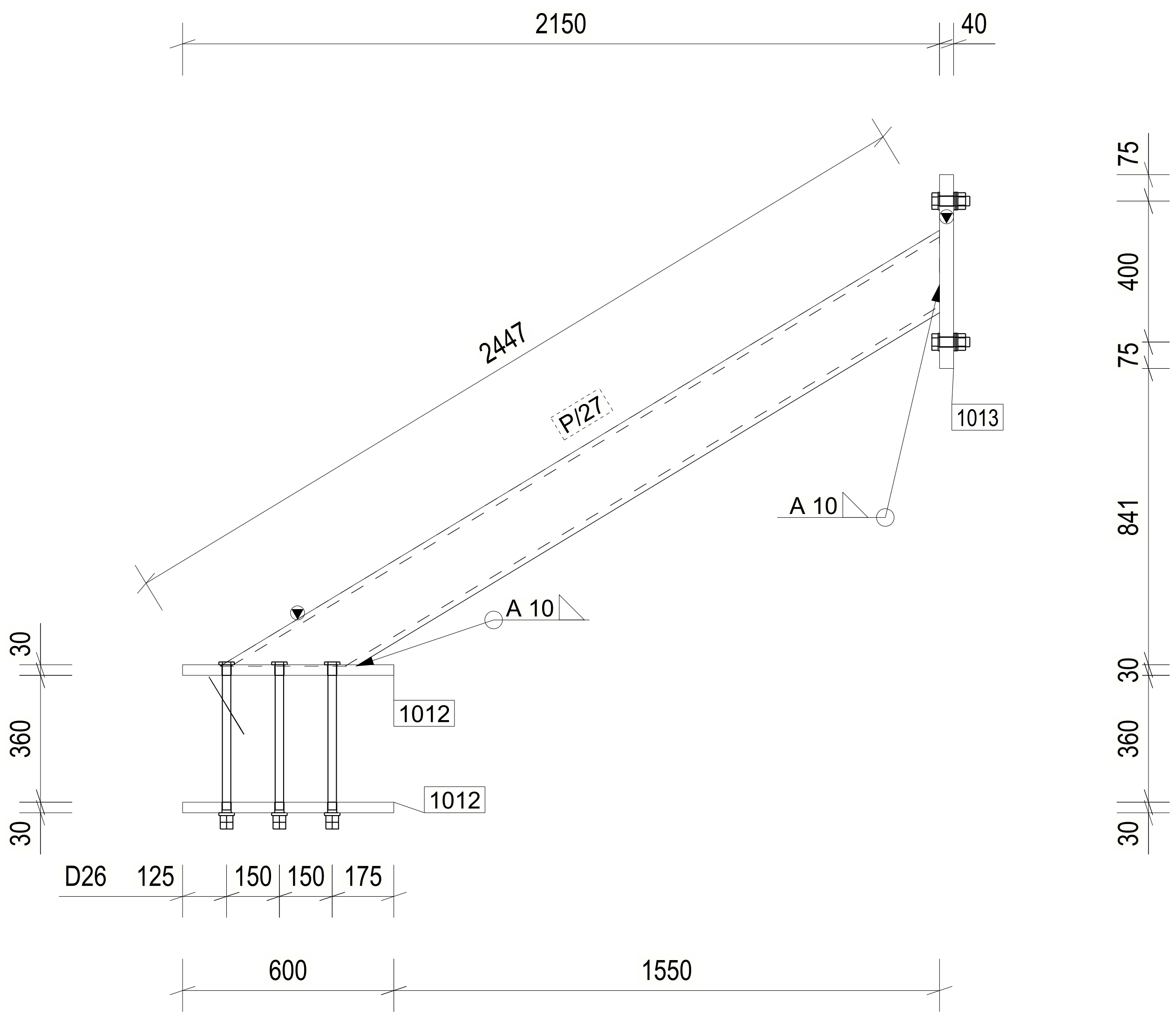
Tekla Structures

VALMISTUS	HITSIT	PINTAKÄSITTELY

1:20



A - A
1:20



OSALUETTELO KOKOONPANOLLE A/13, JOTA VALMISTETAAN 1 KAPPALETTA

OSA	PROFIILI	MATERIAALI	PITUUS [mm]	ALA [m2]	PAINO [kg]	LKM
ALIKOKOONPANO A/14 (ERILLINEN PIIRUSTUS)					77.7	1
1012	PL30*550	S235JR	600	1.5	77.7	2
P/27	CFRHS200X150X16	S235JR	2431	1.5	172.9	1
			YHTEENSÄ:	3.0	406.0	

KOKOONPANON KIINNIKELUETTELO

NIMIKE	HALK.	KOKO	STANDARDI	LUJUUS	MATER./PINTA	VÄRI	kg/YHT.	LKM
PULTTI	24	M24*468	DIN7990	200HV			0.00	6
PULTTI	27	M27*90	DIN931	200HV			2.18	4
MUTTERI	24	M24	DIN934	200HV			1.30	12
MUTTERI	27	M27	DIN934	200HV			0.65	4
ALUSLEVY	26	M24	DIN7989	200HV			0.74	12
ALUSLEVY	28	M27	DIN125	200HV			0.68	16
					YHTEENSÄ:		5.5	

K.OSA/KYLÄ | KORTTELI/TILA | TONTTI/RNRO | VIRANOMAISTEN ARKISTOMERKINTÖJÄ VARTEN

RAKENNUSTOIMENPIDE | PIIRUSTUSLAJI | JUOKSEVA NRO

KOHDE | PIIRUSTUKSEN SISÄLTÖ: HAMK Tech A/13, Steel Reaction Frame | MITTAKAAVAT: 1:20

PIIRT.: Aashish Rokka | SUUN.: Aashish Rokka

TARK.: Zhongcheng Ma | HYV.: Zhongcheng Ma

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TYÖNUMERO | ALANUMERO | PIIR. NRO.: A/13

S.ALA: RAK | SIVU | PVM | MUUTOS

Tekla Structures

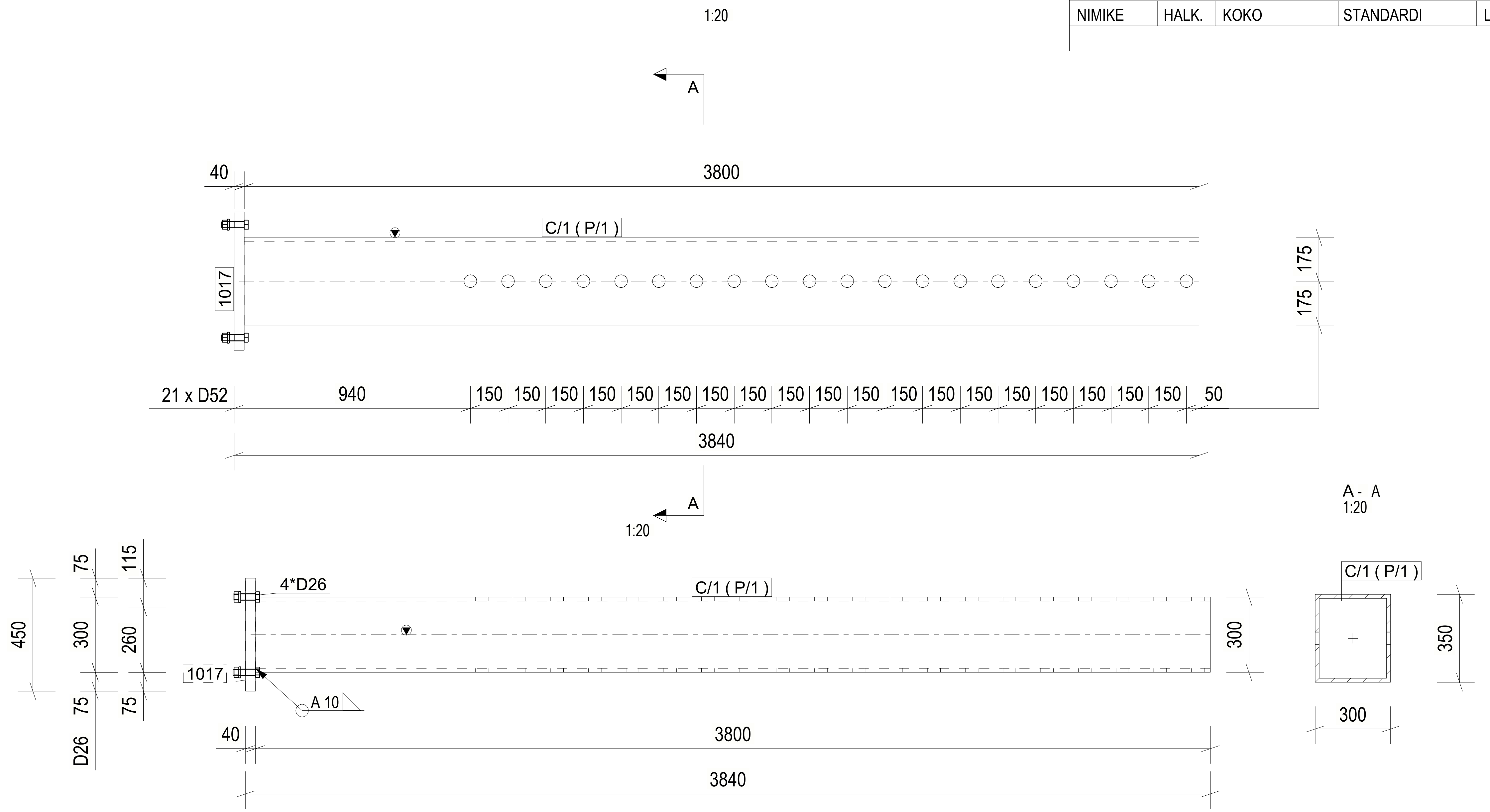
VALMISTUS | HITSIT | PINTAKÄSITTELY

OSALUETTELO KOKOONPANOLLE C/1, JOTA VALMISTETAAN 2 KAPPALETTA

OSA	PROFIILI	MATERIAALI	PITUUS [mm]	ALA [m2]	PAINO [kg]	LKM
1017	PL40*450	S235JR	550	0.6	77.7	1
P/1	CFRHS350*300*16	S355J0	3800	4.9	579.9	1
			YHTEENSÄ:	5.5	657.6	

KOKOONPANON KIINNIKELUETTELO

NIMIKE	HALK.	KOKO	STANDARDI	LUJUUS	MATER./PINTA	VÄRI	kg/YHT.	LKM
					YHTEENSÄ:		0.0	



K.OSA/KYLÄ	KORTTELI/TILA	TONTTI/RNRO	VIRANOMAISTEN ARKISTOMERKINTÖJÄ VARTEN

RAKENNUSTOIMENPIDE

PIIRUSTUSLAJI

JUOKSEVA NRO

KOHDE

PIIRUSTUKSEN SISÄLTÖ
HAMK Tech
C/1, Steel Reaction Frame

MITTAKAAVAT
1:20

PIIRT. Aashish Rokka

SUUN. Aashish Rokka

TARK. Zhongcheng Ma

HYV. Zhongcheng Ma

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TYÖNUMERO | ALANUMERO | PIIR. NRO. C/1

S.ALA RAK | SIVU | PVM | MUUTOS

Tekla Structures

VALMISTUS	HITSIT	PINTAKÄSITTELY

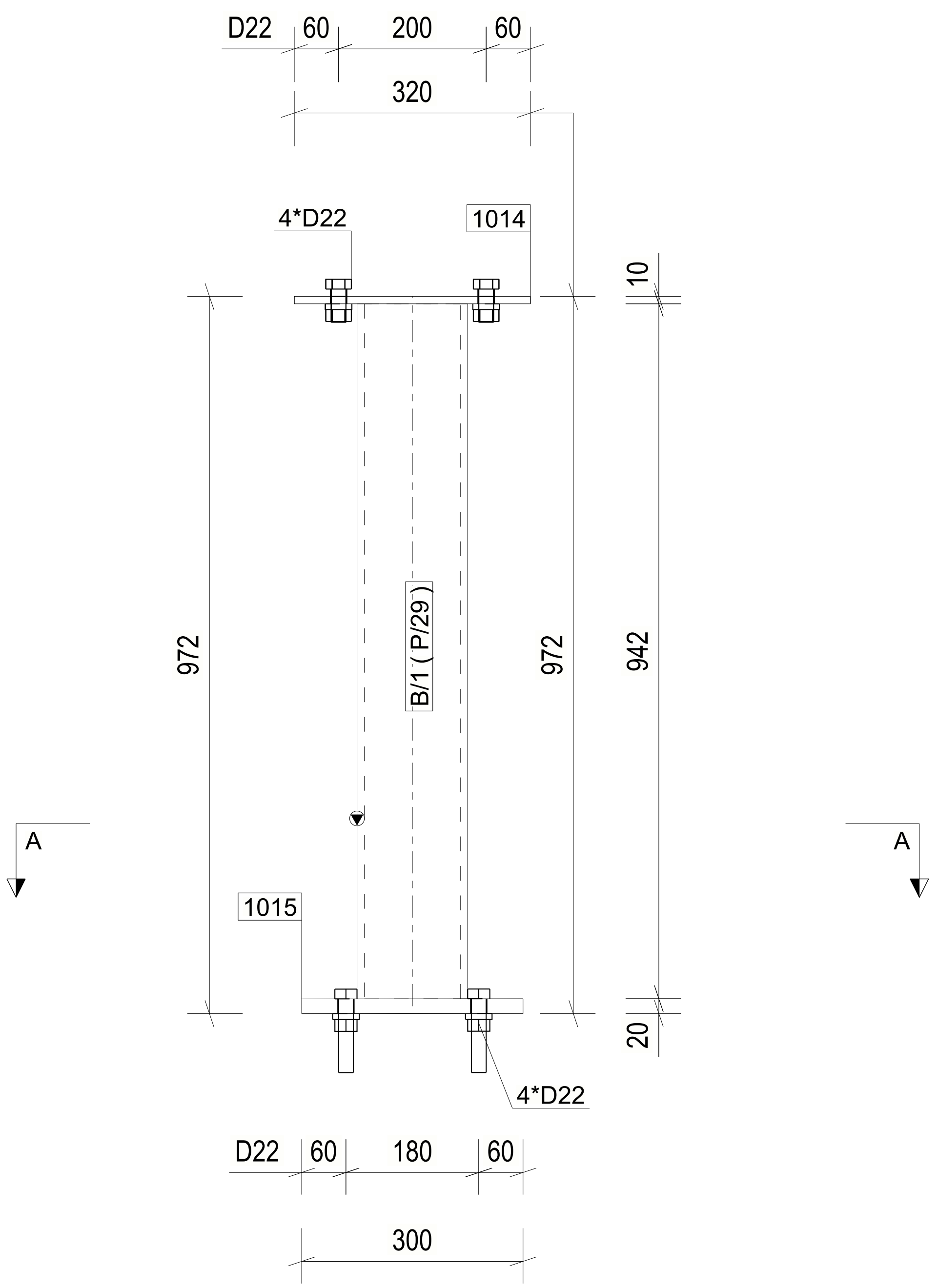
OSALUETTELO KOKOONPANOLLE B/1, JOTA VALMISTETAAN 2 KAPPALETTA

OSA	PROFIILI	MATERIAALI	PITUUS [mm]	ALA [m2]	PAINO [kg]	LKM
1014	PL10*320	S235JR	120	0.1	3.0	1
1015	PL20*300	S235JR	300	0.2	14.1	1
P/29	CFRHS150X100X10	S355J0	942	0.4	34.0	1
			YHTEENSÄ:	0.7	51.2	

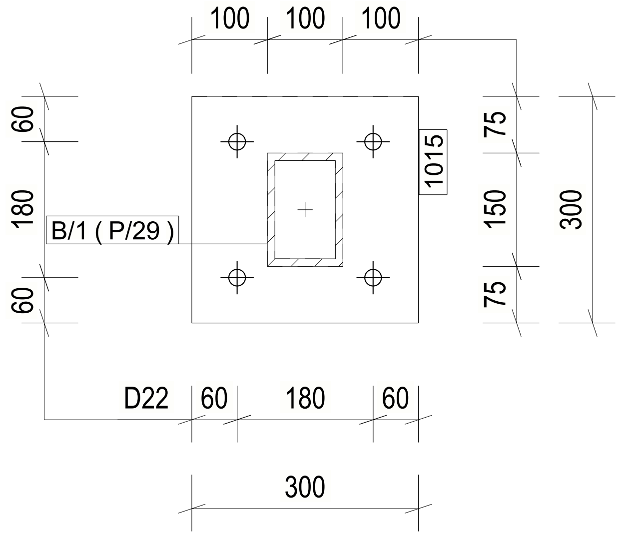
KOKOONPANON KIINNIKELUETTELO

NIMIKE	HALK.	KOKO	STANDARDI	LUJUUS	MATER./PINTA	VÄRI	kg/YHT.	LKM
					YHTEENSÄ:		0.0	

1:10



A - A
1:10



K.OSA/KYLÄ	KORTTELI/TILA	TONTTI/RNRO
RAKENNUSTOIMENPIDE		
KOHDE		
PIIRT.	SUUN.	
TARK.	HYV.	

VIRANOMAISTEN ARKISTOMERKINTÖJÄ VARTEN

PIIRUSTUSLAJI | JUOKSEVA NRO

PIIRUSTUKSEN SISÄLTÖ
KOKOONPANOPIIRUSTUS
B/1, BEAM

MITTAKAAVAT
1:10

TYÖNUMERO	ALANUMERO	PIIR. NRO.	
		B/1	
S.ALA	SIVU	PVM	MUUTOS
RAK			

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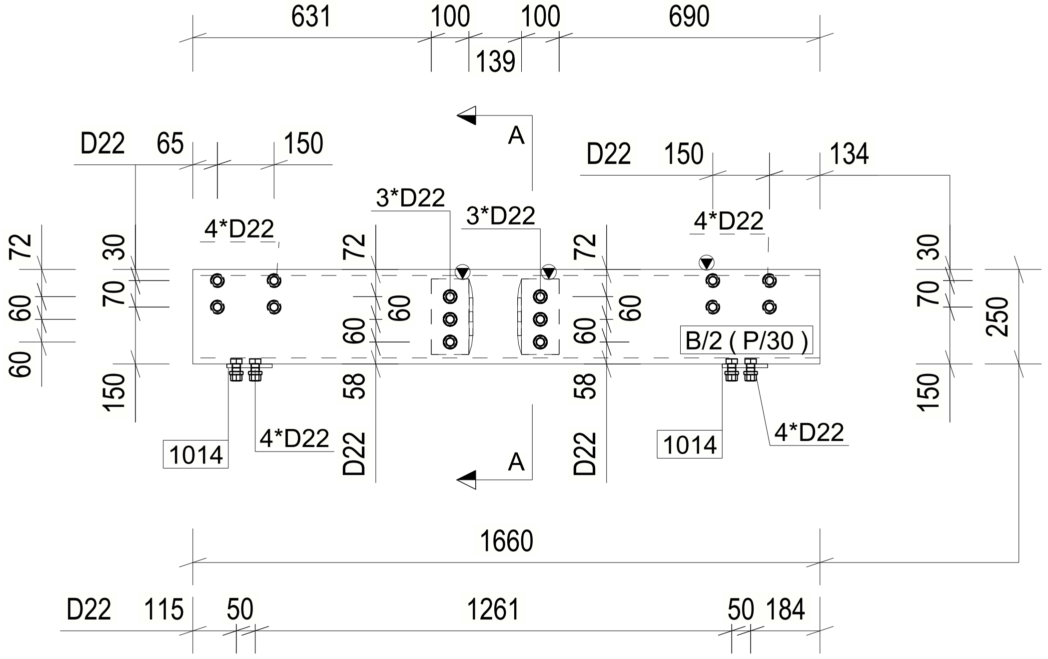
Tekla

Tekla Structures

VALMISTUS	HITSIT	PINTAKÄSITTELY

1:20



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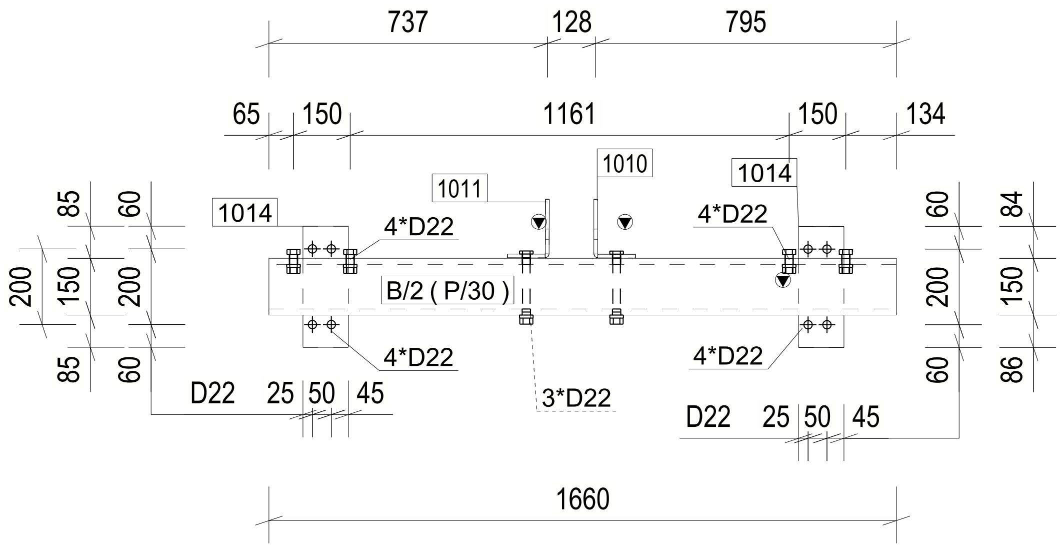
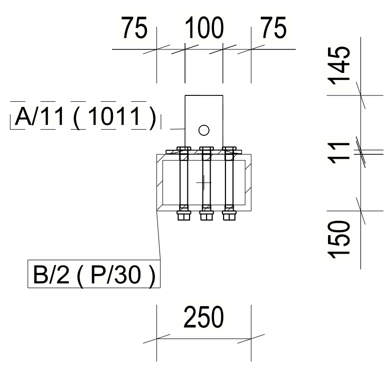


A - A
1:20



OSALUETTELO KOKOONPANOLLE B/2, JOTA VALMISTETAAN 1 KAPPALETTA

OSA	PROFIILI	MATERIAALI	PITUUS [mm]	ALA [m2]	PAINO [kg]	LKM
ALIKOKOONPANO A/10 (ERILLINEN PIIRUSTUS)					2.7	1
ALIKOKOONPANO A/11 (ERILLINEN PIIRUSTUS)					2.7	1
1014	PL10*320	S235JR	120	0.2	3.0	2
P/30	CFRHS250*150*16	S355J0	1660	1.3	153.5	1
			YHTEENSÄ:	1.5	165.0	

KOKOONPANON KIINNIKELUETTELO

NIMIKE	HALK.	KOKO	STANDARDI	LUJUUS	MATER./PINTA	VÄRI	kg/YHT.	LKM
					YHTEENSÄ:		0.0	

K.OSA/KYLÄ	KORTTELI/TILA	TONTTI/RNRO
RAKENNUSTOIMENPIDE		
KOHDE		
PIIRT.	SUUN.	
TARK.	HYV.	

VIRANOMAISTEN ARKISTOMERKINTÖJÄ VARTEN

PIIRUSTUSLAJI | JUOKSEVA NRO

PIIRUSTUKSEN SISÄLTÖ
KOKOONPANOPIIRUSTUS
B/2, BEAM

MITTAKAAVAT
1:20

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Tekla

TYÖNUMERO	ALANUMERO	PIIR. NRO.	
		B/2	
S.ALA	SIVU	PVM	MUUTOS
RAK			

Tekla Structures

VALMISTUS	HITSIT	PINTAKÄSITTELY

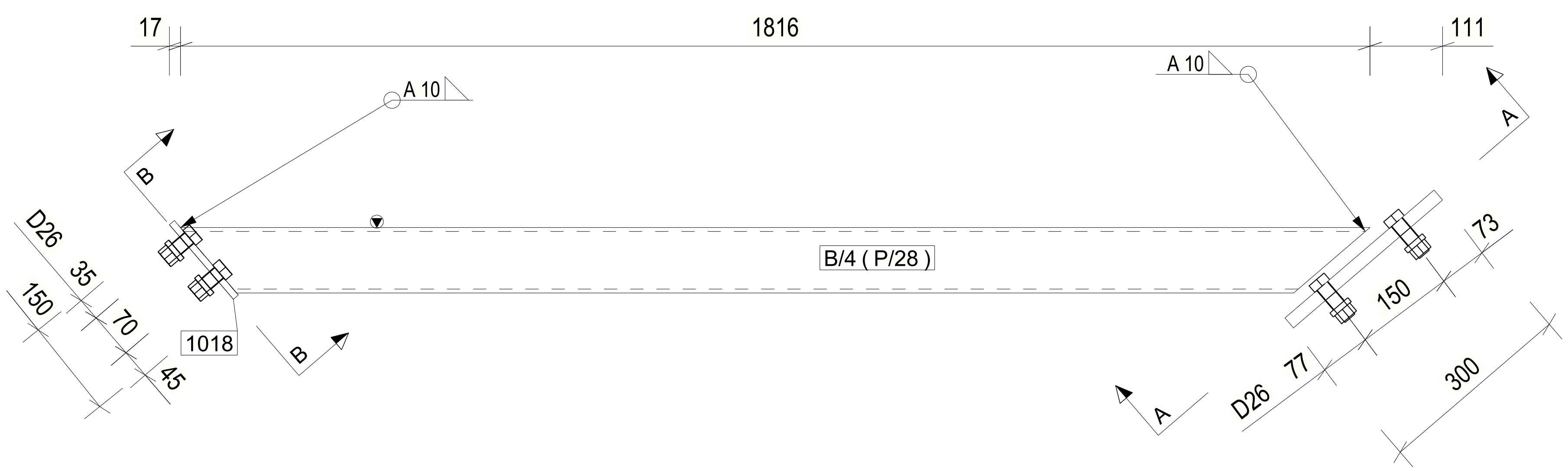
OSALUETTELO KOKOONPANOLLE B/4, JOTA VALMISTETAAN 2 KAPPALETTA

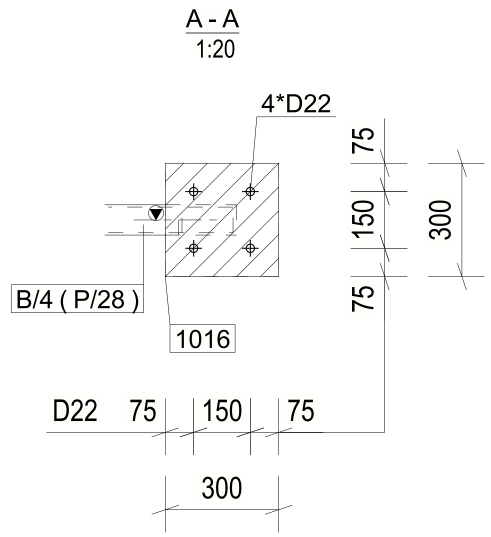
OSA	PROFIILI	MATERIAALI	PITUUS [mm]	ALA [m2]	PAINO [kg]	LKM
1016	PL20*300	S235JR	300	0.2	14.1	1
1018	PL10*150	S235JR	250	0.1	2.9	1
P/28	CFRHS100X80X6	S355J0	1816	0.6	27.1	1
			YHTEENSÄ:	0.9	44.2	

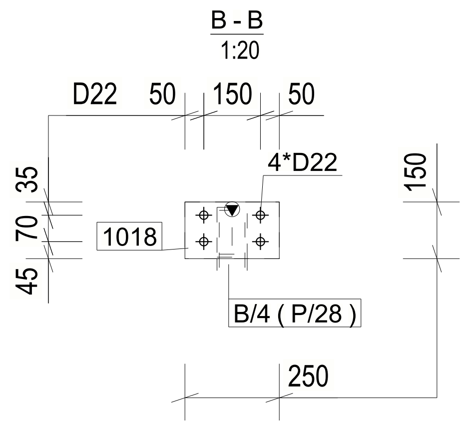
KOKOONPANON KIINNIKELUETTELO

NIMIKE	HALK.	KOKO	STANDARDI	LUJUUS	MATER./PINTA	VÄRI	kg/YHT.	LKM
					YHTEENSÄ:		0.0	

1:10







K.OSA/KYLÄ	KORTTELI/TILA	TONTTI/RNRO
VIRANOMAISTEN ARKISTOMERKINTÖJÄ VARTEN		
RAKENNUSTOIMENPIDE		
PIIRUSTUSLAJI		JUOKSEVA NRO
KOHDE		
PIIRUSTUKSEN SISÄLTÖ: HAMK Tech B/4, Steel Reaction Frame		MITTAKAAVAT: 1:10 1:20
PIIRT.: Aashish Rokka	SUUN.: Aashish Rokka	
TARK.: Zhongcheng Ma	HYV.: Zhongcheng Ma	
TYÖNUMERO	ALANUMERO	PIIR. NRO.: B/4
S.ALA: RAK	SIVU	PVM	MUUTOS

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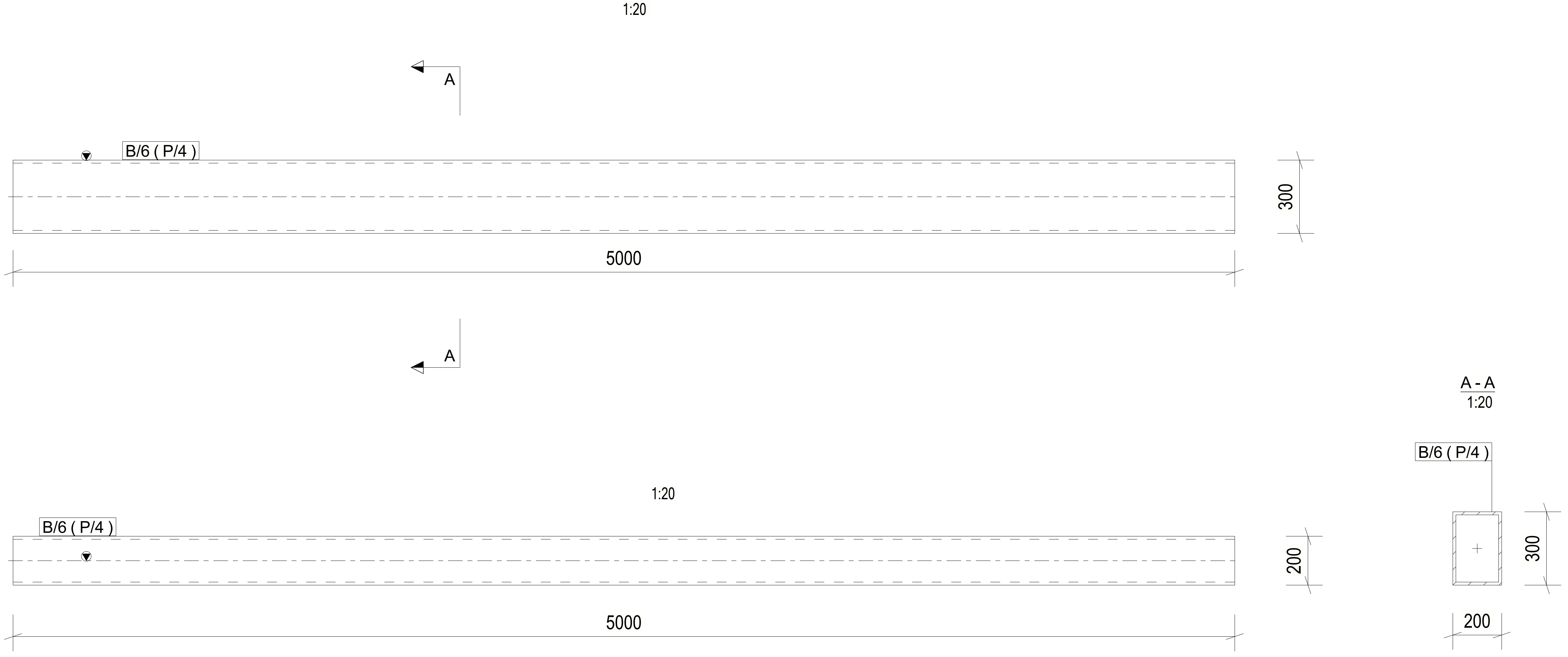
VALMISTUS	HITSIT	PINTAKÄSITTELY

OSALUETTELO KOKOONPANOLLE B/6, JOTA VALMISTETAAN 2 KAPPALETTA						
OSA	PROFIILI	MATERIAALI	PITUUS [mm]	ALA [m2]	PAINO [kg]	LKM
P/4	CFRHS300X200X12.5	S355J0	5000	4.7	466.1	1
			YHTEENSÄ:	4.7	466.1	

KOKOONPANON KIINNIKELUETTELO								
NIMIKE	HALK.	KOKO	STANDARDI	LUJUUS	MATER./PINTA	VÄRI	kg/YHT.	LKM
					YHTEENSÄ:		0.0	



K.OSA/KYLÄ	KORTTELI/TILA	TONTTI/RNRO
VIRANOMAISTEN ARKISTOMERKINTÖJÄ VARTEN		
RAKENNUSTOIMENPIDE	PIIRUSTUSLAJI	JUOKSEVA NRO
KOHDE	PIIRUSTUKSEN SISÄLTÖ HAMK Tech B/6, Steel Reaction Frame	MITTAKAAVAT 1:20
PIIRT. Aashish Rokka	SUUN. Aashish Rokka	
TARK. Zhongcheng Ma	HYV. Zhongcheng Ma	
TYÖNUMERO	ALANUMERO	PIIR. NRO. B/6
S.ALA RAK	SIVU	PVM	MUUTOS

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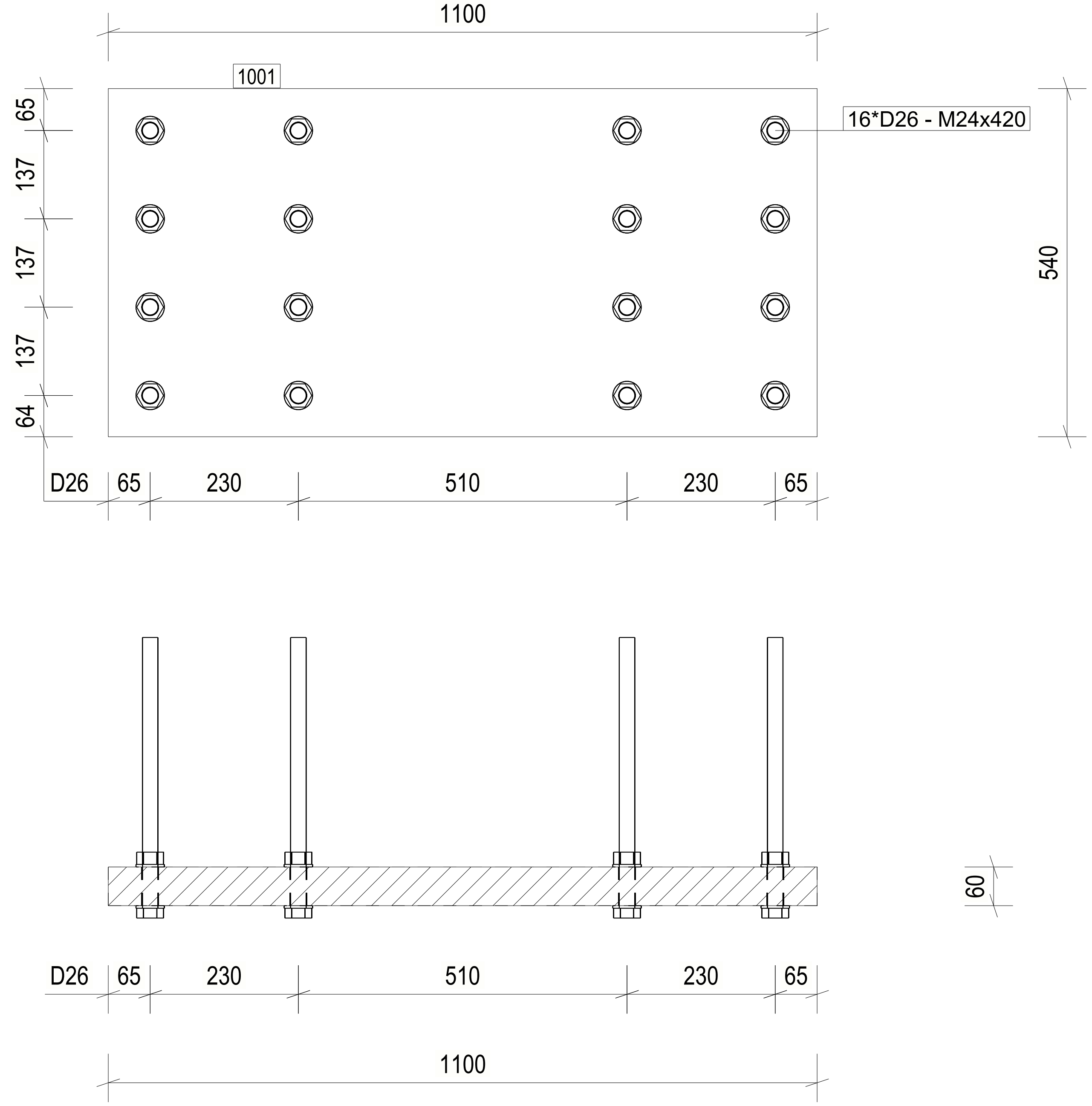
Tekla Structures

VALMISTUS	HITSIT	PINTAKÄSITTELY

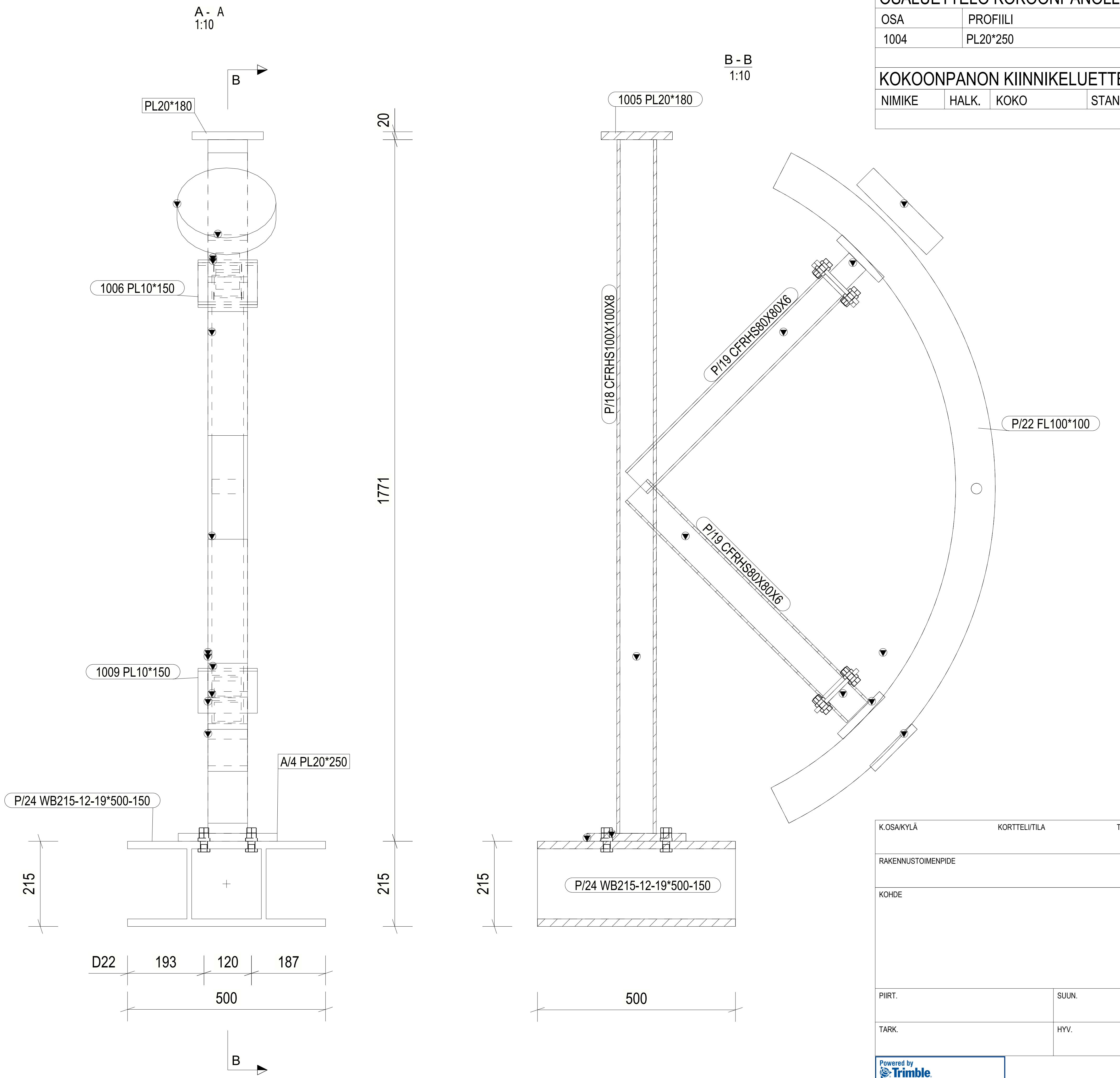
OSA	PROFIILI	MATERIAALI	LKM	PITUUS	PAINO
1001	PL60*540	S355J0	2	1100	279.8
				YHTEENSÄ:	559.5



K.OSA/KYLÄ	KORTTELI/TILA	TONTTI/RNRO	VIRANOMAISTEN ARKISTOMERKINTÖJÄ VARTEN
RAKENNUSTOIMENPIDE			PIIRUSTUSLAJI / JUOKSEVA NRO
KOHDE			PIIRUSTUKSEN SISÄLTÖ: HAMK Tech 1001, Steel Reaction Frame / MITTAKAAVAT: 1:10
PIIRT. Aashish Rokka	SUUN. Aashish Rokka		
TARK. Zhongcheng Ma	HYV. Zhongcheng Ma		
Powered by Trimble Tekla			TYÖNUMERO / ALANUMERO / PIIR. NRO. 1001
			S.ALA RAK / SIVU / PVM / MUUTOS

KOKOONPANOSSA	LKM
A/1	2

Tekla Structures



OSALUETTELO KOKOONPANOLLE A/4, JOTA VALMISTETAAN 1 KAPPALETTA

OSA	PROFIILI	MATERIAALI	PITUUS [mm]	ALA [m2]	PAINO [kg]	LKM
1004	PL20*250	S355J0	250	0.1	9.8	1
			YHTEENSÄ:	0.1	9.8	

KOKOONPANON KIINNIKELUETTELO

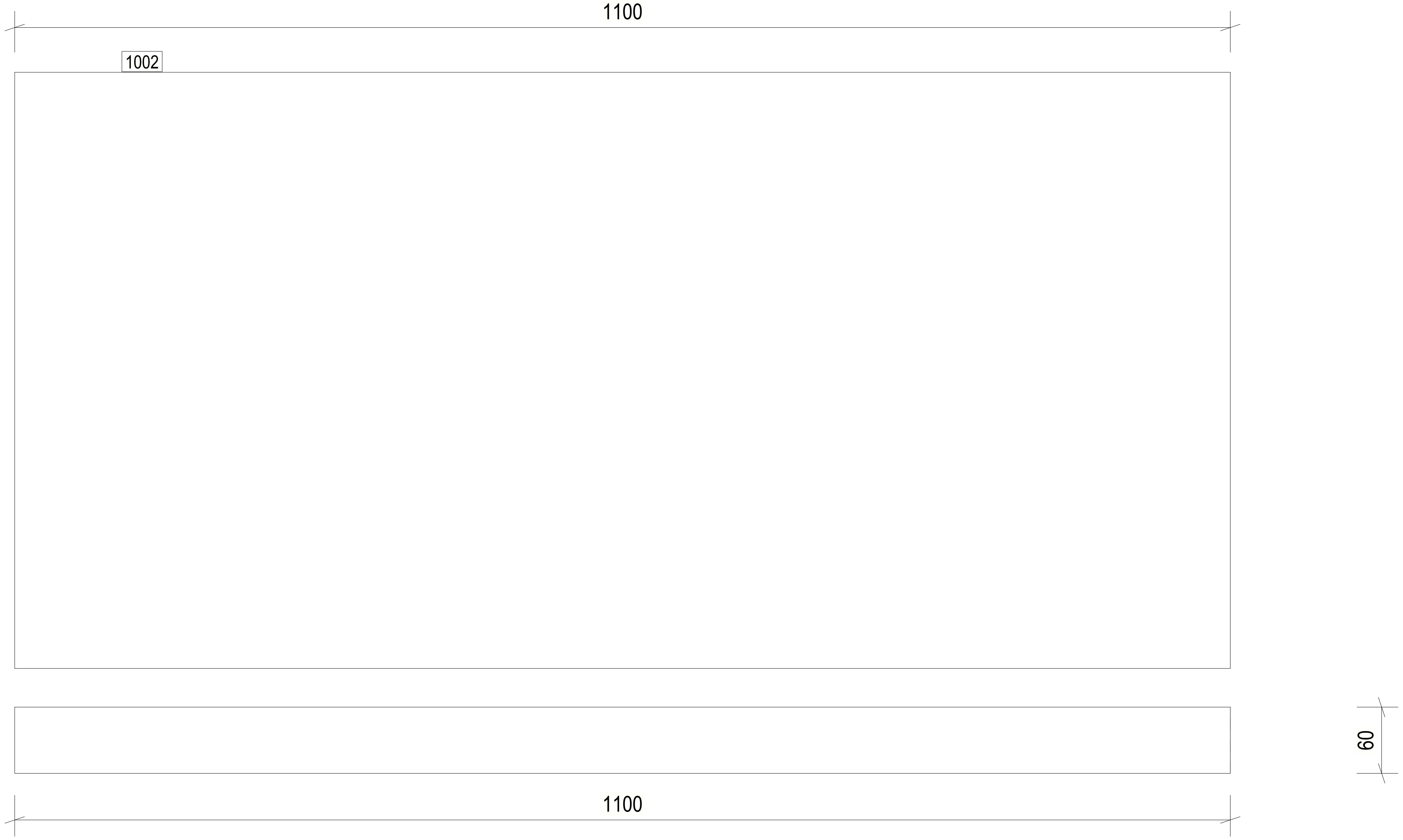
NIMIKE	HALK.	KOKO	STANDARDI	LUJUUS	MATER./PINTA	VÄRI	kg/YHT.	LKM
					YHTEENSÄ:		0.0	

VALMISTUS	HITSIT	PINTAKÄSITTELY

K.OSA/KYLÄ	KORTTELI/TILA	TONTTI/RNRO	VIRANOMAISTEN ARKISTOMERKINTÖJÄ VARTEN
RAKENNUSTOIMENPIDE		PIIRUSTUSLAJI	JUOKSEVA NRO
KOHDE		PIIRUSTUKSEN SISÄLTÖ KOKOONPANOPIIRUSTUS A/4, PLATE	MITTAKAAVAT 1:10
PIIRT.	SUUN.		
TARK.	HYV.		
Powered by Trimble Tekla	TYÖNUMERO	ALANUMERO	PIIR. NRO. A/17
	S.ALA RAK	SIVU	PVM / MUUTOS

Tekla Structures

OSA	PROFIILI	MATERIAALI	LKM	PITUUS	PAINO
1002	PL60*540	S355J0	1	1100	279.8
				YHTEENSÄ:	279.8



K.OSA/KYLÄ	KORTTELI/TILA	TONTTI/RNRO
VIRANOMAISTEN ARKISTOMERKINTÖJÄ VARTEN		
RAKENNUSTOIMENPIDE		
PIIRUSTUSLAJI	JUOKSEVA NRO	
KOHDE		
PIIRUSTUKSEN SISÄLTÖ: HAMK Tech 1002, Steel Reaction Frame	MITTAKAAVAT: 1:5	
PIIRT.: Aashish Rokka	SUUN.: Aashish Rokka	
TARK.: Zhongcheng Ma	HYV.: Zhongcheng Ma	
TYÖNUMERO	ALANUMERO	PIIR. NRO.: 1002
S.ALA: RAK	SIVU	PVM
MUUTOS		

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Tekla

KOKOONPANOSSA	LKM
A/2	1

Tekla Structures

OSA	PROFIILI	MATERIAALI	LKM	PITUUS	PAINO
1003	PL40*360	S355J0	2	540	61.0
				YHTEENSÄ:	122.1

K.OSA/KYLÄ	KORTTELI/TILA
TONTTI/RNRO	VIRANOMAISTEN ARKISTOMERKINTÖJÄ VARTEN
RAKENNUSTOIMENPIDE	PIIRUSTUSLAJI
JUOKSEVA NRO	
KOHDE	PIIRUSTUKSEN SISÄLTÖ: HAMK Tech 1003, Steel Reaction Frame
MITTAKAAVAT	1:5
PIIRT.	Aashish Rokka
SUUN.	Aashish Rokka
TARK.	Zhongcheng Ma
HYV.	Zhongcheng Ma
TYÖNUMERO	
ALANUMERO	
PIIR. NRO.	1003
S.ALA	RAK
SIVU	
PVM	
MUUTOS	

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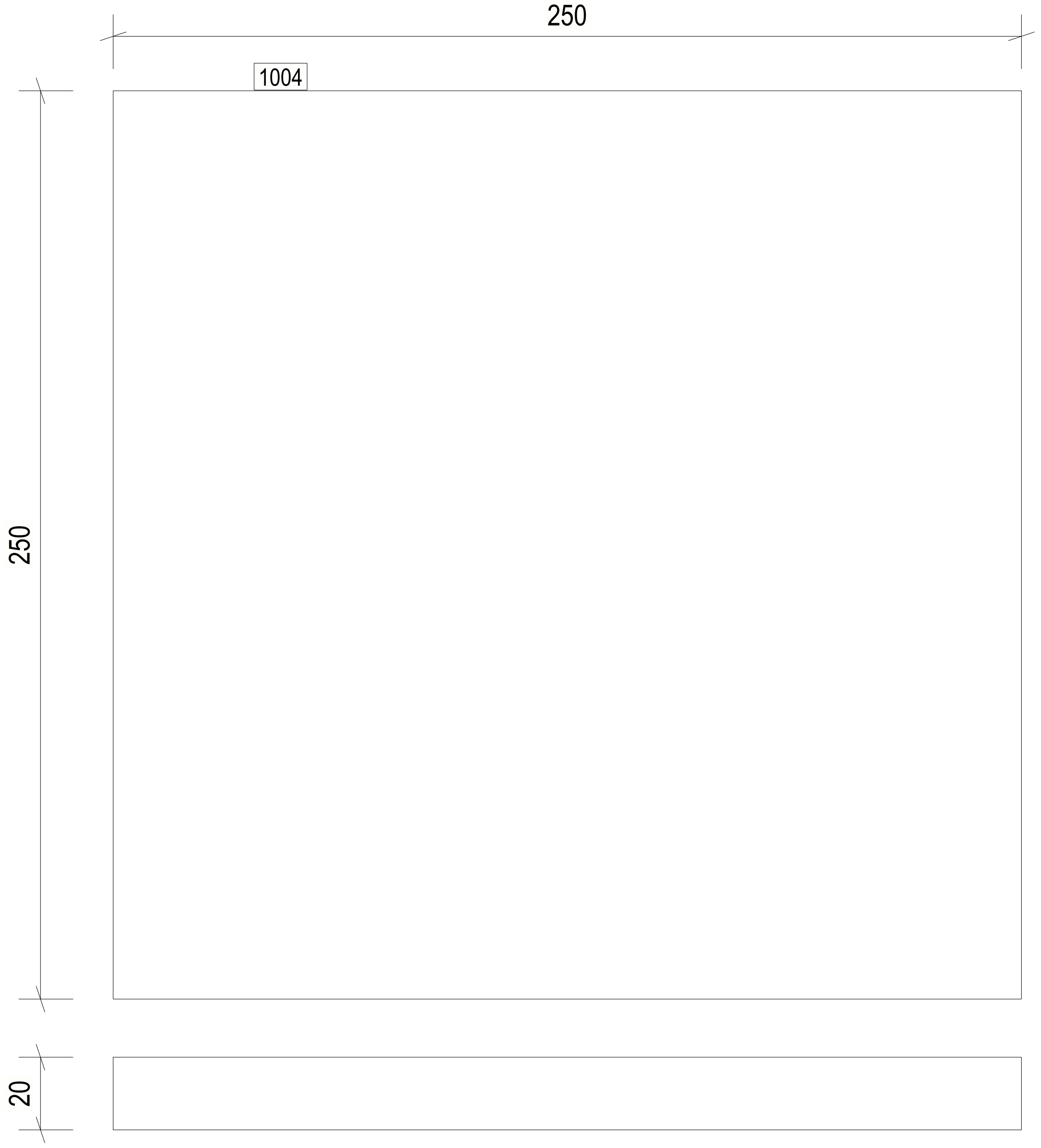
Tekla Structures

KOKOONPANOSSA	LKM
A/3	2

OSA	PROFIILI	MATERIAALI	LKM	PITUUS	PAINO
1004	PL20*250	S355J0	1	250	9.8
				YHTEENSÄ:	9.8



K.OSA/KYLÄ	KORTTELI/TILA	TONTTI/RNRO	VIRANOMAISTEN ARKISTOMERKINTÖJÄ VARTEN
RAKENNUSTOIMENPIDE			PIIRUSTUSLAJI / JUOKSEVA NRO
KOHDE			PIIRUSTUKSEN SISÄLTÖ: HAMK Tech 1004, Steel Reaction Frame / MITTAKAAVAT: 1:2
PIIRT.: Aashish Rokka	SUUN.: Aashish Rokka		
TARK.: Zhongcheng Ma	HYV.: Zhongcheng Ma		

TYÖNUMERO	ALANUMERO	PIIR. NRO.	
		1004	
S.ALA	SIVU	PVM	MUUTOS
RAK			

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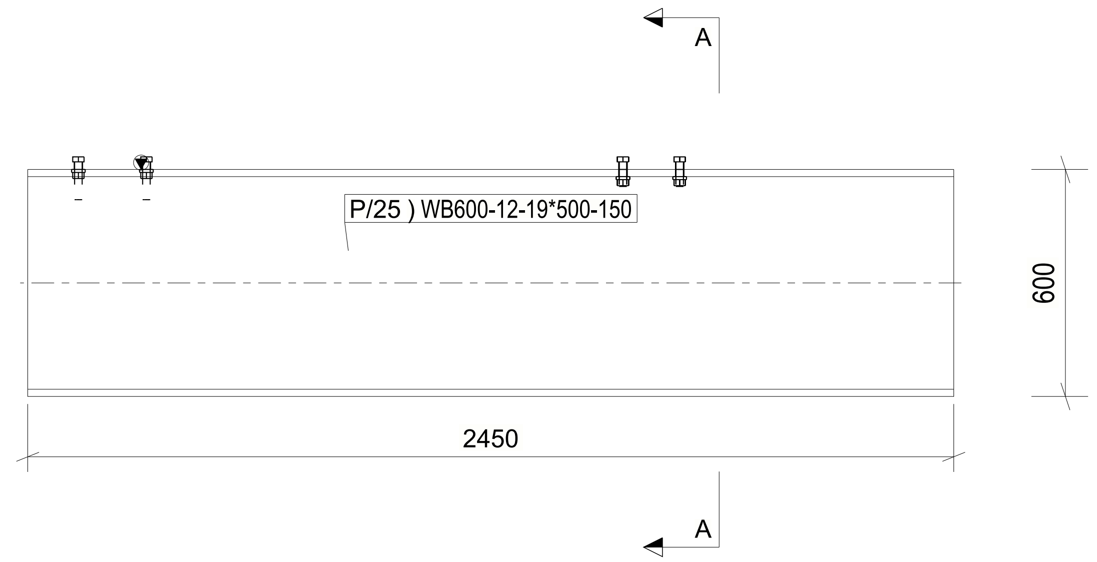
KOKOONPANOSSA	LKM
A/4	1

Tekla Structures

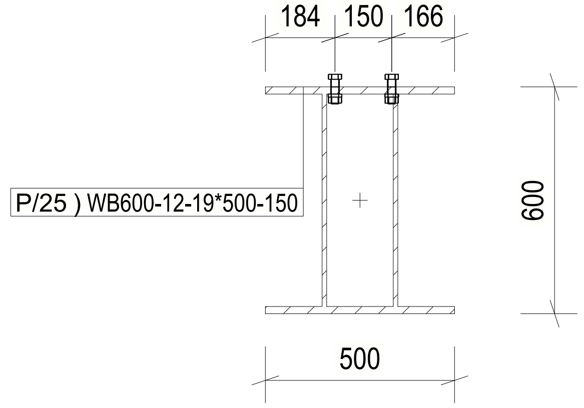
OSALUETTELO KOKOONPANOLLE C/6, JOTA VALMISTETAAN 2 KAPPALETTA						
OSA	PROFIILI	MATERIAALI	PITUUS [mm]	ALA [m2]	PAINO [kg]	LKM
P/25	WB600-12-19*500-150	S235JR	2450	6.9	624.8	1
			YHTEENSÄ:	6.9	624.8	

KOKOONPANON KIINNIKELUETTELO								
NIMIKE	HALK.	KOKO	STANDARDI	LUJUUS	MATER./PINTA	VÄRI	kg/YHT.	LKM
					YHTEENSÄ:		0.0	

1:20



A - A
1:20



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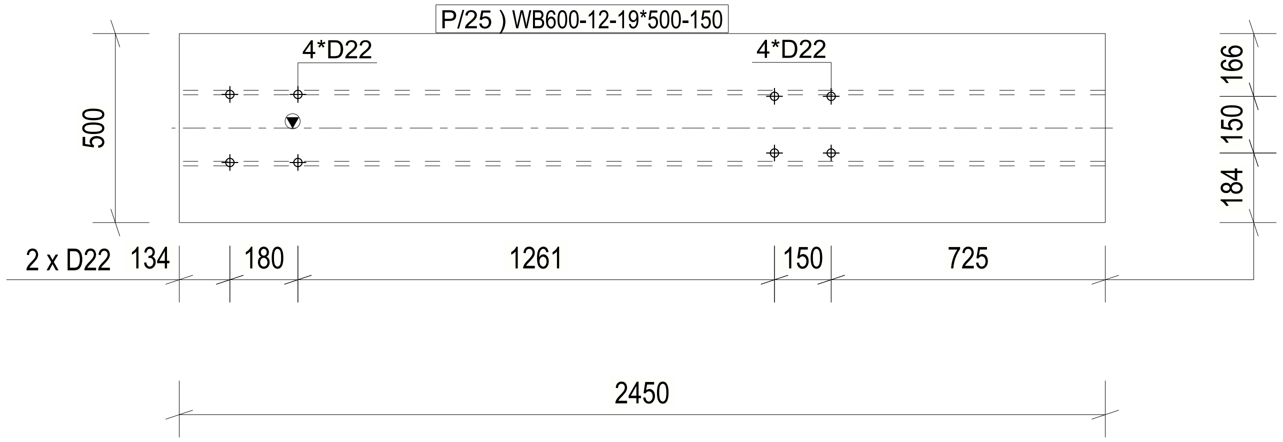

K.OSA/KYLÄ	KORTTELI/TILA	TONTTI/RNRO
RAKENNUSTOIMENPIDE		
KOHDE		
PIIRT. Aashish Rokka	SUUN. Aashish Rokka	
TARK. Zhongcheng Ma	HYV. Zhongcheng Ma	

VIRANOMAISTEN ARKISTOMERKINTÖJÄ VARTEN

PIIRUSTUSLAJI	JUOKSEVA NRO
PIIRUSTUKSEN SISÄLTÖ HAMK Tech C/6, Steel Reaction Frame	MITTAKAAVAT 1:20

TYÖNUMERO	ALANUMERO	PIIR. NRO.	
		C/6	
S.ALA	SIVU	PVM	MUUTOS
RAK			

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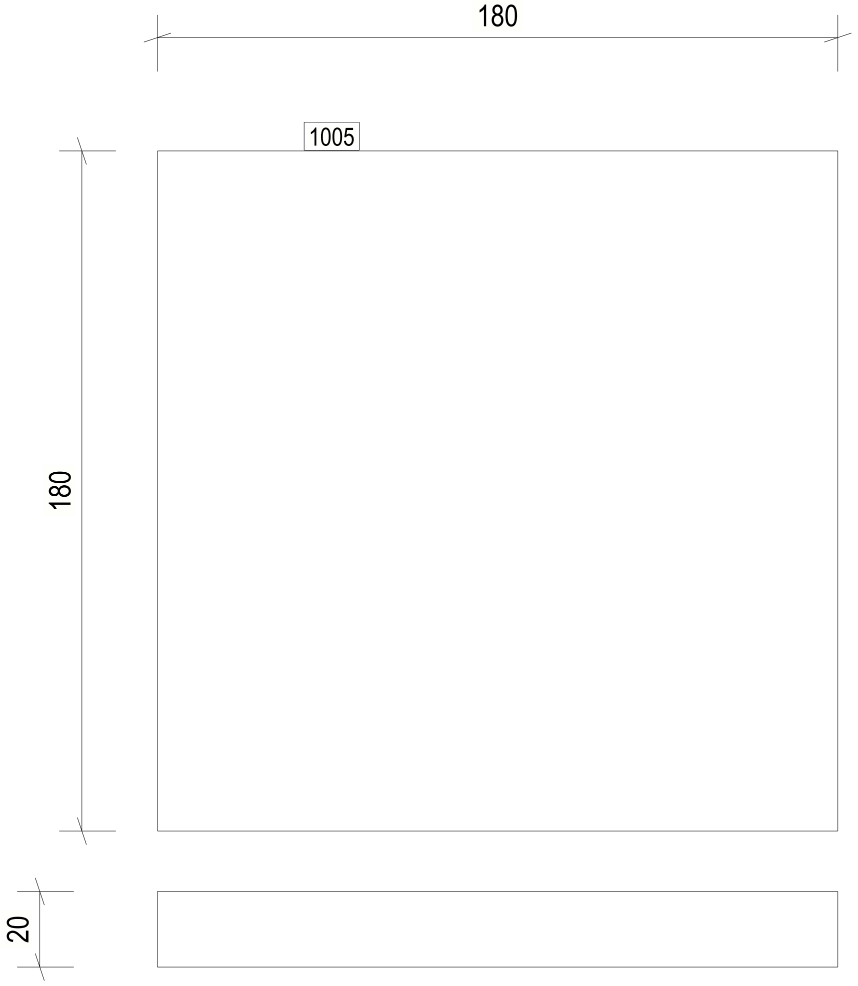
Tekla

VALMISTUS	HITSIT	PINTAKÄSITTELY

Tekla Structures

OSA	PROFIILI	MATERIAALI	LKM	PITUUS	PAINO
1005	PL20*180	S355J0	1	180	5.1
				YHTEENSÄ:	5.1



K.OSA/KYLÄ	KORTTELI/TILA	TONTTI/RNRO
VIRANOMAISTEN ARKISTOMERKINTÖJÄ VARTEN		
RAKENNUSTOIMENPIDE		
PIIRUSTUSLAJI		JUOKSEVA NRO
KOHDE		
PIIRUSTUKSEN SISÄLTÖ: HAMK Tech 1005, Steel Reaction Frame		MITTAKAAVAT: 1:2
PIIRT.: Aashish Rokka	SUUN.: Aashish Rokka	
TARK.: Zhongcheng Ma	HYV.: Zhongcheng Ma	
TYÖNUMERO	ALANUMERO	PIIR. NRO.: 1005
S.ALA: RAK	SIVU	PVM
MUUTOS		

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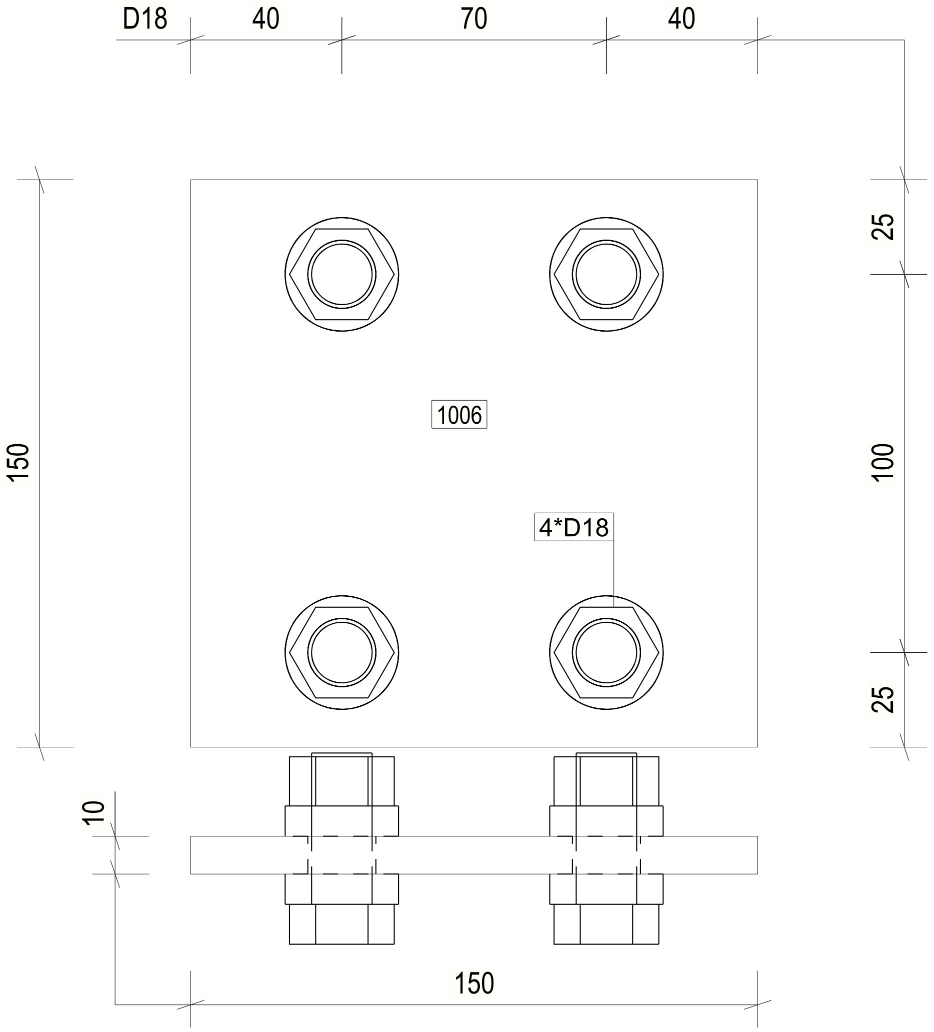
Tekla Structures

KOKOONPANOSSA	LKM
A/5	1

OSA	PROFIILI	MATERIAALI	LKM	PITUUS	PAINO
1006	PL10*150	S355J0	1	150	1.8
				YHTEENSÄ:	1.8



K.OSA/KYLÄ	KORTTELI/TILA	TONTTI/RNRO	VIRANOMAISTEN ARKISTOMERKINTÖJÄ VARTEN
RAKENNUSTOIMENPIDE			PIIRUSTUSLAJI / JUOKSEVA NRO
KOHDE			PIIRUSTUKSEN SISÄLTÖ: HAMK Tech 1006, Steel Reaction Frame / MITTAKAAVAT: 1:2
PIIRT. Aashish Rokka	SUUN. Aashish Rokka		
TARK. Zhongcheng Ma	HYV. Zhongcheng Ma		

TYÖNUMERO	ALANUMERO	PIIR. NRO.	
		1006	
S.ALA	SIVU	PVM	MUUTOS
RAK			

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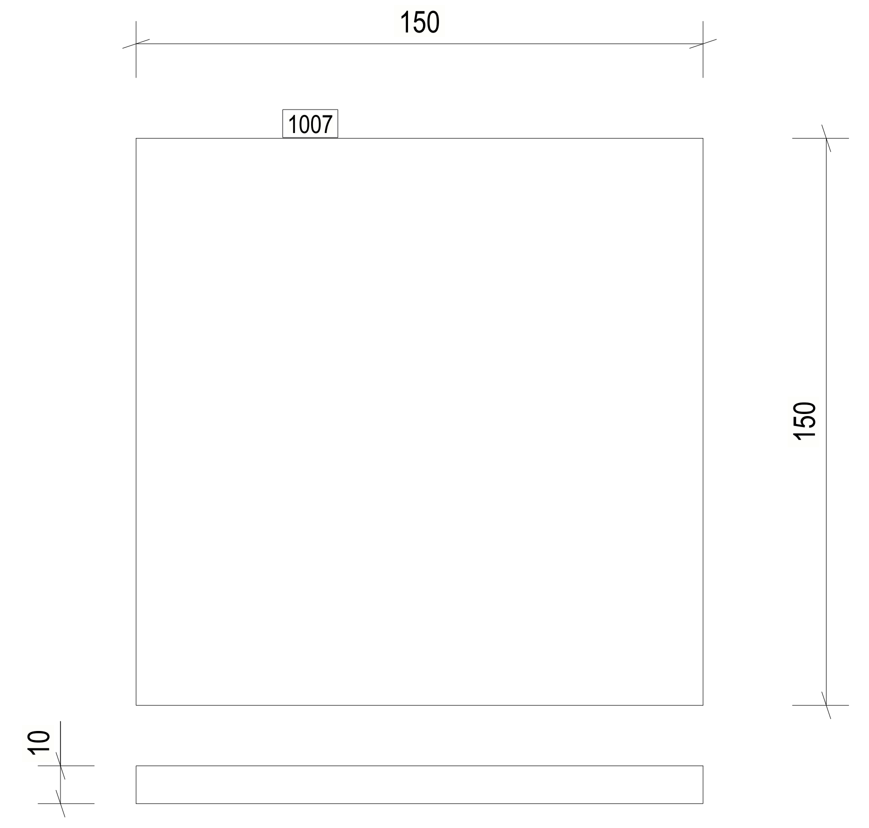
Tekla

Tekla Structures

KOKOONPANOSSA	LKM
A/6	1

OSA	PROFIILI	MATERIAALI	LKM	PITUUS	PAINO
1007	PL10*150	S355J0	2	150	1.8
				YHTEENSÄ:	3.5

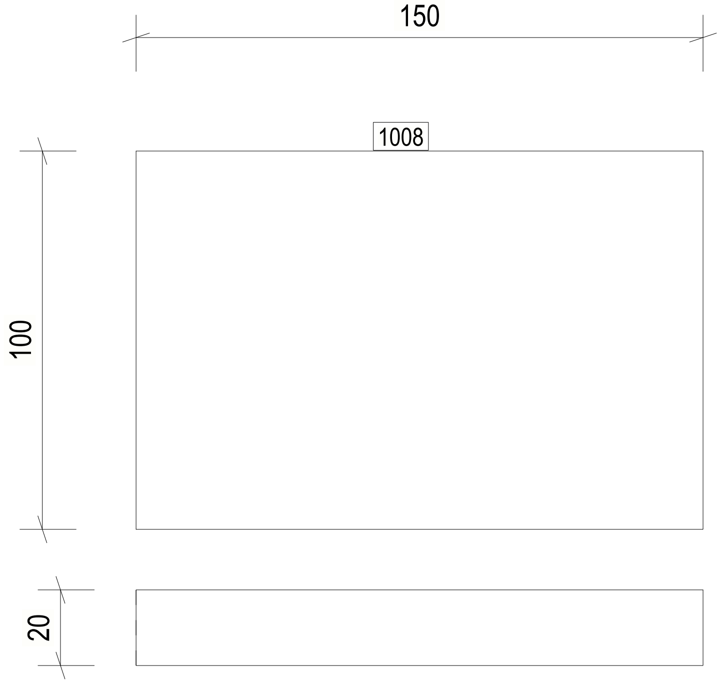


K.OSA/KYLÄ / KORTTELI/TILA / TONTTI/RNRO	VIRANOMAISTEN ARKISTOMERKINTÖJÄ VARTEN
RAKENNUSTOIMENPIDE	PIIRUSTUSLAJI / JUOKSEVA NRO
KOHDE	PIIRUSTUKSEN SISÄLTÖ: HAMK Tech 1007, Steel Reaction Frame / MITTAKAAVAT: 1:2
PIIRT. Aashish Rokka / SUUN. Aashish Rokka	
TARK. Zhongcheng Ma / HYV. Zhongcheng Ma	
Powered by Trimble Tekla	TYÖNUMERO / ALANUMERO / PIIR. NRO. 1007
	S.ALA RAK / SIVU / PVM / MUUTOS

KOKOONPANOSSA	LKM
A/7	2

Tekla Structures

OSA	PROFIILI	MATERIAALI	LKM	PITUUS	PAINO
1008	PL20*100	S355J0	4	150	2.4
				YHTEENSÄ:	9.4



KOKOONPANOSSA	LKM
A/8	4

Tekla Structures

K.OSA/KYLÄ	KORTTELI/TILA	TONTTI/RNRO
VIRANOMAISTEN ARKISTOMERKINTÖJÄ VARTEN		
RAKENNUSTOIMENPIDE		
PIIRUSTUSLAJI	JUOKSEVA NRO	
KOHDE		
PIIRUSTUKSEN SISÄLTÖ: HAMK Tech 1008, Steel Reaction Frame	MITTAKAAVAT: 1:2	
PIIRT.: Aashish Rokka	SUUN.: Aashish Rokka	
TARK.: Zhongcheng Ma	HYV.: Zhongcheng Ma	
TYÖNUMERO	ALANUMERO	PIIR. NRO.: 1008
S.ALA: RAK	SIVU	PVM
MUUTOS		

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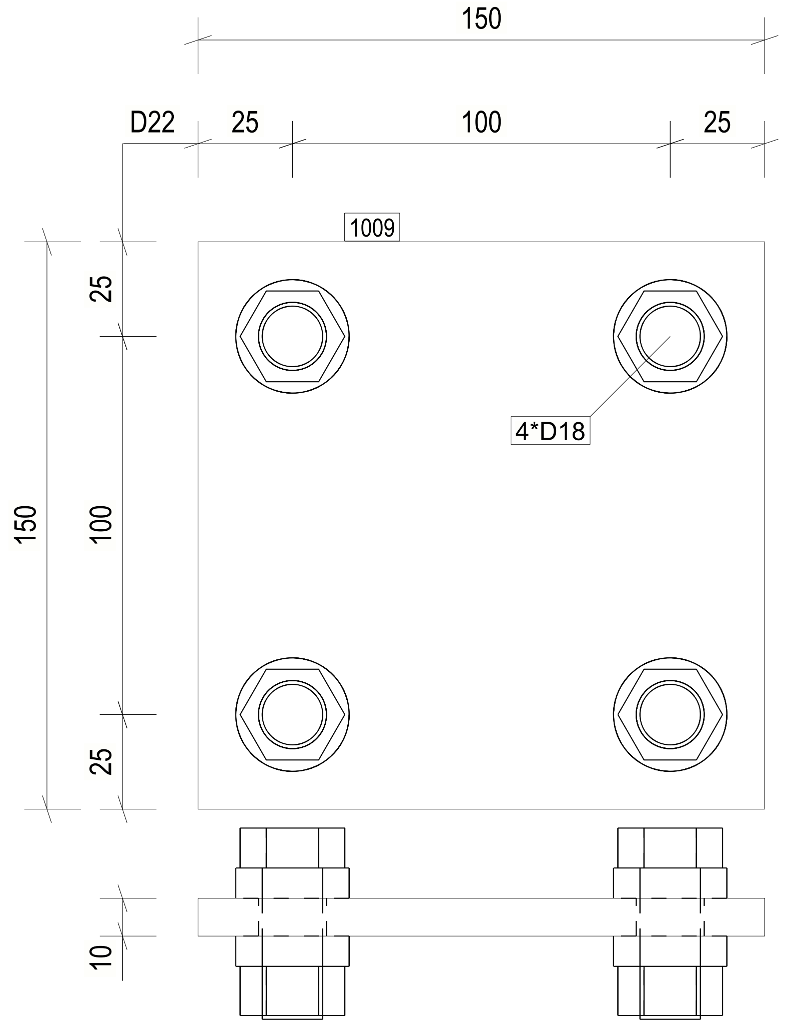
Tekla

OSA	PROFIILI	MATERIAALI	LKM	PITUUS	PAINO
1009	PL10*150	S355J0	1	150	1.8
				YHTEENSÄ:	1.8



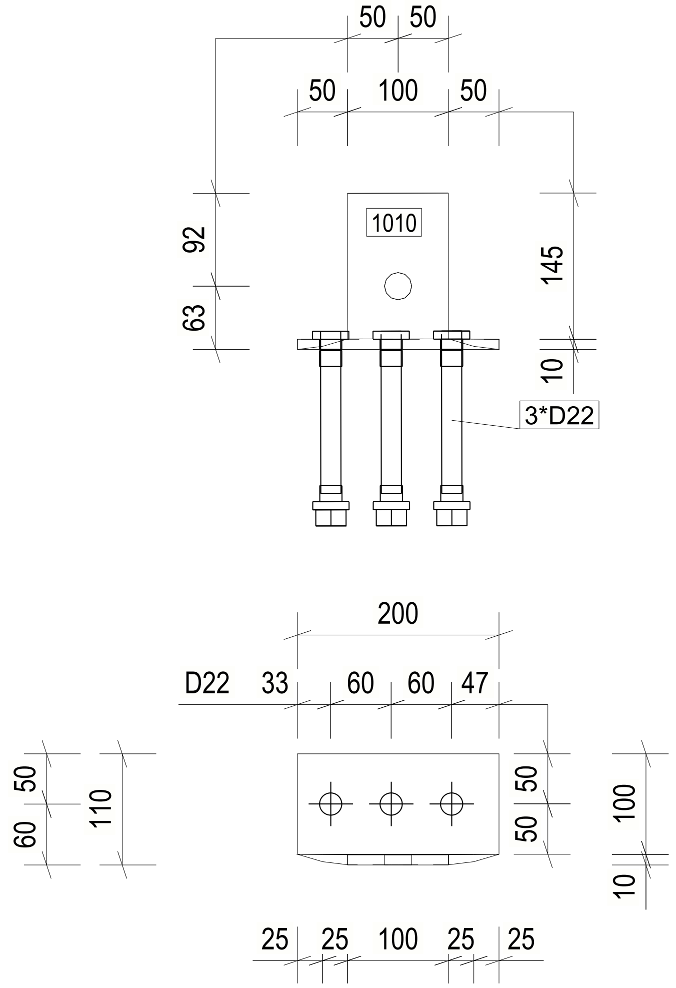
K.OSA/KYLÄ	KORTTELI/TILA	TONTTI/RNRO	VIRANOMAISTEN ARKISTOMERKINTÖJÄ VARTEN
RAKENNUSTOIMENPIDE			PIIRUSTUSLAJI / JUOKSEVA NRO
KOHDE			PIIRUSTUKSEN SISÄLTÖ: HAMK Tech 1009, Steel Reaction Frame / MITTAKAAVAT: 1:2
PIIRT.: Aashish Rokka	SUUN.: Aashish Rokka		
TARK.: Zhongcheng Ma	HYV.: Zhongcheng Ma		

TYÖNUMERO	ALANUMERO	PIIR. NRO.	
		1009	
S.ALA	SIVU	PVM	MUUTOS
RAK			

KOKOONPANOSSA	LKM
A/9	1

Tekla Structures

OSA	PROFIILI	MATERIAALI	LKM	PITUUS	PAINO
1010	PL10*200	S235JR	1	253	2.7
				YHTEENSÄ:	2.7



KOKOONPANOSSA	LKM
A/10	1

Tekla Structures

K.OSA/KYLÄ	KORTTELI/TILA	TONTTI/RNRO
VIRANOMAISTEN ARKISTOMERKINTÖJÄ VARTEN		
RAKENNUSTOIMENPIDE		
PIIRUSTUSLAJI	JUOKSEVA NRO	
KOHDE		
PIIRUSTUKSEN SISÄLTÖ: HAMK Tech 1010, Steel Reaction Frame	MITTAKAAVAT: 1:7.5	
PIIRT.: Aashish Rokka	SUUN.: Aashish Rokka	
TARK.: Zhongcheng Ma	HYV.: Zhongcheng Ma	
TYÖNUMERO	ALANUMERO	PIIR. NRO.: 1010
S.ALA: RAK	SIVU	PVM
MUUTOS		

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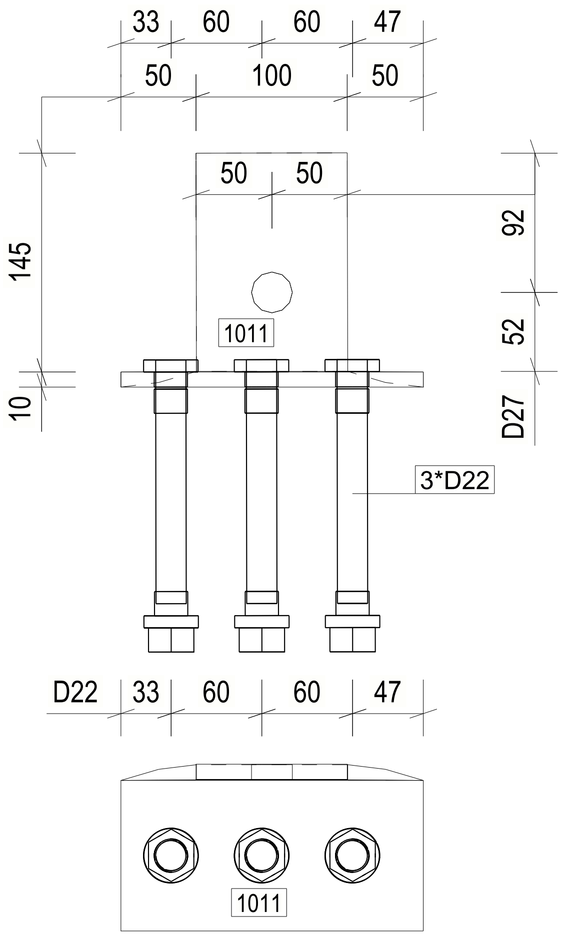
Tekla

OSA	PROFIILI	MATERIAALI	LKM	PITUUS	PAINO
1011	PL10*200	S235JR	1	253	2.7
				YHTEENSÄ:	2.7



K.OSA/KYLÄ	KORTTELI/TILA	TONTTI/RNRO	VIRANOMAISTEN ARKISTOMERKINTÖJÄ VARTEN
RAKENNUSTOIMENPIDE			PIIRUSTUSLAJI / JUOKSEVA NRO
KOHDE			PIIRUSTUKSEN SISÄLTÖ: HAMK Tech 1011, Steel Reaction Frame / MITTAKAAVAT: 1:5
PIIRT.: Aashish Rokka	SUUN.: Aashish Rokka		
TARK.: Zhongcheng Ma	HYV.: Zhongcheng Ma		

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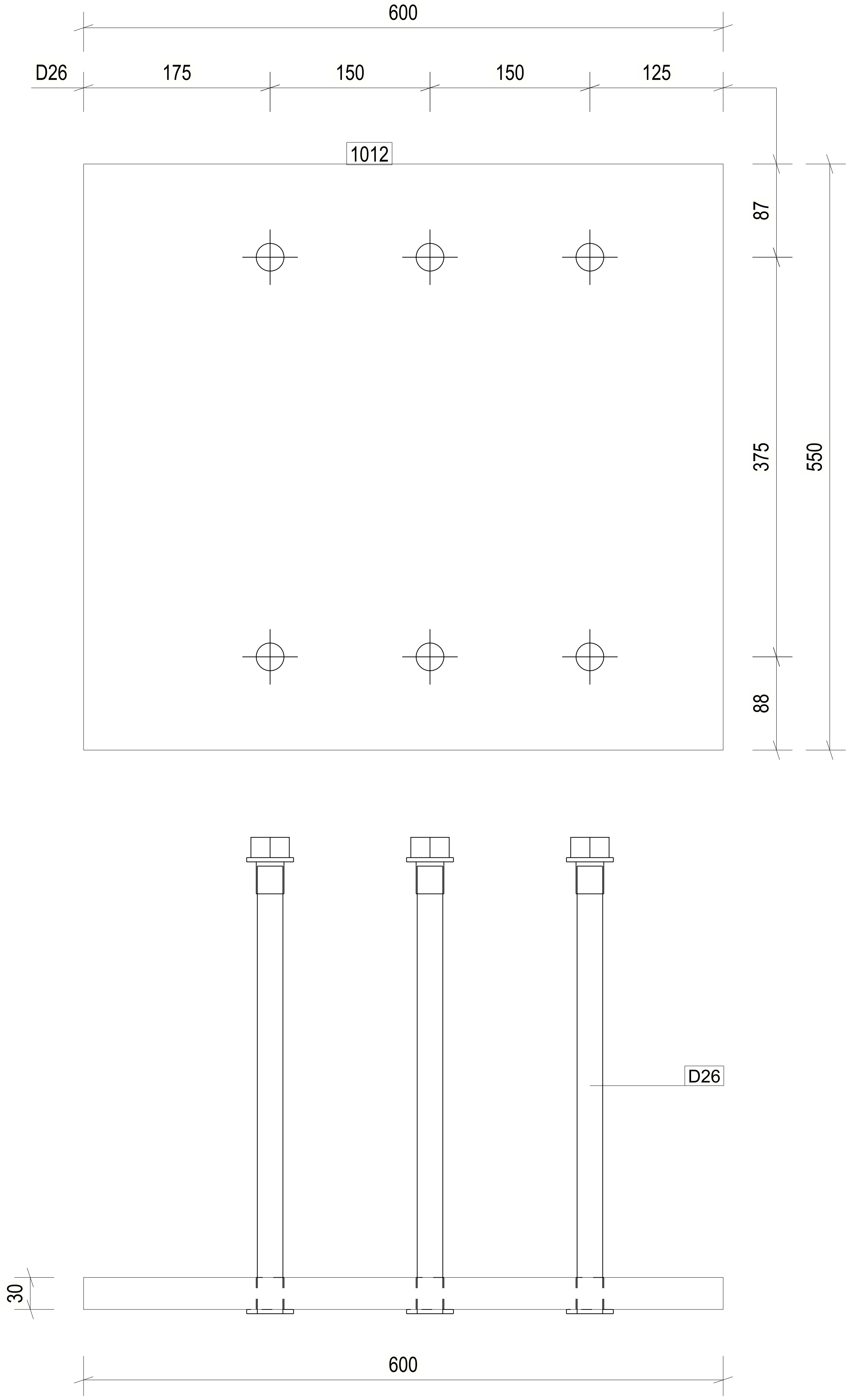
Tekla

TYÖNUMERO	ALANUMERO	PIIR. NRO.	
		1011	
S.ALA	SIVU	PVM	MUUTOS
RAK			

Tekla Structures

KOKOONPANOSSA	LKM
A/11	1

OSA	PROFIILI	MATERIAALI	LKM	PITUUS	PAINO
1012	PL30*550	S235JR	4	600	77.7
				YHTEENSÄ:	310.9



KOKOONPANOSSA	LKM
A/12	2
A/13	2

Tekla Structures

K.OSA/KYLÄ	KORTTELI/TILA	TONTTI/RNRO
VIRANOMAISTEN ARKISTOMERKINTÖJÄ VARTEN		
RAKENNUSTOIMENPIDE		
PIIRUSTUSLAJI		JUOKSEVA NRO
KOHDE		
PIIRUSTUKSEN SISÄLTÖ: HAMK Tech 1012, Steel Reaction Frame		MITTAKAAVAT: 1:5
PIIRT.: Aashish Rokka	SUUN.: Aashish Rokka	
TARK.: Zhongcheng Ma	HYV.: Zhongcheng Ma	
TYÖNUMERO	ALANUMERO	PIIR. NRO.: 1012
S.ALA: RAK	SIVU	PVM
MUUTOS		

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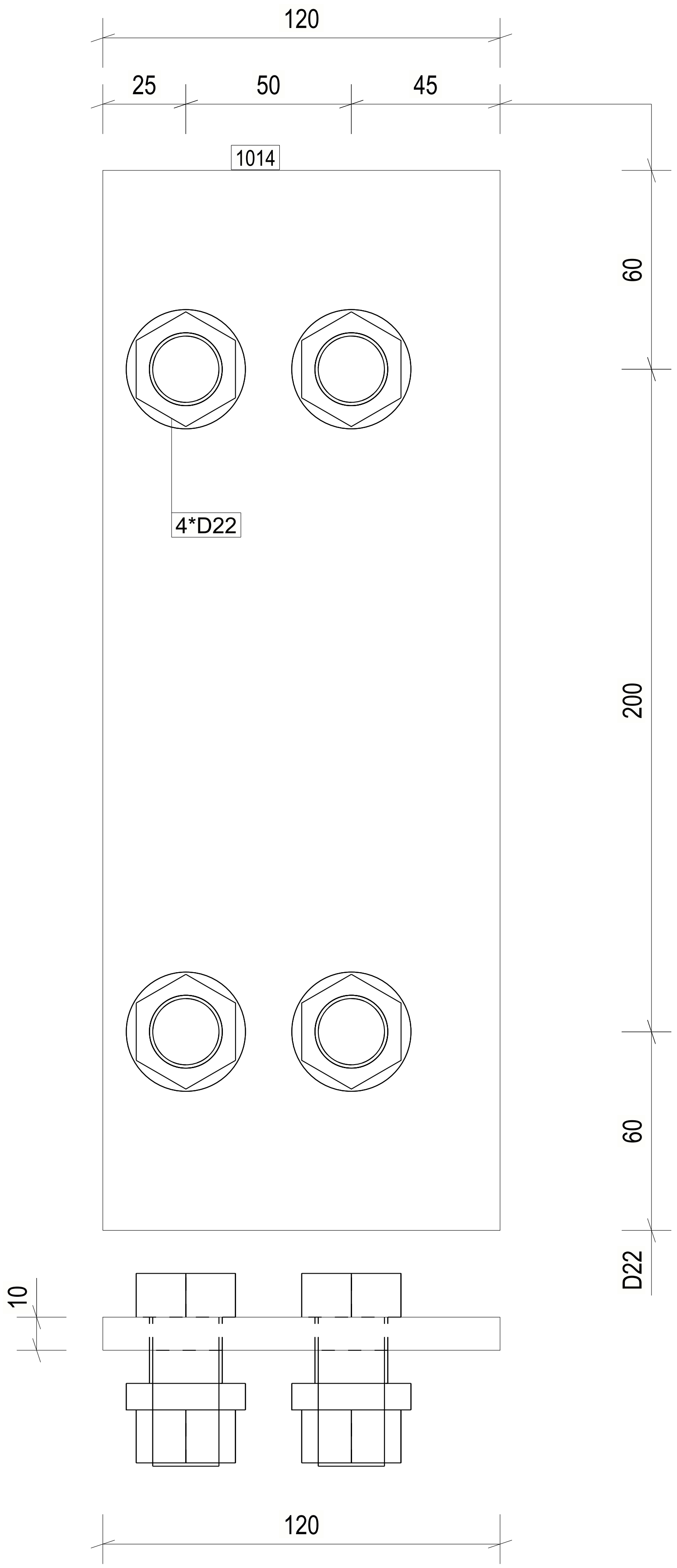
Tekla

OSA	PROFIILI	MATERIAALI	LKM	PITUUS	PAINO
1014	PL10*320	S235JR	4	120	3.0
				YHTEENSÄ:	12.1

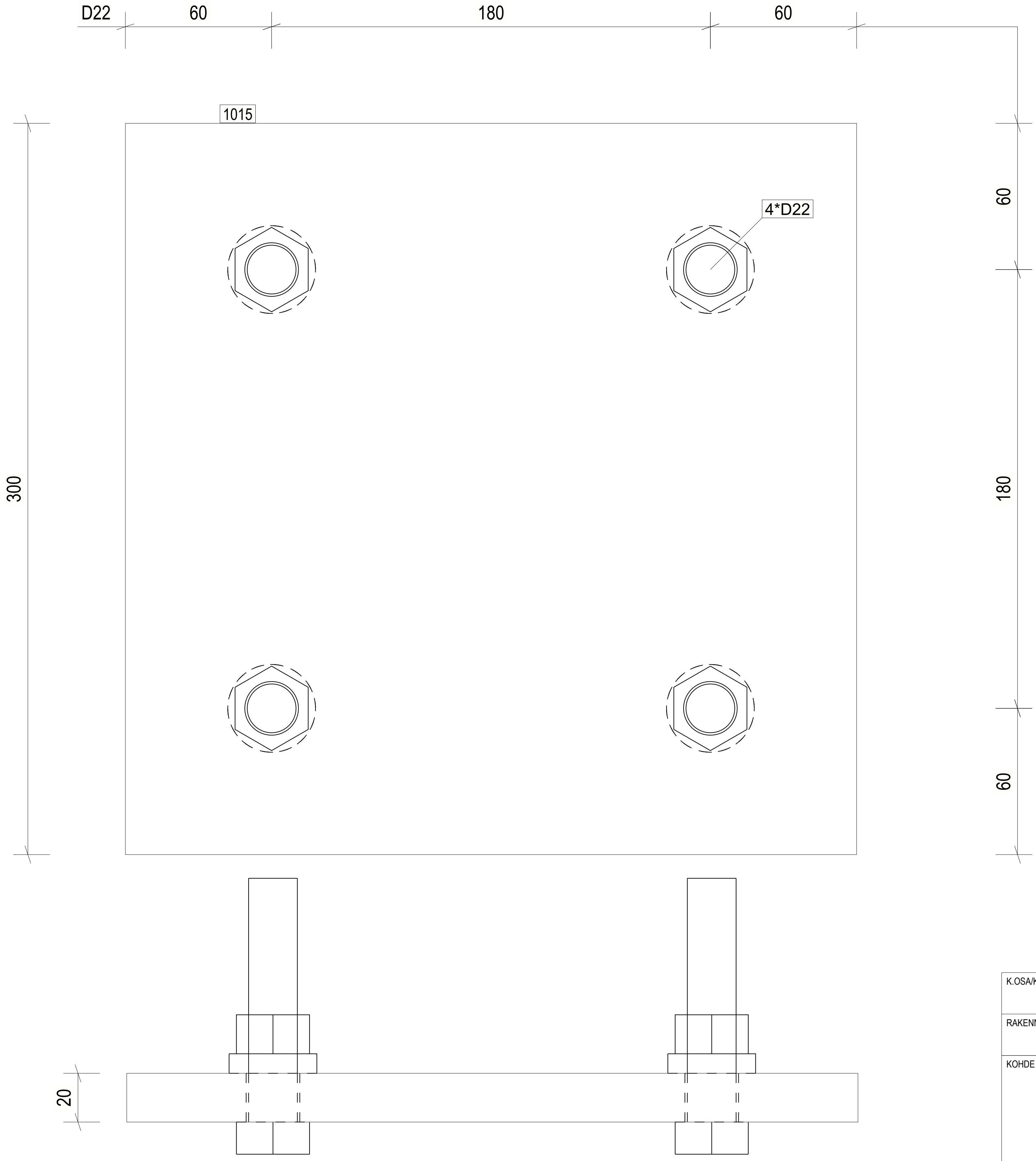


K.OSA/KYLÄ	KORTTELI/TILA	TONTTI/RNRO	VIRANOMAISTEN ARKISTOMERKINTÖJÄ VARTEN
RAKENNUSTOIMENPIDE		PIIRUSTUSLAJI	JUOKSEVA NRO
KOHDE		PIIRUSTUKSEN SISÄLTÖ HAMK Tech 1014, Steel Reaction Frame	MITTAKAAVAT 1:2
PIIRT. Aashish Rokka	SUUN. Aashish Rokka		
TARK. Zhongcheng Ma	HYV. Zhongcheng Ma		
Powered by Trimble Tekla	TYÖNUMERO	ALANUMERO	PIIR. NRO. 1014
	S.ALA RAK	SIVU	PVM / MUUTOS

KOKOONPANOSSA	LKM
B/1	2
B/2	2

Tekla Structures

OSA	PROFIILI	MATERIAALI	LKM	PITUUS	PAINO
1015	PL20*300	S235JR	2	300	14.1
				YHTEENSÄ:	28.3



KOKOONPANOSSA	LKM
B/1	2

Tekla Structures

K.OSA/KYLÄ	KORTTELI/TILA	TONTTI/RNRO
VIRANOMAISTEN ARKISTOMERKINTÖJÄ VARTEN		
RAKENNUSTOIMENPIDE		
PIIRUSTUSLAJI	JUOKSEVA NRO	
KOHDE		
PIIRUSTUKSEN SISÄLTÖ: HAMK Tech 1015, Steel Reaction Frame	MITTAKAAVAT: 1:2	
PIIRT.: Aashish Rokka	SUUN.: Aashish Rokka	
TARK.: Zhongcheng Ma	HYV.: Zhongcheng Ma	
TYÖNUMERO	ALANUMERO	PIIR. NRO.: 1015
S.ALA: RAK	SIVU	PVM
MUUTOS		

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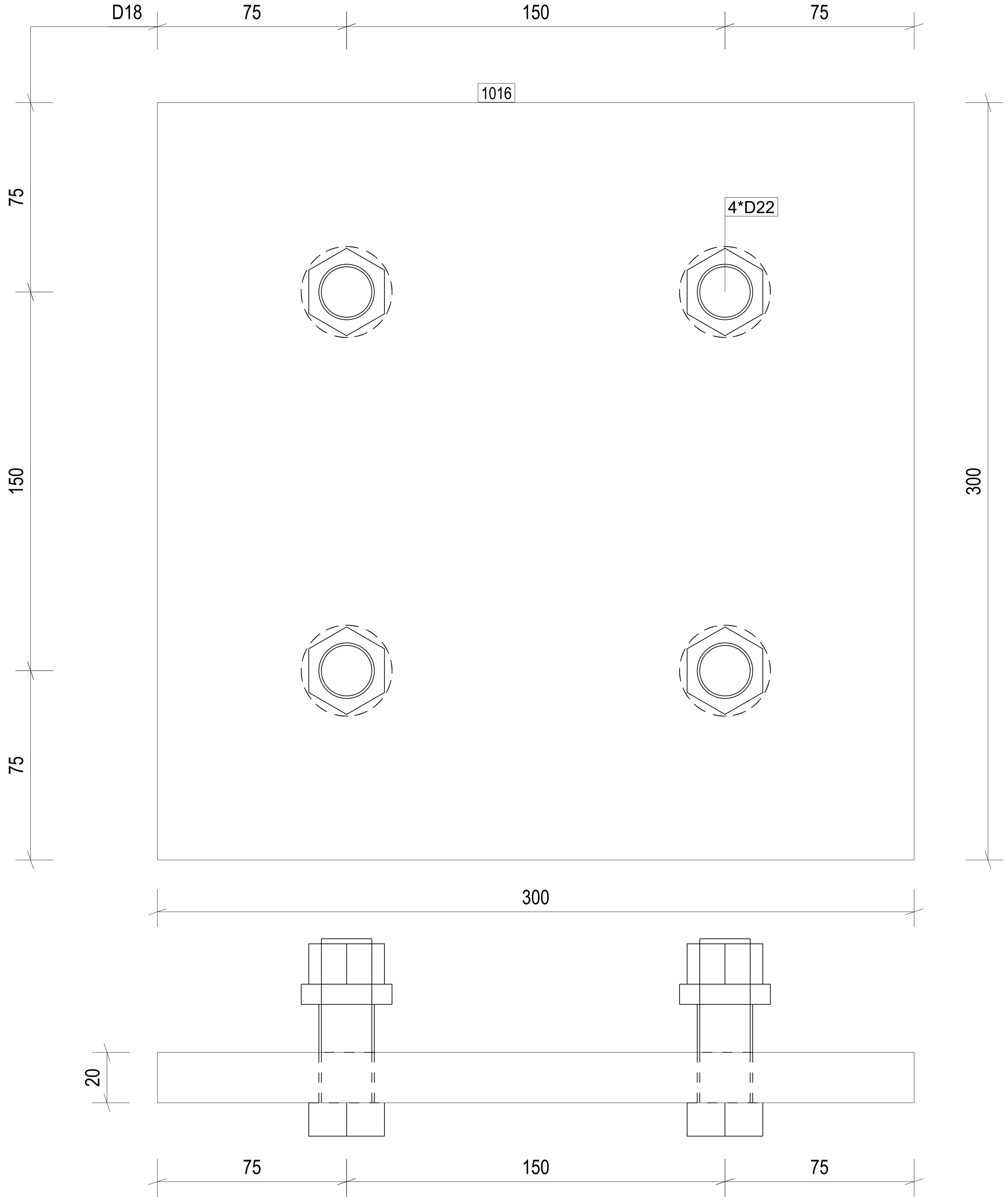
Tekla

OSA	PROFIILI	MATERIAALI	LKM	PITUUS	PAINO
1016	PL20*300	S235JR	2	300	14.1
				YHTEENSÄ:	28.3



K.OSA/KYLÄ	KORTTELI/TILA	TONTTI/RNRO
RAKENNUSTOIMENPIDE		
KOHDE		
PIIRT. Aashish Rokka	SUUN. Aashish Rokka	
TARK. Zhongcheng Ma	HYV. Zhongcheng Ma	

VIRANOMAISTEN ARKISTOMERKINTÖJÄ VARTEN

PIIRUSTUSLAJI	JUOKSEVA NRO
PIIRUSTUKSEN SISÄLTÖ HAMK Tech 1016, Steel Reaction Frame	MITTAKAAVAT 1:2

TYÖNUMERO	ALANUMERO	PIIR. NRO. 1016	
S.ALA RAK	SIVU	PVM	MUUTOS

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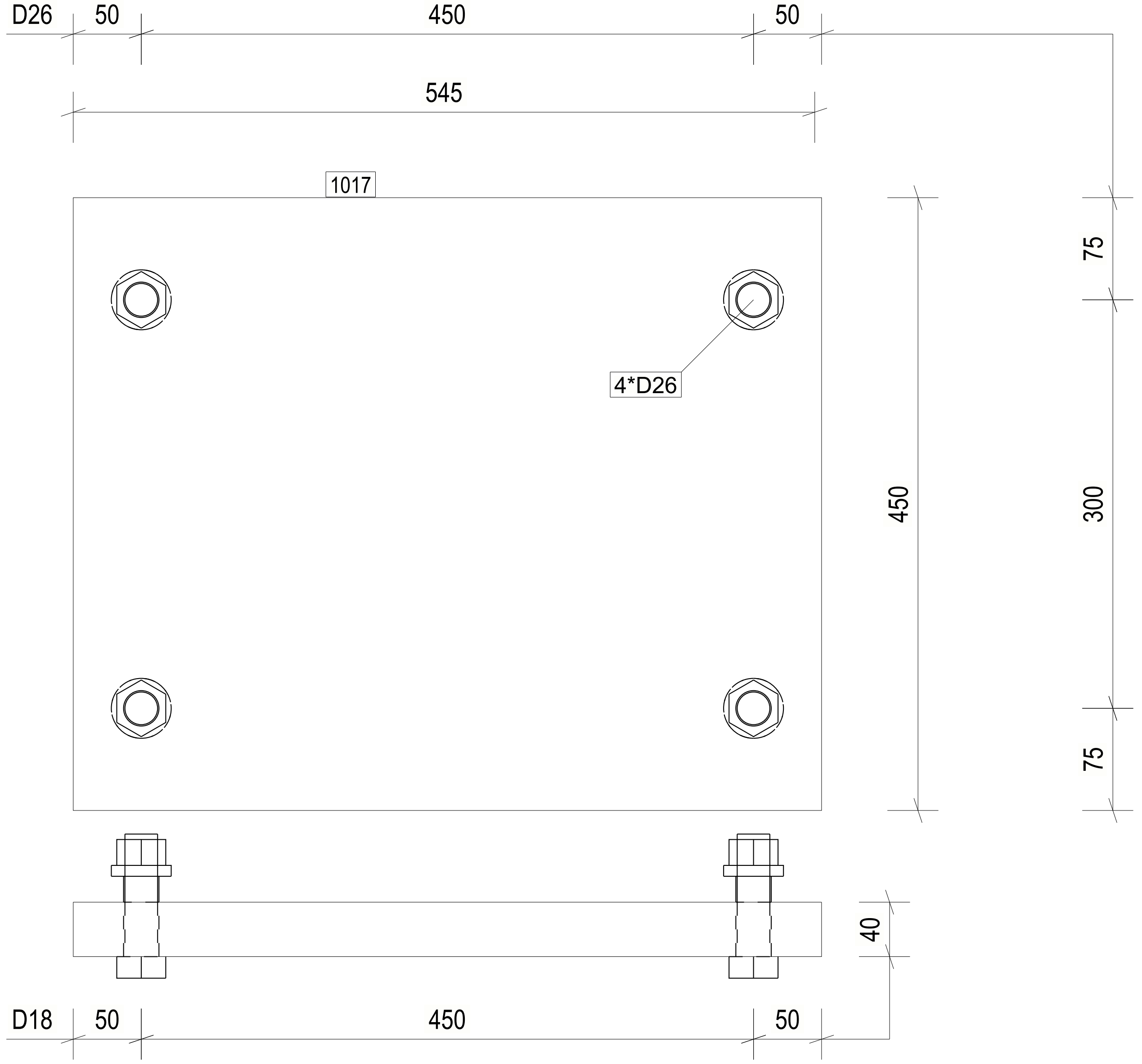
Tekla

Tekla Structures

KOKOONPANOSSA	LKM
B/4	2

OSA	PROFIILI	MATERIAALI	LKM	PITUUS	PAINO
1017	PL40*450	S235JR	2	550	77.7
				YHTEENSÄ:	155.4

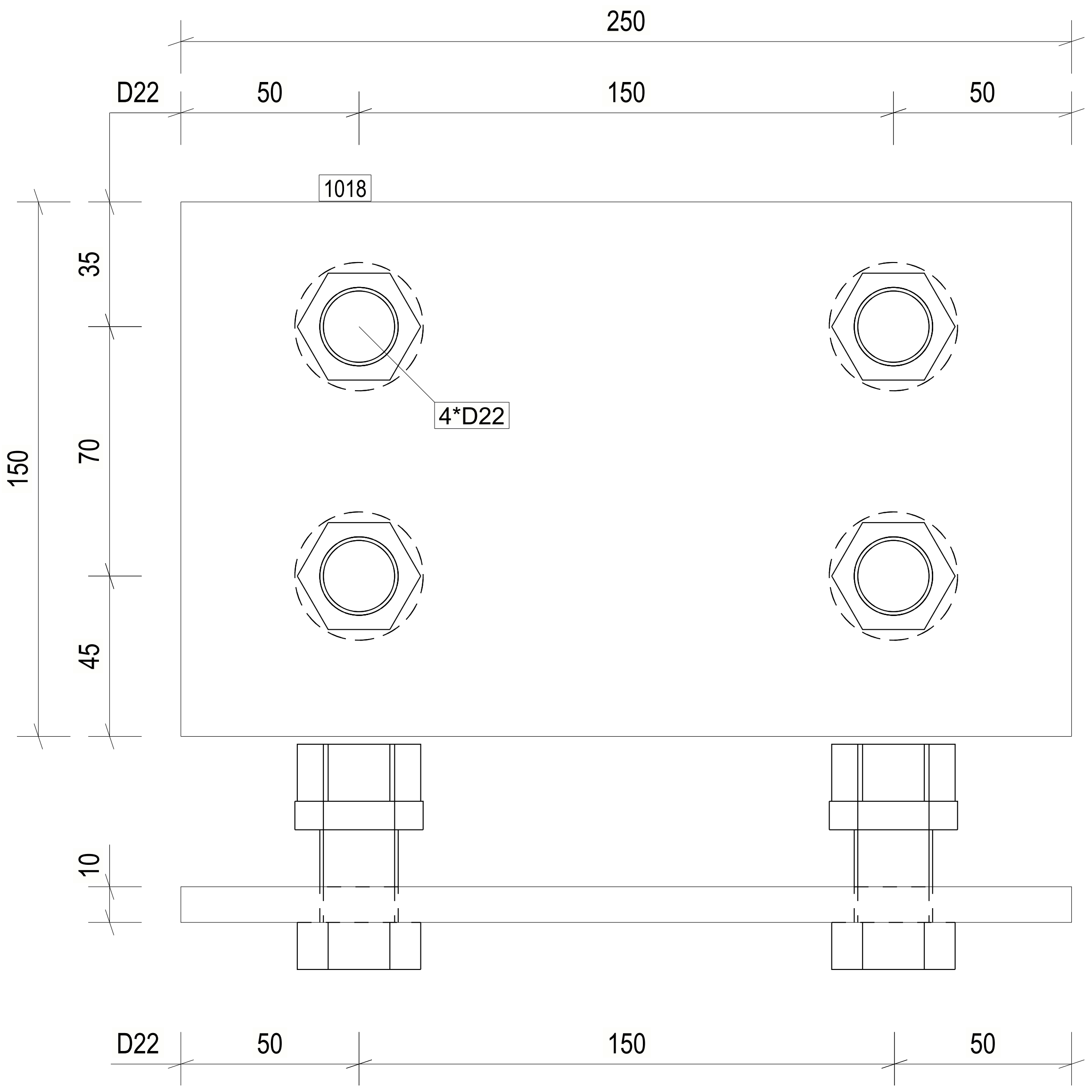


K.OSA/KYLÄ	KORTTELI/TILA	TONTTI/RNRO	VIRANOMAISTEN ARKISTOMERKINTÖJÄ VARTEN
RAKENNUSTOIMENPIDE			PIIRUSTUSLAJI / JUOKSEVA NRO
KOHDE			PIIRUSTUKSEN SISÄLTÖ: HAMK Tech 1017, Steel Reaction Frame — MITTAKAAVAT: 1:5
PIIRT.: Aashish Rokka	SUUN.: Aashish Rokka		
TARK.: Zhongcheng Ma	HYV.: Zhongcheng Ma		
			TYÖNUMERO / ALANUMERO / PIIR. NRO.: 1017
			S.ALA: RAK / SIVU / PVM / MUUTOS

KOKOONPANOSSA	LKM
C/1	2

Tekla Structures

OSA	PROFIILI	MATERIAALI	LKM	PITUUS	PAINO
1018	PL10*150	S235JR	2	250	2.9
				YHTEENSÄ:	5.9



K.OSA/KYLÄ	KORTTELI/TILA	TONTTI/RNRO	VIRANOMAISTEN ARKISTOMERKINTÖJÄ VARTEN
RAKENNUSTOIMENPIDE		PIIRUSTUSLAJI	JUOKSEVA NRO
KOHDE		PIIRUSTUKSEN SISÄLTÖ HAMK Tech 1018, Steel Reaction Frame	MITTAKAAVAT 1:2
PIIRT. Aashish Rokka	SUUN. Aashish Rokka		
TARK. Zhongcheng Ma	HYV. Zhongcheng Ma		

TYÖNUMERO	ALANUMERO	PIIR. NRO.	
		1018	
S.ALA	SIVU	PVM	MUUTOS
RAK			

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KOKOONPANOSSA	LKM
B/4	2

Tekla Structures

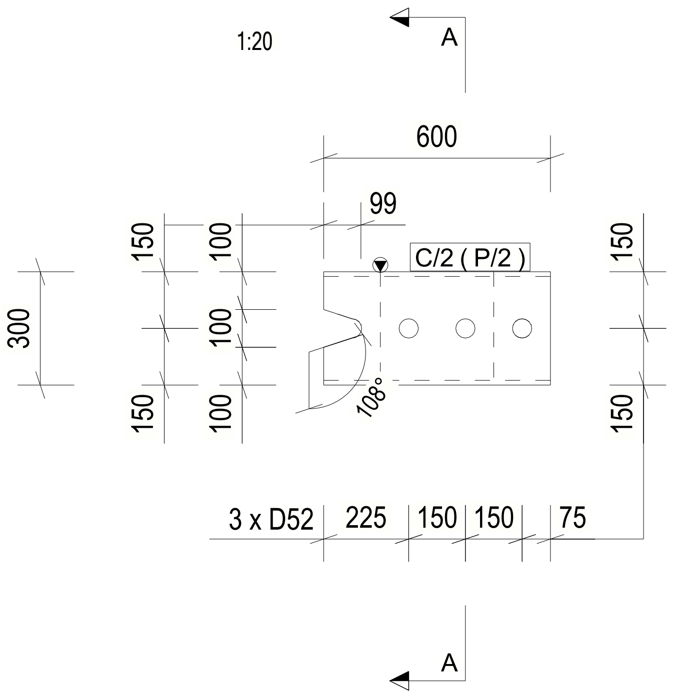
OSALUETTELO KOKOONPANOLLE C/2, JOTA VALMISTETAAN 4 KAPPALETTA

OSA	PROFIILI	MATERIAALI	PITUUS [mm]	ALA [m2]	PAINO [kg]	LKM
P/2	CFRHS300X200X12.5	S355J0	600	0.6	41.0	1
			YHTEENSÄ:	0.6	41.0	

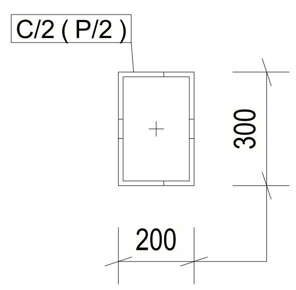
KOKOONPANON KIINNIKELUETTELO

NIMIKE	HALK.	KOKO	STANDARDI	LUJUUS	MATER./PINTA	VÄRI	kg/YHT.	LKM
					YHTEENSÄ:		0.0	

1:20



A - A
1:20



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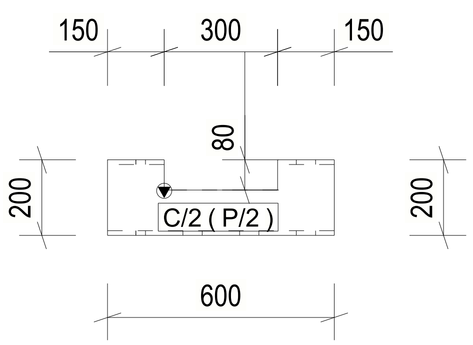

VALMISTUS	HITSIT	PINTAKÄSITTELY

K.OSA/KYLÄ	KORTTELI/TILA	TONTTI/RNRO	VIRANOMAISTEN ARKISTOMERKINTÖJÄ VARTEN
RAKENNUSTOIMENPIDE			PIIRUSTUSLAJI / JUOKSEVA NRO
KOHDE			PIIRUSTUKSEN SISÄLTÖ: KOKOONPANOPIIRUSTUS C/2, Vertical pillar — MITTAKAAVAT: 1:20
PIIRT.	SUUN.		
TARK.	HYV.		

TYÖNUMERO	ALANUMERO	PIIR. NRO.	
		C/2	
S.ALA	SIVU	PVM	MUUTOS
RAK			

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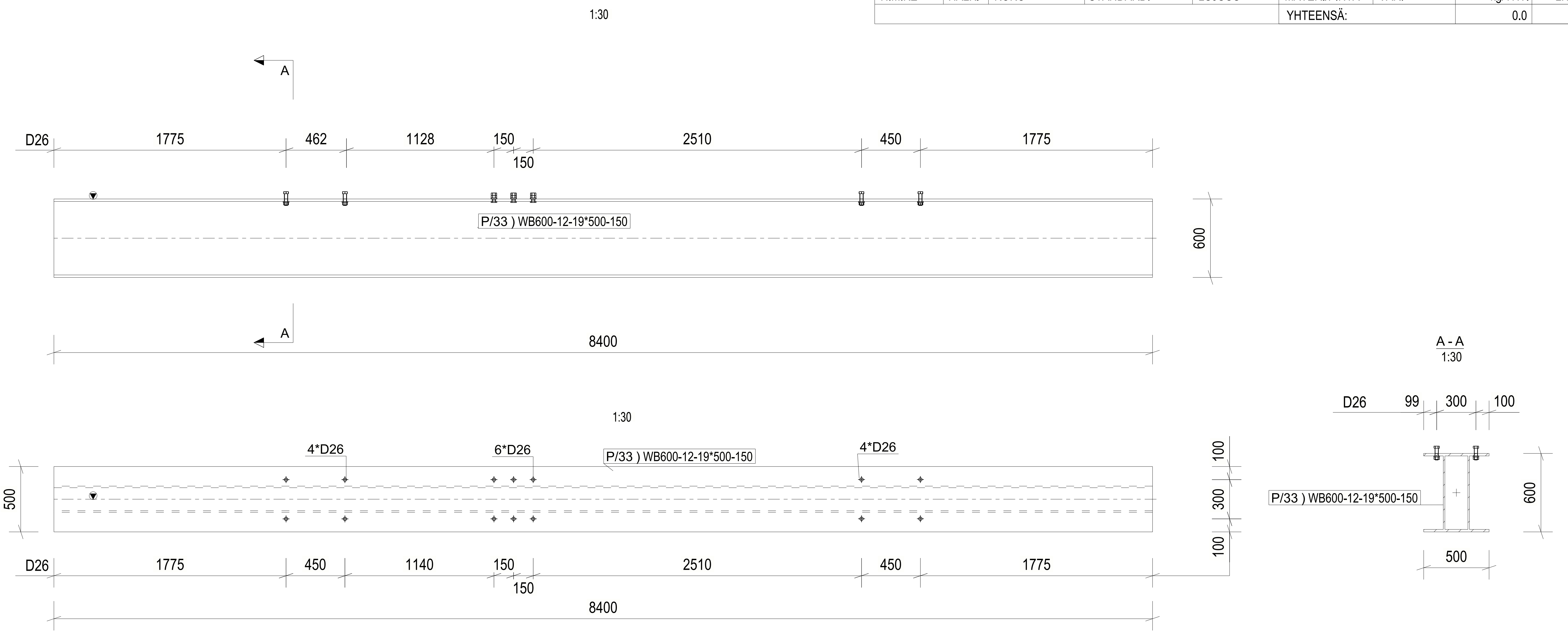
Tekla Structures

OSALUETTELO KOKOONPANOLLE C/8, JOTA VALMISTETAAN 1 KAPPALETTA

OSA	PROFIILI	MATERIAALI	PITUUS [mm]	ALA [m2]	PAINO [kg]	LKM
P/33	WB600-12-19*500-150	S235JR	8400	23.5	2142.3	1
			YHTEENSÄ:	23.5	2142.3	

KOKOONPANON KIINNIKELUETTELO

NIMIKE	HALK.	KOKO	STANDARDI	LUJUUS	MATER./PINTA	VÄRI	kg/YHT.	LKM
					YHTEENSÄ:		0.0	

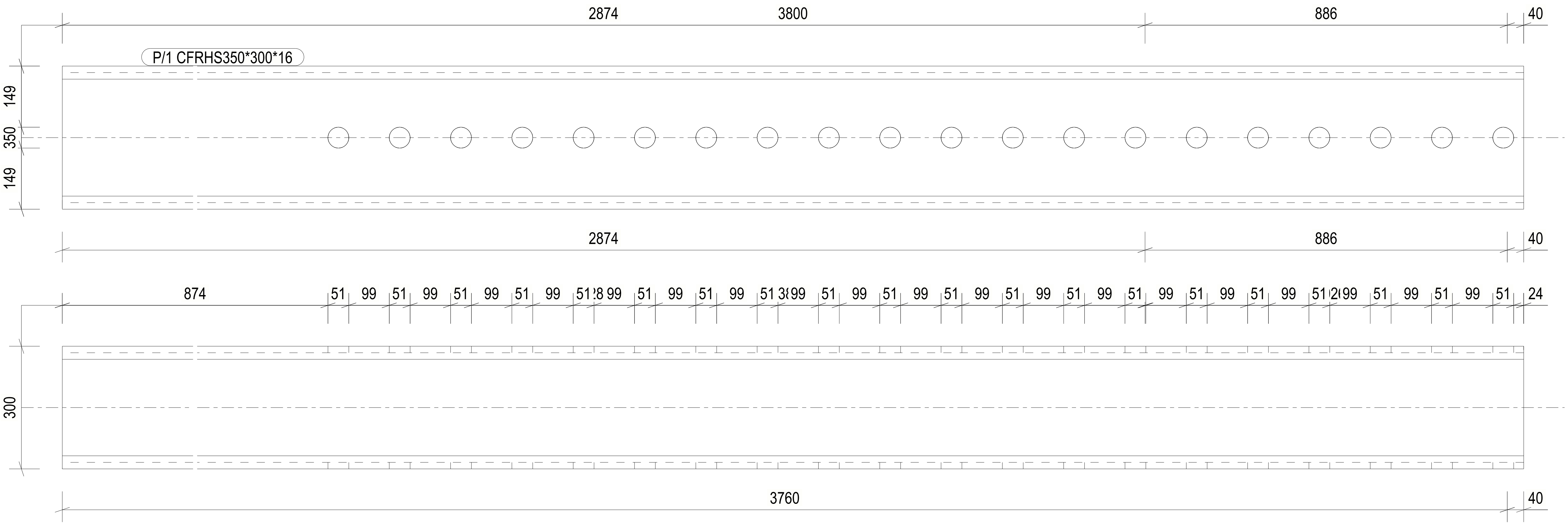


K.OSA/KYLÄ	KORTTELI/TILA	TONTTI/RNRO	VIRANOMAISTEN ARKISTOMERKINTÖJÄ VARTEN	
RAKENNUSTOIMENPIDE			PIIRUSTUSLAJI	JUOKSEVA NRO
KOHDE			PIIRUSTUKSEN SISÄLTÖ HAMK Tech C/8, Steel Reaction Frame	MITTAKAAVAT 1:30
PIIRT. Aashish Rokka	SUUN. Aashish Rokka			
TARK. Zhongcheng Ma	HYV. Zhongcheng Ma			
Powered by Trimble Tekla		TYÖNUMERO	ALANUMERO	PIIR. NRO. C/8
		S.ALA RAK	SIVU	PVM / MUUTOS

Tekla Structures

VALMISTUS	HITSIT	PINTAKÄSITTELY

OSA	PROFIILI	MATERIAALI	LKM	PITUUS	PAINO
P/1	CFRHS350*300*16	S355J0	2	3800	579.9
				YHTEENSÄ:	1159.8



K.OSA/KYLÄ	KORTTELI/TILA	TONTTI/RNRO	VIRANOMAISTEN ARKISTOMERKINTÖJÄ VARTEN

RAKENNUSTOIMENPIDE

PIIRUSTUSLAJI

JUOKSEVA NRO

KOHDE

PIIRUSTUKSEN SISÄLTÖ
HAMK Tech
P/1, Steel Reaction Frame

MITTAKAAVAT
1:10

PIIRT.	SUUN.
Aashish Rokka	Aashish Rokka
TARK. Zhongcheng Ma	HYV.

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Tekla

TYÖNUMERO	ALANUMERO	PIIR. NRO.	
		P/1	
S.ALA	SIVU	PVM	MUUTOS
RAK			

Tekla Structures

KOKOONPANOSSA	LKM
C/1	2

OSA	PROFIILI	MATERIAALI	LKM	PITUUS	PAINO
P/4	CFRHS300X200X12.5	S355J0	2	5000	466.1
				YHTEENSÄ:	932.2

KOKOONPANOSSA	LKM
B/6	2

Tekla Structures

K.OSA/KYLÄ	KORTTELI/TILA
TONTTI/RNRO	VIRANOMAISTEN ARKISTOMERKINTÖJÄ VARTEN
RAKENNUSTOIMENPIDE	PIIRUSTUSLAJI
JUOKSEVA NRO	
KOHDE	PIIRUSTUKSEN SISÄLTÖ: HAMK Tech, P/4, Steel Reaction Frame
MITTAKAAVAT	1:5
PIIRT.	Aashish Rokka
SUUN.	Aashish Rokka
TARK.	Zhongcheng Ma
HYV.	Zhongcheng Ma
TYÖNUMERO	
ALANUMERO	
PIIR. NRO.	P/4
S.ALA	RAK
SIVU	
PVM	
MUUTOS	

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Tekla

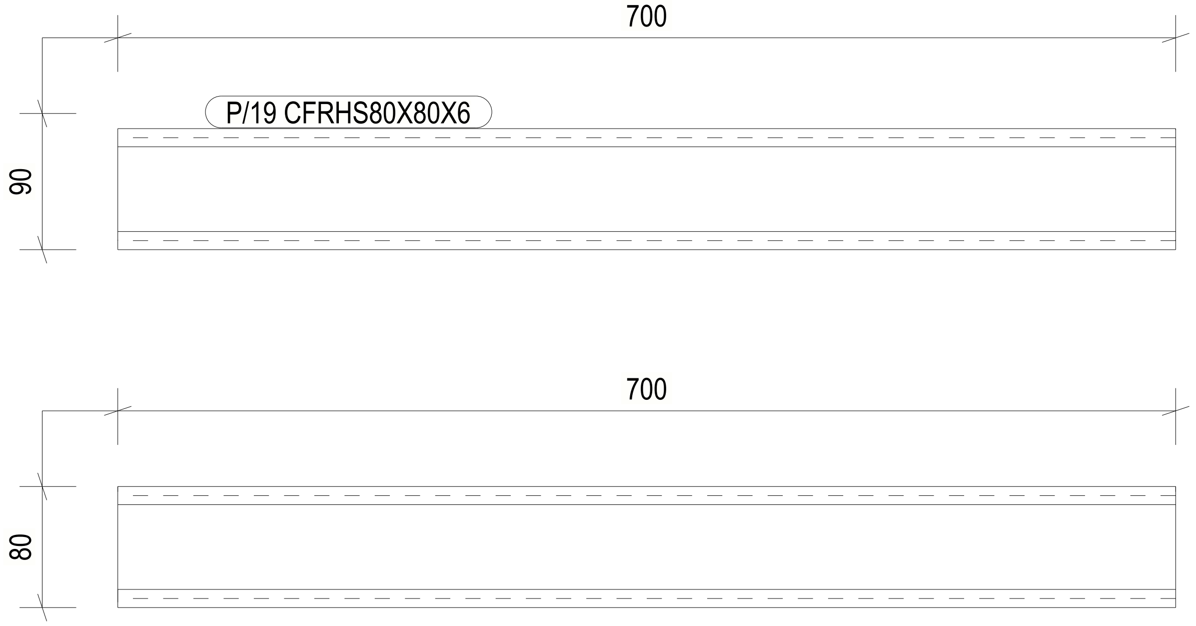
OSA	PROFIILI	MATERIAALI	LKM	PITUUS	PAINO
P/18	CFRHS100X100X8	S355J0	1	1751	40.5
				YHTEENSÄ:	40.5

K.OSA/KYLÄ	KORTTELI/TILA	TONTTI/RNRO	VIRANOMAISTEN ARKISTOMERKINTÖJÄ VARTEN
RAKENNUSTOIMENPIDE			PIIRUSTUSLAJI / JUOKSEVA NRO
KOHDE			PIIRUSTUKSEN SISÄLTÖ: HAMK Tech P/18, Steel Reaction Frame — MITTAKAAVAT: 1:5
PIIRT.: Aashish Rokka	SUUN.: Aashish Rokka		
TARK.: Zhongcheng Ma	HYV.		
Powered by Trimble — Tekla			TYÖNUMERO / ALANUMERO / PIIR. NRO.: P/18
			S.ALA: RAK / SIVU / PVM / MUUTOS

KOKOONPANOSSA	LKM
B/8	1

Tekla Structures

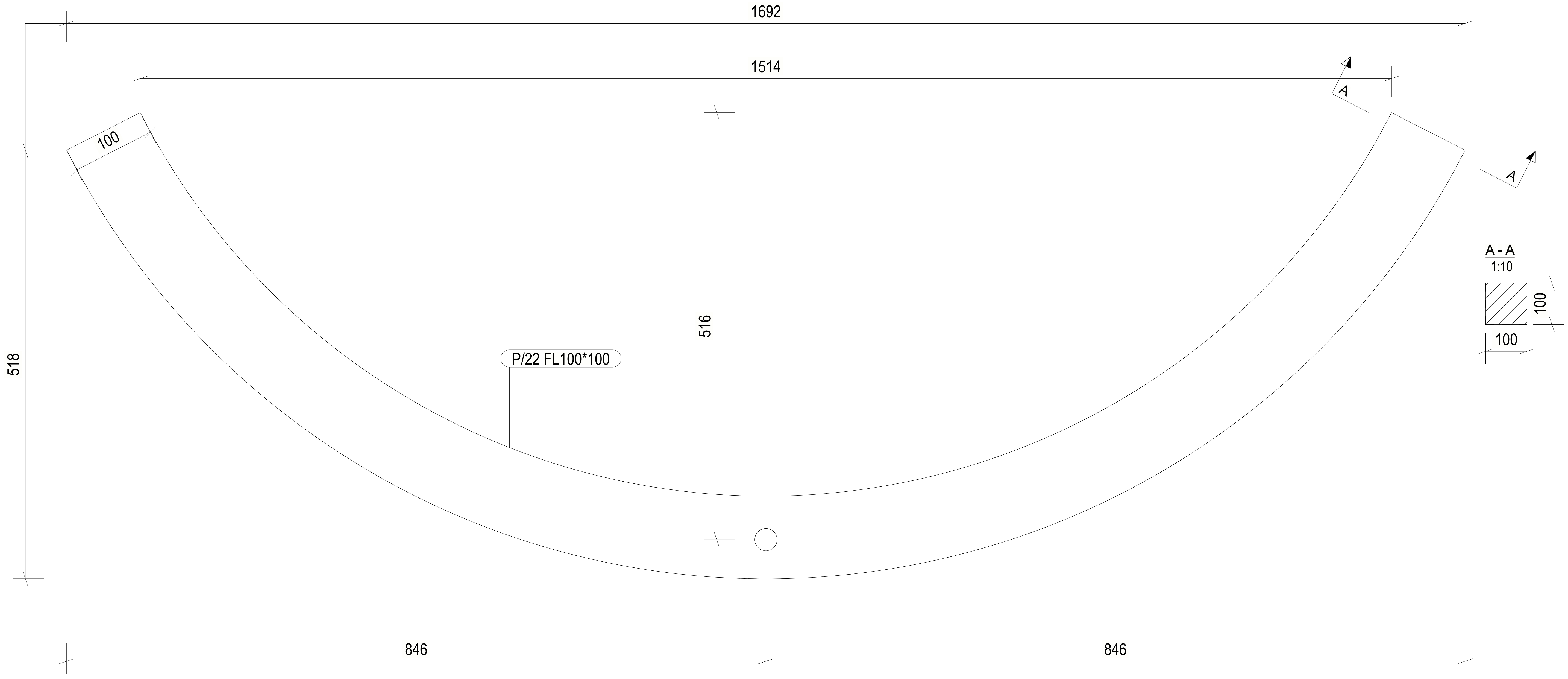
OSA	PROFIILI	MATERIAALI	LKM	PITUUS	PAINO
P/19	CFRHS80X80X6	S235JR	2	700	9.8
				YHTEENSÄ:	19.5



K.OSA/KYLÄ	KORTTELI/TILA	TONTTI/RNRO
VIRANOMAISTEN ARKISTOMERKINTÖJÄ VARTEN		
RAKENNUSTOIMENPIDE	PIIRUSTUSLAJI	JUOKSEVA NRO
KOHDE	PIIRUSTUKSEN SISÄLTÖ: HAMK Tech P/19, Steel Reaction Frame	MITTAKAAVAT: 1:5
PIIRT.: Aashish Rokka	SUUN.: Aashish Rokka	
TARK.: Zhongcheng Ma	HYV.	
TYÖNUMERO	ALANUMERO	PIIR. NRO.: P/19
S.ALA: RAK	SIVU	PVM / MUUTOS

KOKOONPANOSSA	LKM
B/9	2

OSA	PROFIILI	MATERIAALI	LKM	PITUUS	PAINO
P/22	FL100*100	S235JR	1	1978	154.8
				YHTEENSÄ:	154.8



K.OSA/KYLÄ	KORTTELI/TILA	TONTTI/RNRO

VIRANOMAISTEN ARKISTOMERKINTÖJÄ VARTEN

RAKENNUSTOIMENPIDE

PIIRUSTUSLAJI

JUOKSEVA NRO

KOHDE

PIIRUSTUKSEN SISÄLTÖ
HAMK Tech
P/22, Steel Reaction Frame

MITTAKAAVAT
1:5
1:10

PIIRT. Aashish Rokka

SUUN. Aashish Rokka

TARK. Zhongcheng Ma

HYV.

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TYÖNUMERO

ALANUMERO

PIIR. NRO. P/22

S.ALA RAK

SIVU

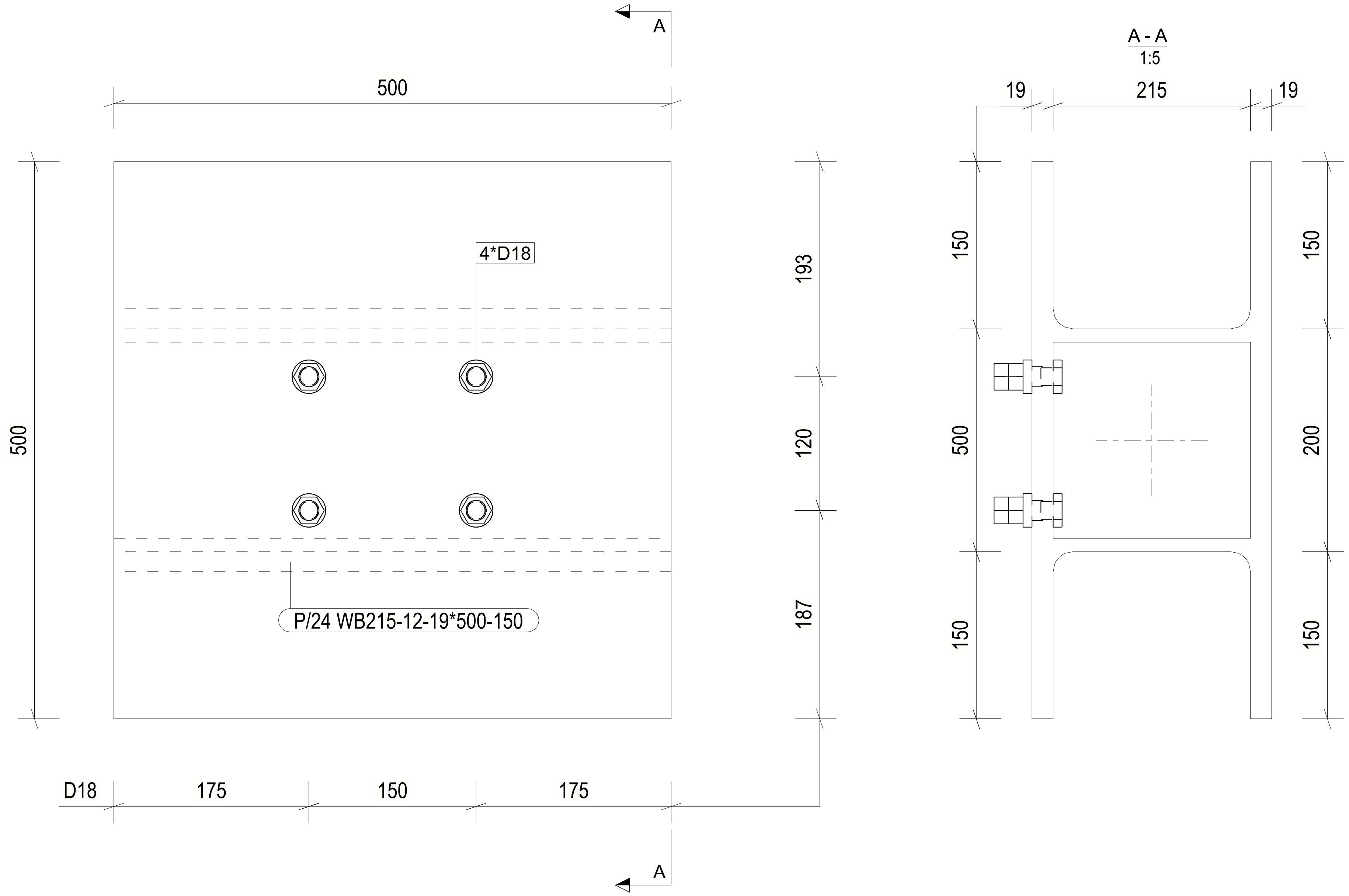
PVM

MUUTOS

Tekla Structures

KOKOONPANOSSA	LKM
B/12	1

OSA	PROFIILI	MATERIAALI	LKM	PITUUS	PAINO
P/24	WB215-12-19*500-150	S235JR	1	500	91.2
				YHTEENSÄ:	91.2



K.OSA/KYLÄ	KORTTELI/TILA	TONTTI/RNRO	VIRANOMAISTEN ARKISTOMERKINTÖJÄ VARTEN

RAKENNUSTOIMENPIDE

PIIRUSTUSLAJI

JUOKSEVA NRO

KOHDE

PIIRUSTUKSEN SISÄLTÖ

HAMK Tech

P/24, Steel Reaction Frame

MITTAKAAVAT

1:5

1:5

PIIRT.	SUUN.
Aashish Rokka	Aashish Rokka
TARK. Zhongcheng Ma	HYV.

Powered by Trimble

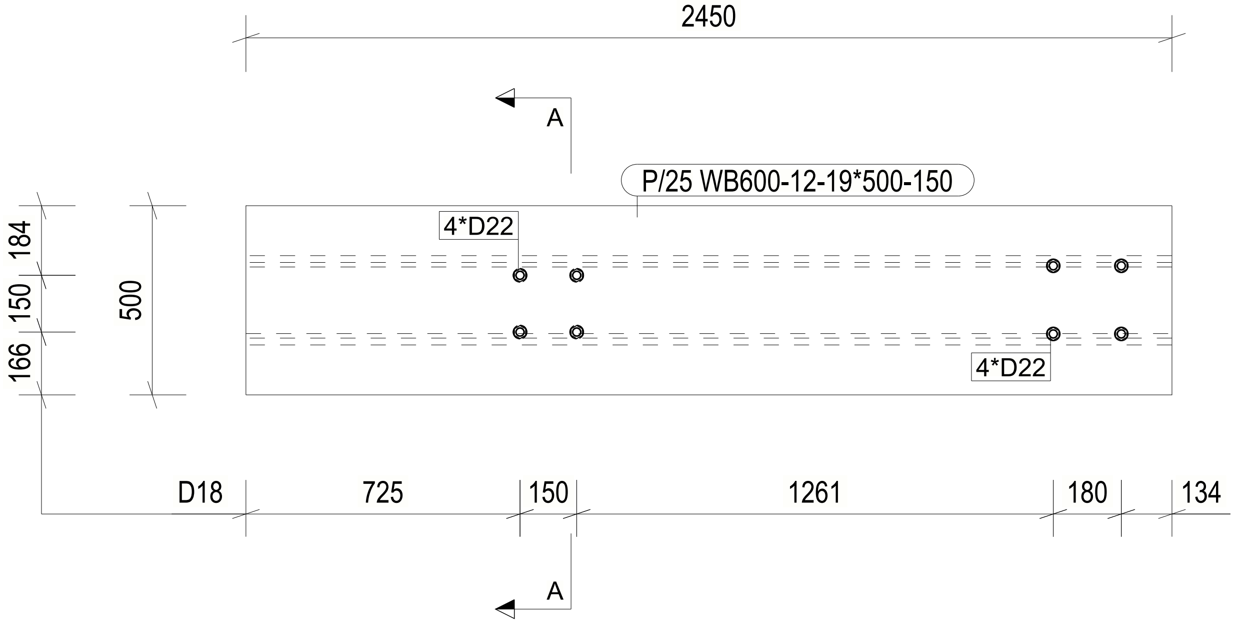
Tekla

TYÖNUMERO	ALANUMERO	PIIR. NRO.
		P/24
S.ALA RAK	SIVU	PVM	MUUTOS

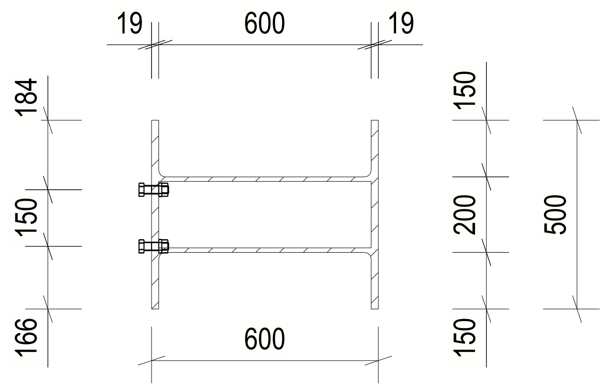
Tekla Structures

KOKOONPANOSSA	LKM
C/5	1

OSA	PROFIILI	MATERIAALI	LKM	PITUUS	PAINO
P/25	WB600-12-19*500-150	S235JR	2	2450	624.8
				YHTEENSÄ:	1249.7



A - A
1:20



KOKOONPANOSSA	LKM
C/6	2

Tekla Structures

K.OSA/KYLÄ | KORTTELI/TILA | TONTTI/RNRO

VIRANOMAISTEN ARKISTOMERKINTÖJÄ VARTEN

RAKENNUSTOIMENPIDE

PIIRUSTUSLAJI

JUOKSEVA NRO

KOHDE

PIIRUSTUKSEN SISÄLTÖ
HAMK Tech
P/25, Steel Reaction Frame

MITTAKAAVAT
1:20

PIIRT.
Aashish Rokka

SUUN.
Aashish Rokka

TARK.
Zhongcheng Ma

HYV.

Powered by Trimble

Tekla

TYÖNUMERO

ALANUMERO

PIIR. NRO.
P/25

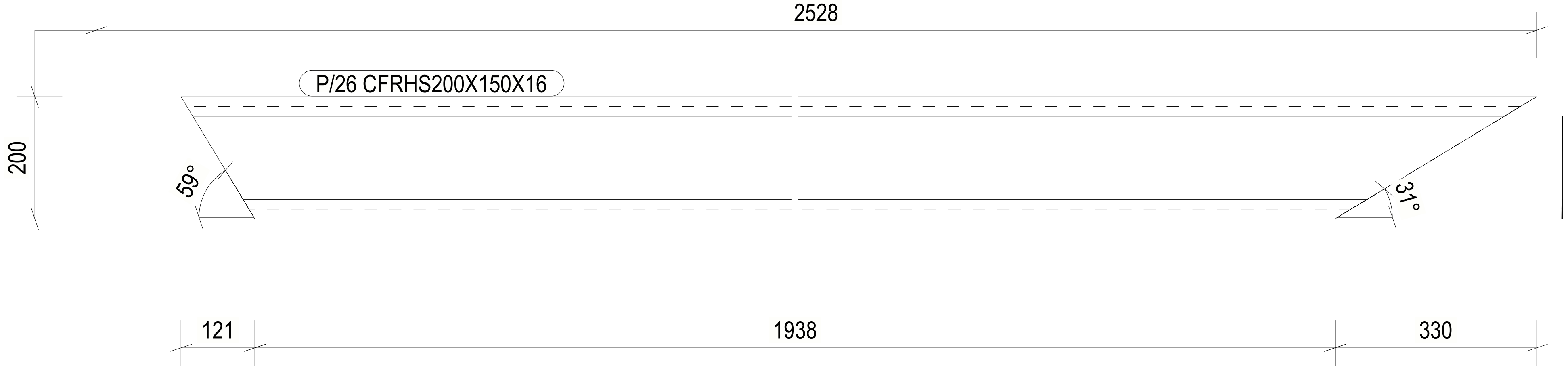
S.ALA
RAK

SIVU

PVM

MUUTOS

OSA	PROFIILI	MATERIAALI	LKM	PITUUS	PAINO
P/26	CFRHS200X150X16	S235JR	1	2431	172.9
				YHTEENSÄ:	172.9

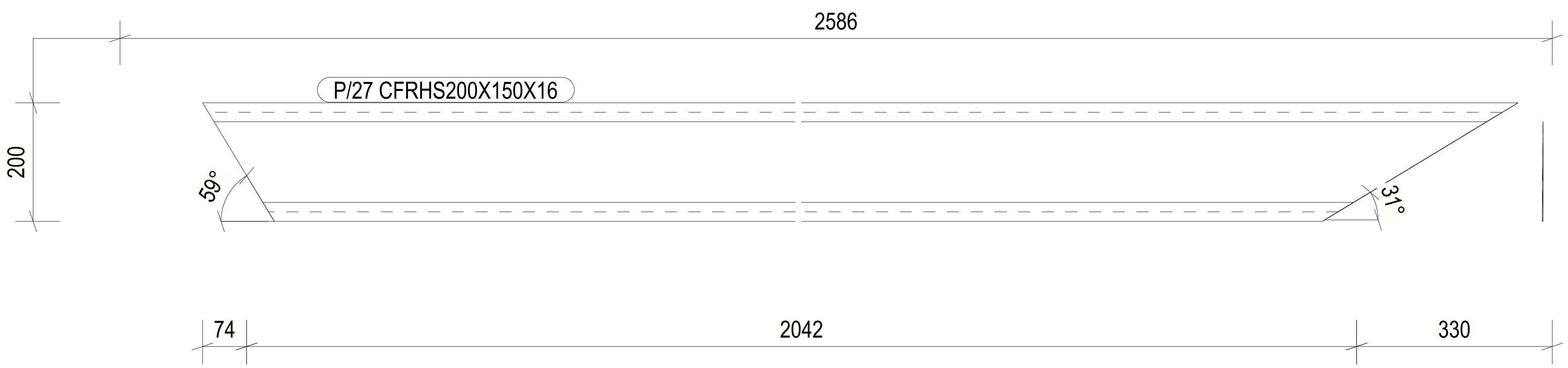


K.OSA/KYLÄ	KORTTELI/TILA	TONTTI/RNRO	VIRANOMAISTEN ARKISTOMERKINTÖJÄ VARTEN
RAKENNUSTOIMENPIDE		PIIRUSTUSLAJI	JUOKSEVA NRO
KOHDE		PIIRUSTUKSEN SISÄLTÖ HAMK Tech P/26, Steel Reaction Frame	MITTAKAAVAT 1:10
PIIRT. Aashish Rokka	SUUN. Aashish Rokka		
TARK. Zhongcheng Ma	HYV.		

TYÖNUMERO	ALANUMERO	PIIR. NRO.	
		P/26	
S.ALA	SIVU	PVM	MUUTOS
RAK			

KOKOONPANOSSA	LKM
A/12	1

OSA	PROFIILI	MATERIAALI	LKM	PITUUS	PAINO
P/27	CFRHS200X150X16	S235JR	1	2431	172.9
				YHTEENSÄ:	172.9



K.OSA/KYLÄ	KORTTELI/TILA	TONTTI/RNRO	VIRANOMAISTEN ARKISTOMERKINTÖJÄ VARTEN

RAKENNUSTOIMENPIDE

PIIRUSTUSLAJI

JUOKSEVA NRO

KOHDE

PIIRUSTUKSEN SISÄLTÖ

HAMK Tech

P/27, Steel Reaction Frame

MITTAKAAVAT

1:10

PIIRT. Aashish Rokka

SUUN. Aashish Rokka

TARK. Zhongcheng Ma

HYV.

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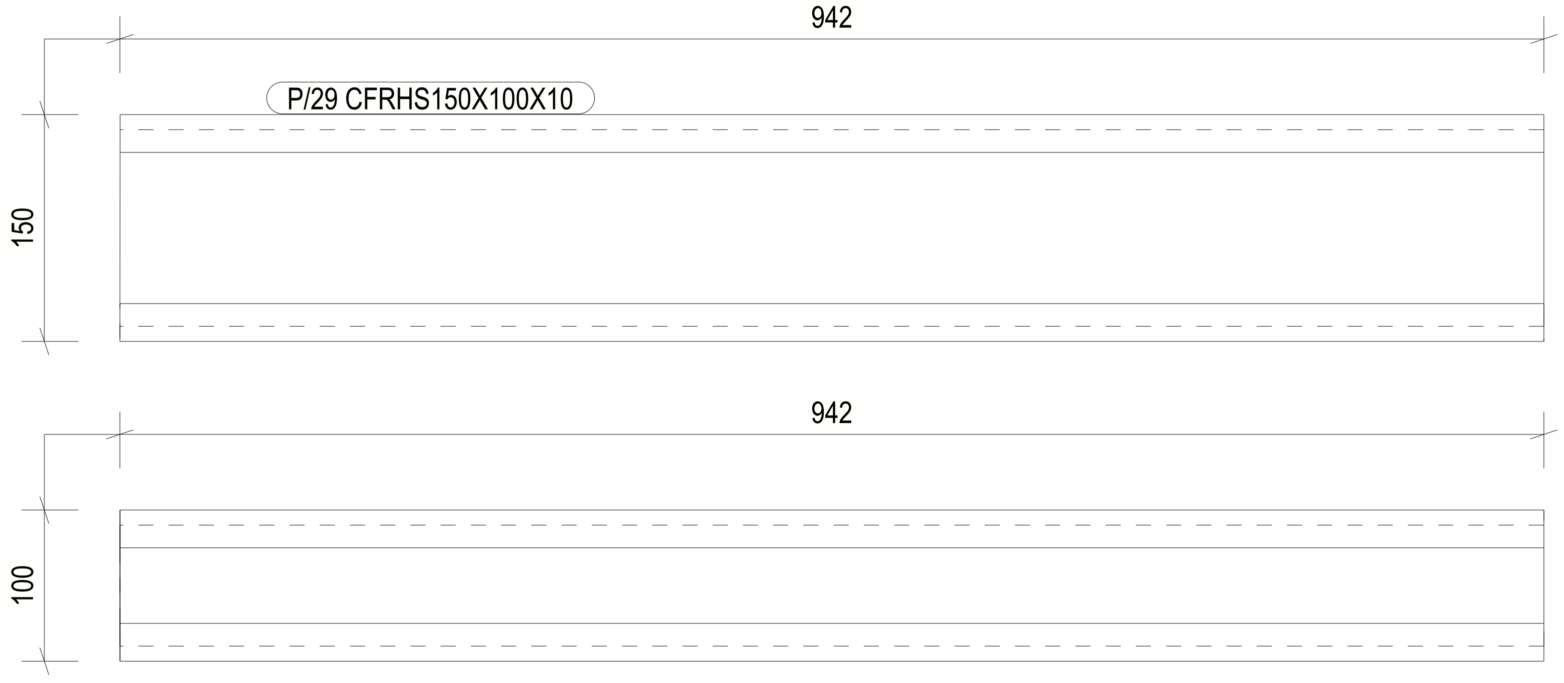
Tekla

TYÖNUMERO	ALANUMERO	PIIR. NRO.	
		P/27	
S.ALA	SIVU	PVM	MUUTOS
RAK			

KOKOONPANOSSA	LKM
A/13	1

Tekla Structures

OSA	PROFIILI	MATERIAALI	LKM	PITUUS	PAINO
P/29	CFRHS150X100X10	S355J0	2	942	34.0
				YHTEENSÄ:	68.0



K.OSA/KYLÄ	KORTTELI/TILA	TONTTI/RNRO	VIRANOMAISTEN ARKISTOMERKINTÖJÄ VARTEN
RAKENNUSTOIMENPIDE			PIIRUSTUSLAJI / JUOKSEVA NRO
KOHDE			PIIRUSTUKSEN SISÄLTÖ: HAMK Tech, P/29, Steel Reaction Frame / MITTAKAAVAT: 1:5
PIIRT.: Aashish Rokka	SUUN.: Aashish Rokka		
TARK.: Zhongcheng Ma	HYV.:		

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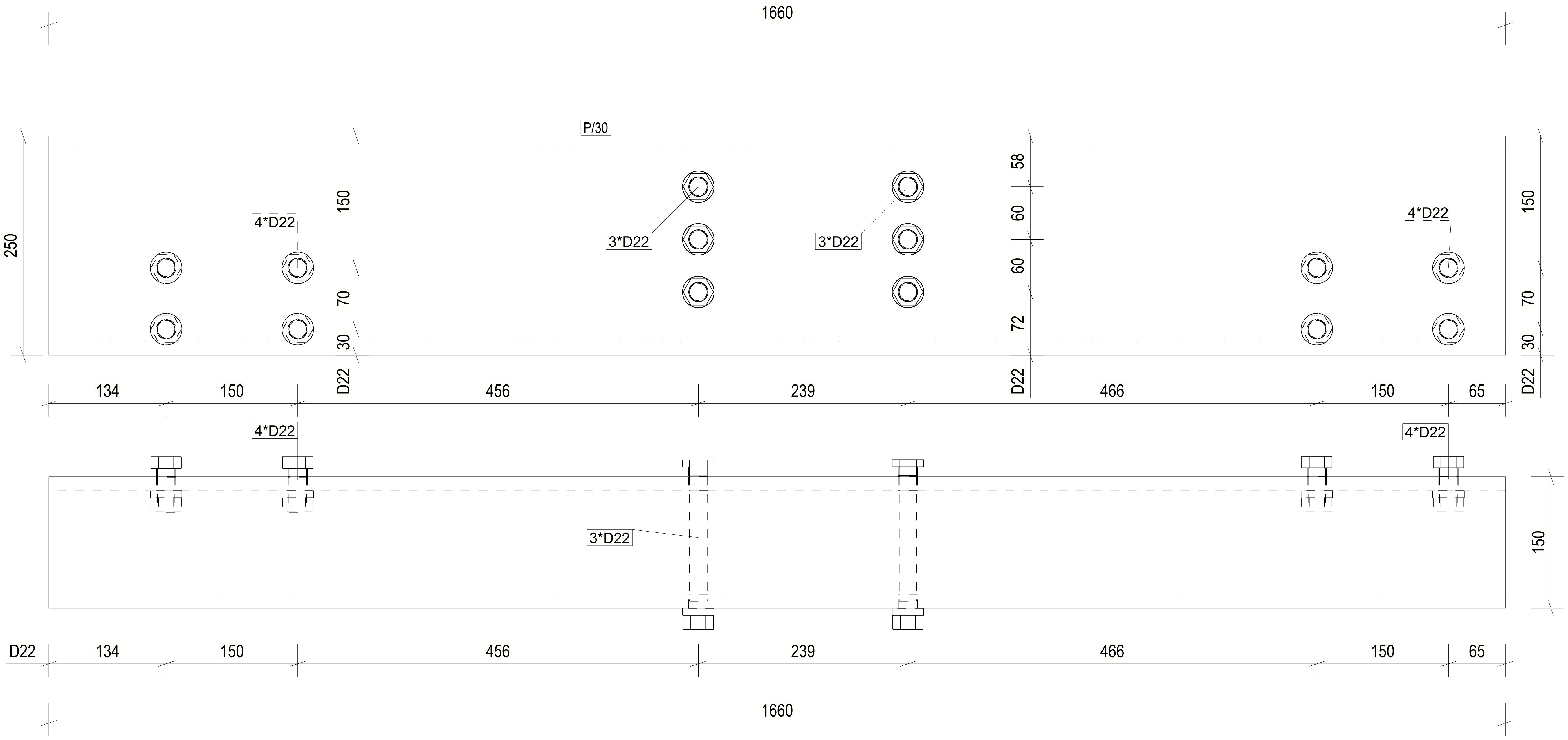
TYÖNUMERO	ALANUMERO	PIIR. NRO.	
		P/29	
S.ALA	SIVU	PVM	MUUTOS
RAK			

KOKOONPANOSSA	LKM
B/1	2

Tekla Structures

OSA	PROFIILI	MATERIAALI	LKM	PITUUS	PAINO
P/30	CFRHS250*150*16	S355J0	1	1660	153.5
				YHTEENSÄ:	153.5

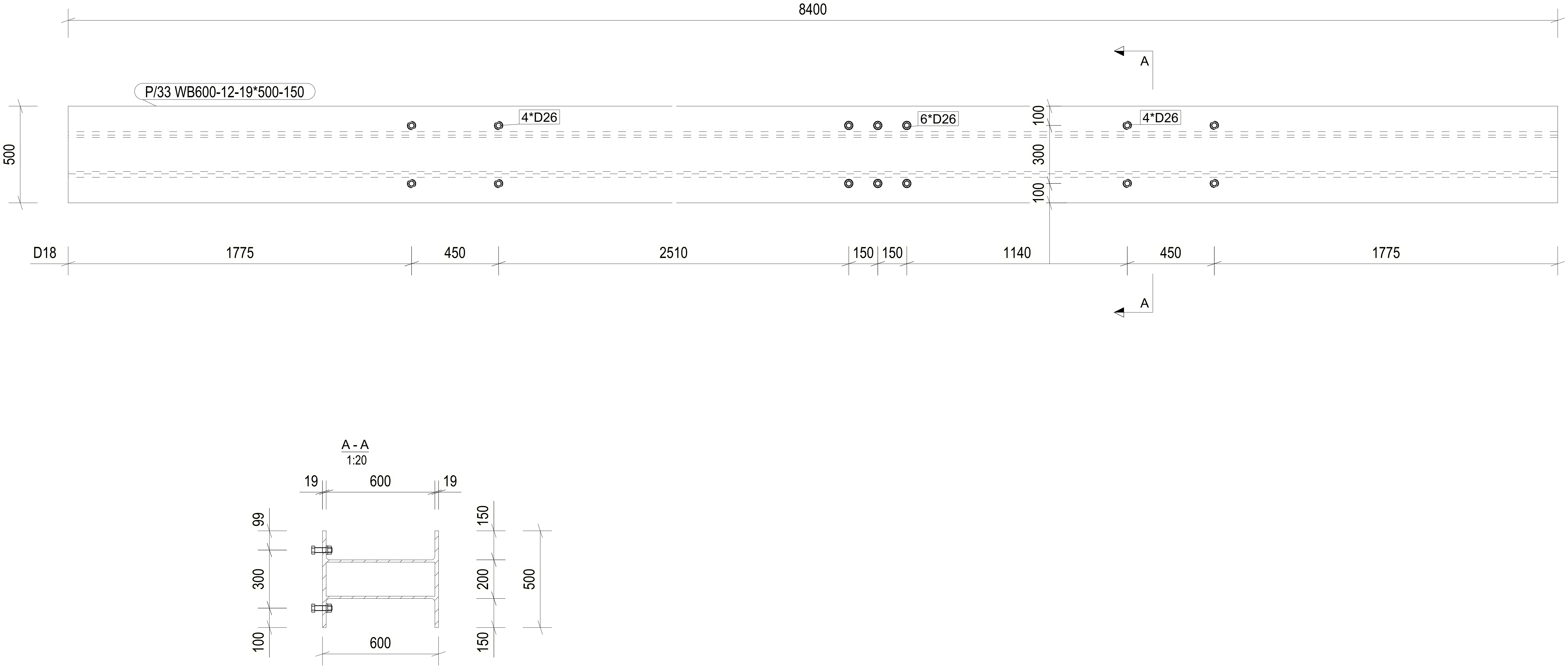


K.OSA/KYLÄ	KORTTELI/TILA	TONTTI/RNRO	VIRANOMAISTEN ARKISTOMERKINTÖJÄ VARTEN
RAKENNUSTOIMENPIDE			PIIRUSTUSLAJI / JUOKSEVA NRO
KOHDE			PIIRUSTUKSEN SISÄLTÖ: HAMK Tech P/30, Steel Reaction Frame / MITTAKAAVAT: 1:5
PIIRT.: Aashish Rokka	SUUN.: Aashish Rokka		
TARK.: Zhongcheng Ma	HYV.: Zhongcheng Ma		
			TYÖNUMERO / ALANUMERO / PIIR. NRO.: P/30
			S.ALA: RAK / SIVU / PVM / MUUTOS

KOKOONPANOSSA	LKM
B/2	1

Tekla Structures

OSA	PROFIILI	MATERIAALI	LKM	PITUUS	PAINO
P/33	WB600-12-19*500-150	S235JR	1	8400	2142.3
				YHTEENSÄ:	2142.3



K.OSA/KYLÄ	KORTTELI/TILA	TONTTI/RNRO	VIRANOMAISTEN ARKISTOMERKINTÖJÄ VARTEN
RAKENNUSTOIMENPIDE			PIIRUSTUSLAJI / JUOKSEVA NRO
KOHDE			PIIRUSTUKSEN SISÄLTÖ: HAMK Tech P/33, Steel Reaction Frame — MITTAKAAVAT: 1:20
PIIRT.: Aashish Rokka	SUUN.: Aashish Rokka		
TARK.: Zhongcheng Ma	HYV.:		
Powered by Trimble Tekla	TYÖNUMERO	ALANUMERO	PIIR. NRO.: P/33
	S.ALA: RAK	SIVU	PVM / MUUTOS

KOKOONPANOSSA	LKM
C/8	1

Tekla Structures

Appendix 4 Mathcad calculation of anchor bolt force

$s := 300mm$ — Distance between anchor rod

$N_1 := 54$ — Total number of anchor bolts

$N_2 := 27$ — Bolts in x direction

$N_3 := 27$ — Bolts in y direction

$T_f := 1721.750\frac{kN}{m}$ — Maximum distributed tension force in base beam obtained from RFEM

$m_f := 0.001\frac{kN \cdot m}{m}$ — Moment force obtained from RFEM

Force for 2 bolts

$F := s \cdot T_f = 516.525kN$

$\frac{F}{2} = 258.262kN$ — Since we have bolts two direction

$258.262kN + m_f = 258.263kN$

$\frac{258.263kN}{N_1} = 4.783\,kN$