Saimaa University of Applied Sciences
Technology, Lappeenranta
Double Degree Programme in Civil and Construction Engineering

Mikhail Baranovskiy

DEVELOPMENT OF STANDARDIZED ROOFING TRUSS DESIGN

Thesis 2015

Abstract

Mikhail Baranovskiy
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Instructors: Lecturer Petri Himmi, Saimaa University of Applied Sciences
Chief Designer Dmitrii Zasulskii, Ruukki Rus

This thesis work was made for Ruukki Rus, for the Russian filial of the big Finnish company. Ruukki Rus makes projects and produce different steel structures. However, there was a task to reduce the time spending to design process. As standardization and unification of elements, constructions and design solutions is one of the main ways to reduce the complexity and cost of the construction, there was decided to standardize structures in typical building. The purpose of this work was to make a standardized series of the roofing truss designs with 10 % slope for 24, 30, 36 meters spans and different load combinations.

Calculations were made in SCAD Office, in Microsoft Excel and some simple calculations were made by hands. All calculations (determination of the load bearing capacity and welded connections strength) were made according to the Russian code SP16.13330.2011 «Steel Structures». On this calculations basis BIM models in Tekla Structures were made. The metal consumption and all the standard sections drawings were received from those BIM models.

Designed series of truss structures with a 10% slope and 24, 30, 36 meters spans covers a range of line loads from 1.3 t/m to 3.3 t/m. In comparison with the truss structures series Molodechno it has a lower metal consumption by reducing the cross section of the upper chords due to vertical elements adding.

The result of this thesis work is a table for customers where they can choose type of roofing structures they need and estimate the approximate weight and cost, and almost the same table for designers – to consult customers and to make some structure decisions according to customer needs. Therefore, this series reduce the time spending from the moment of the concept project to the moment of manufacturing because the time of designing is much less.

Keywords: Truss structure, steel structure, Standardization, Unification, Large span truss, roofing structure, standard element, metal consumption, RHS profile.

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1. Introduction

This thesis was made for the Russian filial of the Finnish company Rautarukki in Saint Petersburg. This is a big Finnish corporation, consists of three business areas: construction, engineering and metals. Ruukki produces different products for their clients in various industries, including chassis and cabins for heavy vehicles, hot rolled steel coils and plates, sheets for roofing and building and bridge structures.

The aim of this research was to develop standard roofing truss structures with a 10% slope for 24, 30, 36 meters spans for different load combinations. Requirements was:

1. Development of a series should be based on structural, technological features of production, the factory restrictions and available metal rolling range.
2. Separate sections should be standardized for use in the trusses with a various span.
3. 24-meter truss must be designed so to not fall into the oversize transporting category, therefore, the restriction on the maximum height of a 12-meter section was set in the range of 2.5 meters.
4. 36-meter truss had to back up all the loads of IV snow area.

1.1. Standardization actuality

Standardization and unification has a significant effect on the rate of development and on the level of production. It acts to raise the operating speed of the manufacture. An album of standard solutions is a reference base for the preliminary analysis of the project cost by the customer. On the basis of these series tools for automation of modeling and obtaining drawings can be formed. Therefore, standardization and unification are always actual.

Standardization - is the establishment and application of the rules in order to streamline operations in a particular area for the benefit of and with the participation of all stakeholders, in particular, to achieve optimal overall economy while respecting the functional conditions and safety requirements.

Unification and modulating of the geometric dimensions in the case of trusses allows you to standardize both the trusses and the adjacent elements (girders, connections, and so on). This leads to a reduction in the number of sizes of parts and allows in case of mass structures production to use specialized equipment.

Development of an album of the standardized truss constructions within the concrete company occurs on the basis of existing equipment and production capacity, internal range of metal rolling, transportation requirements. Taking into account the statistics of the most common construction solutions, such as span, trusses spacing and their working condition.

The scope of standardization narrowed as a result of taking into account these requirements, that allows to achieve the most qualitative optimization of the construction and production.

1.2. Initial data and tasks

- **Initial data:**

– Required truss slope equal 10%;

– Three span types: 24 meters, 30 meters and 36 meters;

– Truss elements had to be made of RHS profiles in accordance to GOST 30245-2003;

– 36-meter truss had to back up all the loads minimum of the IV snow area.

- **Tasks**

– Calculate the strength and stability of the 36-meter truss in IV snow area in SCAD Office program complex and determine the optimal chords sizes;

– Calculate other trusses strength and stability;

– Make buckling truss elements analysis;

– Calculate the welding connections strength between chords and members;

– Calculate the bottom chord friction joint;

– Making a table for truss construction selection;

– Making truss sections drawings.

2. Standards in building and metal structures history

«Unification – reduction to uniformity, eliminating unreasonable individual difference in the building or structure design in buildings of one appointment, their elements, structures, components, equipment. Unification involves the selection of rational gradations of the geometrical sizes and other parameters based on a uniform modular system».

Building standards are public documents on the consensus base, it can be in the specifications, procedural requirements, or handbooks form. Building standards can be changed or update to suit the economy and community changing needs.

To provide a basis level of safety requirements for buildings, houses, machinery and other objects Government regulators or some public authorities often refer to standards in their regulation. In our daily life, standards are everywhere, from the buildings to lighting on the streets to the seat belts in your vehicle.

In the building and construction sphere, standards allow modulating best practices, technical requirements and methods to create a safe and well-minded built environment for the society.

On the world level, it is really important for countries to work together aimed to share the best methods and technologies. International agencies, which develop standards such as the International Organization for Standardization (ISO), have brought together people from different countries all over the world to develop standards important for building and construction.

In USSR Government agency (later named Gosstandart) was established in 1925, and was put in charge of writing, publishing, updating the standards. GOST 1 State Standardization System (the first GOST standard) was published in 1968.

The government of the Soviet Union developed GOST standards as part of the national standardization strategy.

Now, the GOST standards collection includes more than 20,000 titles used extensively in 12 countries. The GOST standards cover energy, oil and gas, environmental protection, construction, transportation, telecommunications, mining, food processing and so on. Also, there are a lot of building standards.

2.1. Metal structures history

2.1.1. The first period (from the XII century to the XVII century beginning)

Metal was applied in unique on that time constructions (palaces, churches, etc.) as a metal ties for a stonework. Ties were hammered from bloomer pig iron (Figure 2.1).

Figure 2.1. The tie in a brick arch

2.1.2. The second period (from the XVII century beginning to the end of the XVIII century)

In that period, the inclined metal rafters and space structures were used. Bars in structures were made from forged metal strips and were connected by forge welding. Structures of this type remained intact until our days. For example, the dome of Kazanskiy Cathedral in St. Petersburg (1805), etc.

2.1.3. The third period (from the XVIII century beginning to the middle of the XVIII century)

The process of elements pig iron casting were mastered. Pig iron bridges and overlapping structures in residential and industrial buildings were built. Joints were made with the use of locks and bolts. In 1784 the first pig iron bridge were built in St. Petersburg (Nikolaevskii bridge, Figure 2.2). The dome of St. Isaac's Cathedral (Figure 2.3) is the unique structure of the 1840s. The dome is built from separate elements as a spatial structure. Dome construction consists of the top conic part supporting a stone dome-drum and the lower, more flat part. The external dome cover from an easy iron framework leans on a pig iron dome structure.

Figure 2.2. Nikolaevskii bridge

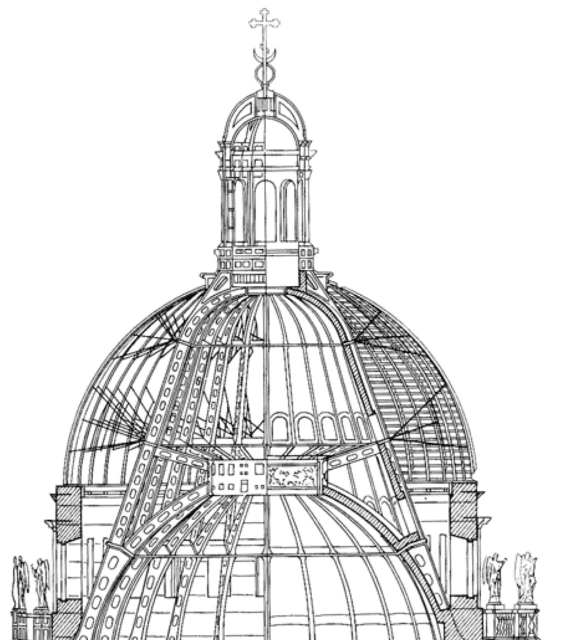


Figure 2.3. The St. Isaac's Cathedral dome structure

2.1.4. The fourth period (from the 30th of the XIX century to the 20th of the XX century)

It is connected with rapid technical progress in all areas of equipment of that time and in metallurgy and metal working. In the XIX century beginning bloomer process of getting iron was changed to the more improved new method – puddling, and in the late 1880s it was changed to steel smelting from the pig iron in Martins furnaces. Rivet connections were appeared in the 1830s (Figure 2.4). In the 1840s, the process of profiled metal rolled plate production was mastered. Steel has driven out the pig iron because steel has much better bearing capacity characteristics (especially in tension).

Figure 2.4. Rivet connections of the steel bridge constructions

2.1.5. The fifth period

In the late 1940s, rivet connections were almost completely changed to welding. Welding was lighter, more processability and cheaper. Metallurgical industry development made it possible to use the low-alloy high-tensile steel in constructions.

The steel economy in steel structures can be reached in case of following main realization rules:

- Usage of the low-alloyed and high-strength steel in structures;
- Usage of the most economic rolled and bent profiles (Figure 2.5);

- Researches and implementation in structures of modern effective constructive forms and systems (spatial, prestressed, etc.);
- Improvement of calculation and research methods to find the optimum constructive decisions with use of electronic computer facilities.

Figure 2.5. Different types of the rolled sections

2.2. Truss structures

Truss – is a system of rods, which will not lose its geometrical shape stability if all joints are pin-connected. Trusses, practically, has the same functionality as a beam but trusses are supposed to cover larger spans. In case of large spans designing of big beams (I-beam, for example) does not economically advantageous because of the I-beam web under exploitation (because stresses in web are less than stresses in flanges (Figure 2.6)) and because of web bulging possibility. Bulging of the web is possible because in big I-beams the web is high.

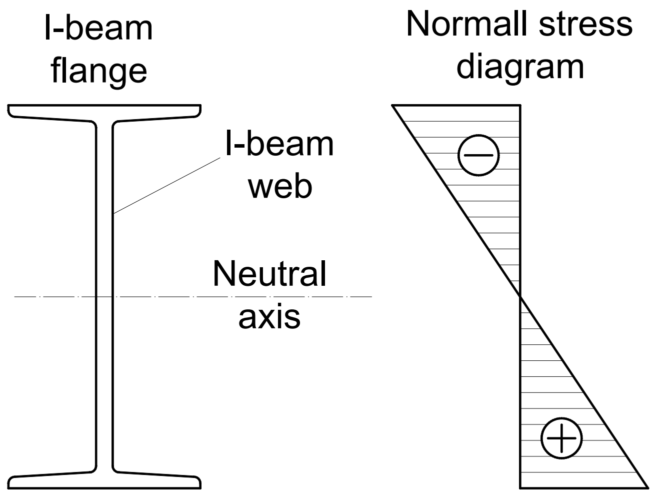


Figure 2.6. Normal-stress diagram in I-beam cross section

In these instances, beams are replaced by frame structures – trusses. Truss elements (rods) under joint loads works generally in central compression or central tension. It helps to use the truss material better, because normal-stress diagrams in rods cross sections has almost rectangular form. Because of that, trusses are much lighter than beams of the same span and bearing capacity. The spacing between truss seats – **span**; rods located on perimeter of the truss – **upper and bottom chords**; connection rods between chords – **verticals and diagonals**; the spacing between neighboring joints of any chord - **panel length** (Figure 2.7).

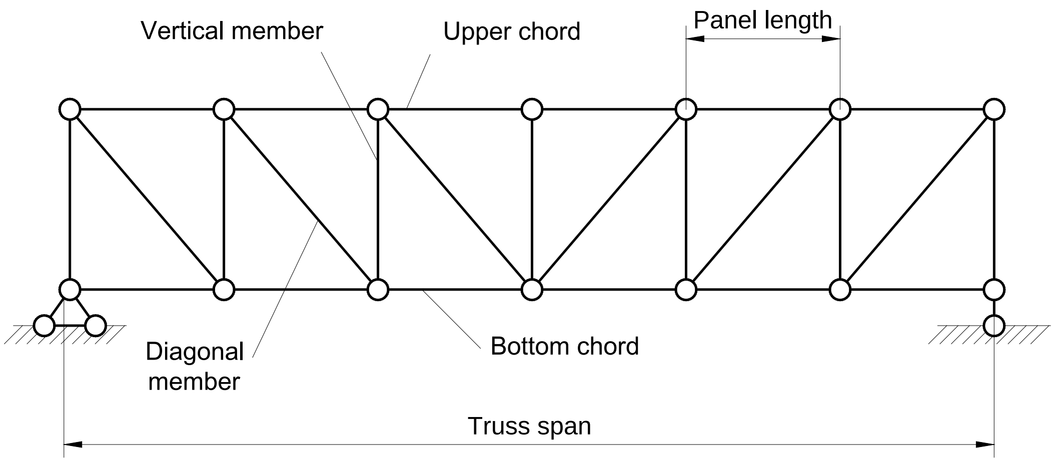


Figure 2.7. Truss and basic definitions

2.3. Truss classification

- Classification by truss configuration.

There are two basic types of truss configurations:

– With parallel chords (Figure 2.7);
– With polygonal chords outline (or polygonal trusses).

For example, polygonal trusses can be parabolic (Figure 2.8 a), triangle (Figure 2.8 b), etc.

a)
b)

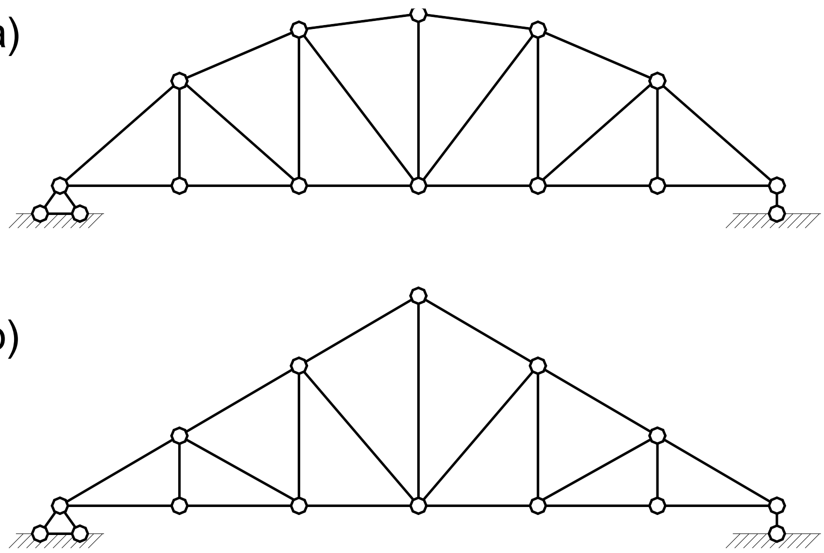


Figure 2.8. Polygonal trusses

– By the supports type

Support types are shown on figure 2.9.

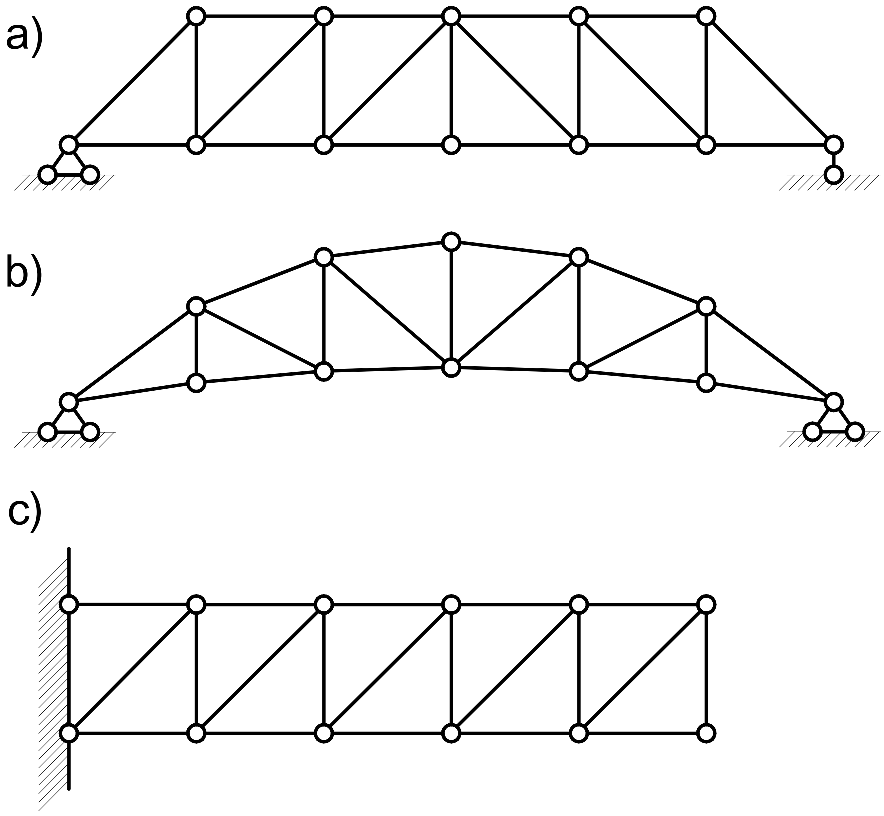


Figure 2.9. Support types (a – free-ended beam; b – supports with forbidden horizontal movements; c – console support)

- By truss intended use:
  - Pitched trusses (Figure 2.10 a)
  - Bridge trusses (Figure 2.10 b)
  - Crane trusses (Figure 2.10 c)
  - Etc.

a)

b)

c)

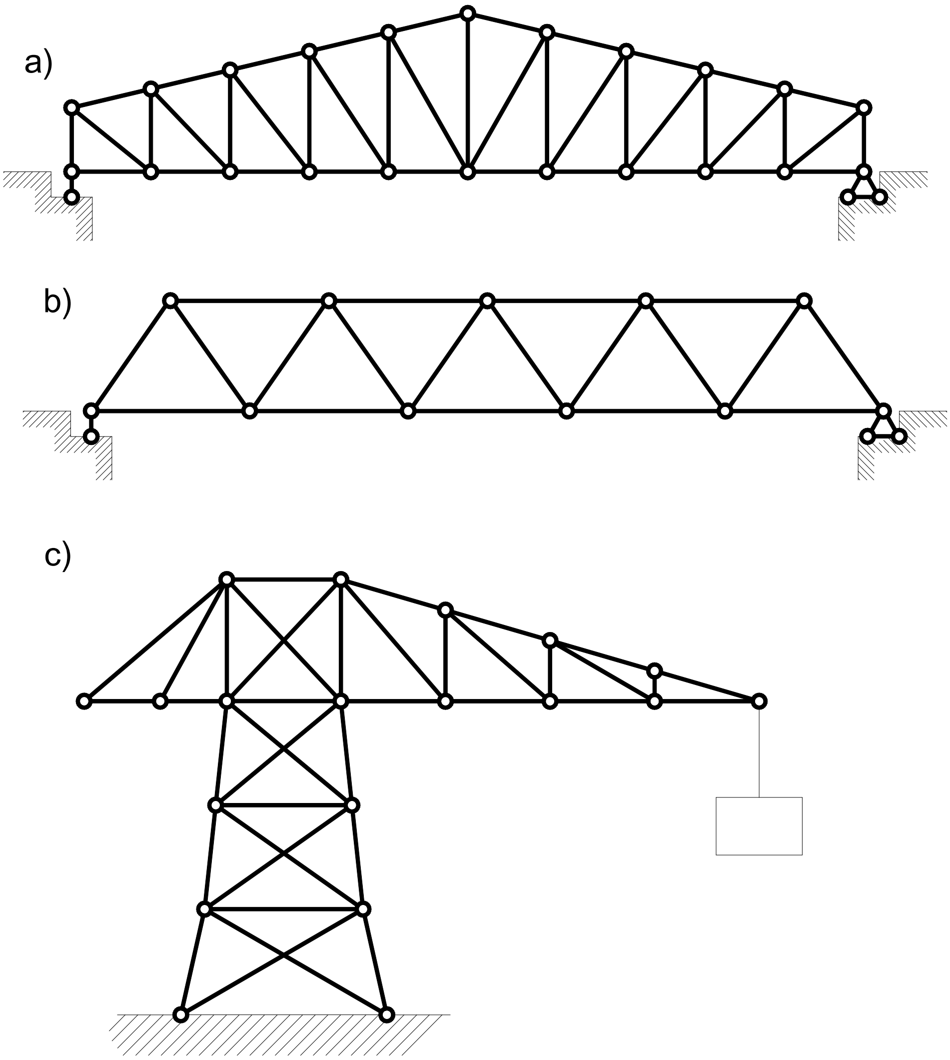


Figure 2.10. Truss types by destination

2.4. Truss configuration selection

In this thesis work, it was necessary to develop the roofing truss structure with 10% slope. Because of that, it was essential to make the upper chord with 10% slope. On the ground of these requirements, there was the choice between triangle truss configuration and polygonal truss configuration.

- Triangle truss (Figure 2.11)
- Polygonal truss (Figure 2.12)

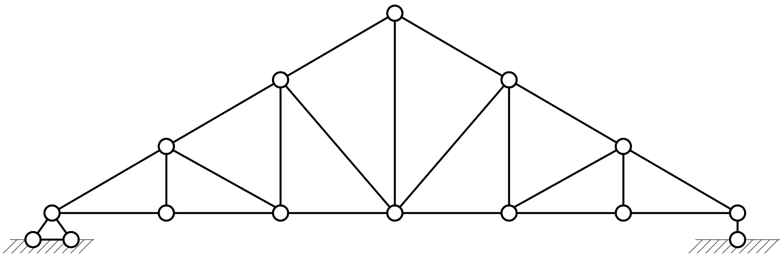


Figure 2.11. Triangle truss configuration

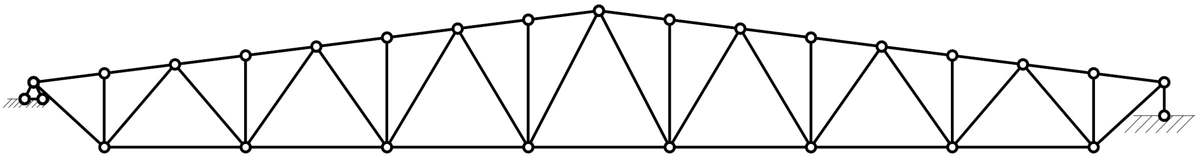


Figure 2.12. Polygonal truss configuration

The comparative analysis of those two truss types was executed to calculate the bearing capacity. Two analytical schemes were modeled in SCAD Office program complex. Schemes had the same upper chords slope (because of the initial data of this project).

The calculation results are shown on Figures 2.13-2.14.

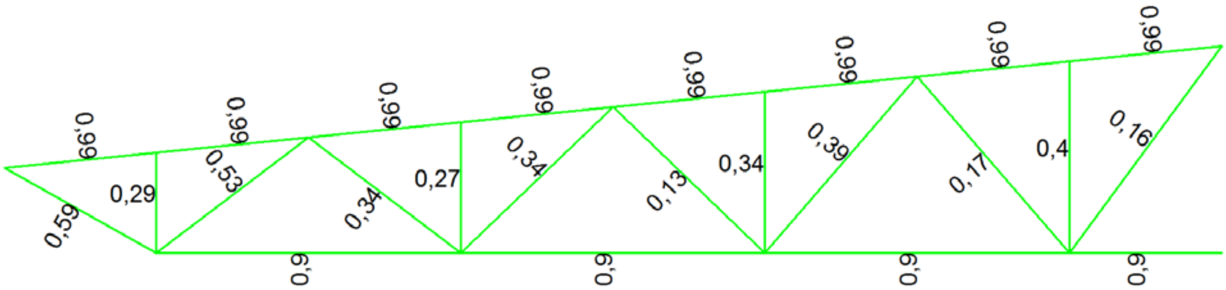


Figure 2.13. Elements efficiency in 24 meters span polygonal truss elements with $2.3\ tnf/m$ loading

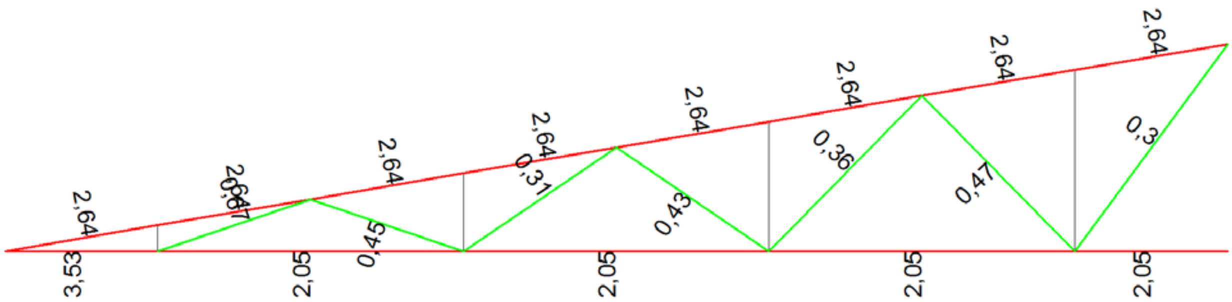


Figure 2.14. Elements efficiency in 24 meters span triangle truss elements with $2.3\ tnf/m$ loading

In virtue of calculation results, it was decided to choose polygonal truss configuration because of better bearing capacity on an equal truss height and upper chord slope.

2.5. Structural behaviour analysis

To examine a structure behavior it was decided to choose some parameters to change in some range and after that analyze the bearing capacity variation.

Changing parameters:

- **Truss height**

Five trusses of the same configuration and slope, but different highness were calculated in SCAD Office program complex. The step of high changing were accepted equal 0.5 meters. The bearing capacity of each truss were calculated and the results are shown in table 2.1 and on the chart 2.1.

Table 2.1. Maximum load – truss height relation

Truss height	Maximum load
[m]	[tnf/m]
2	1,5
2,5	2,3
3	2,96
3,5	3,63
4	4,15

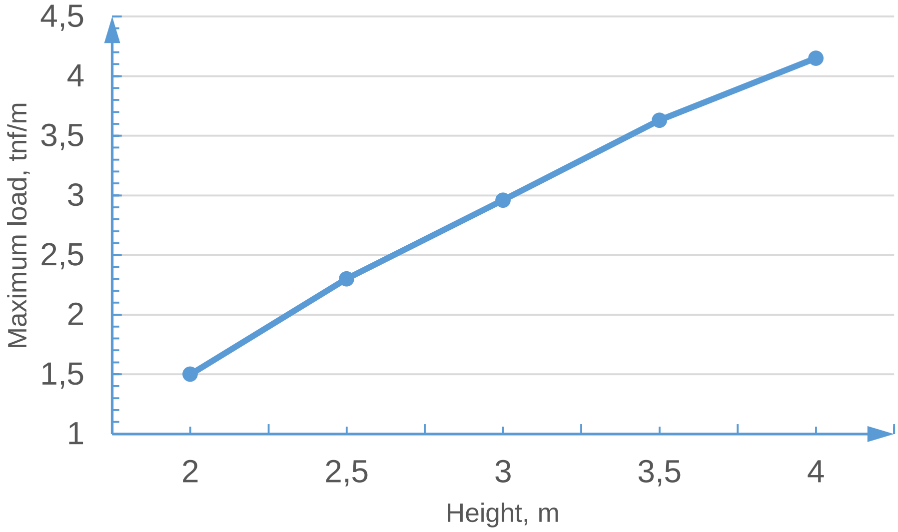


Chart 2.1. Maximum load – truss height relation

From these table and chart, it is obvious that bearing capacity is growing up when the truss become higher.

- **Upper chord slope**

At this stage of truss analyzing different variants of upper chord slope were examined (only to determine the truss behavior).

The calculation results are shown in table 2.2 and on the chart 2.2.

Table 2.2. Maximum load – slope relation

Slope [%]	Maximum load [tnf/m]
0	1,1
5	1,7
10	2,3
15	2,8
20	3,3

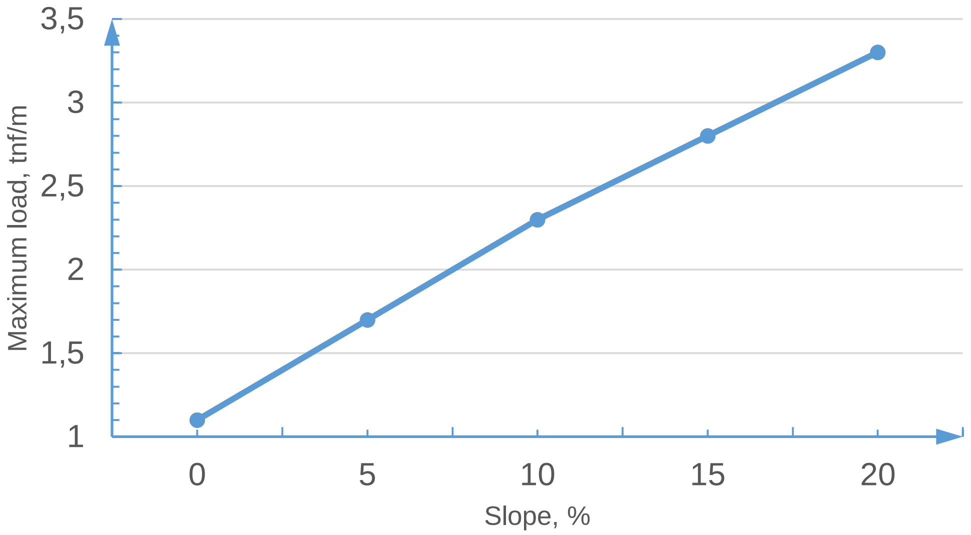


Chart 2.2. Maximum load – slope relation

- **Steel strength of main bearing elements (upper and bottom chords and main diagonals)**

In order to analyze the dependence of the truss bearing capacity from the steel strength, there were several analytical schemes modeled in SCAD Office program complex with different steel strength. The calculation results are shown in the table 2.3 and on the chart 2.3.

Table 2.3. Maximum load – steel strength relation

Steel	Maximum load
Mpa	[tnf/m]
245	1,5
275	1,9
345	2,3
440	2,9
590	3,5

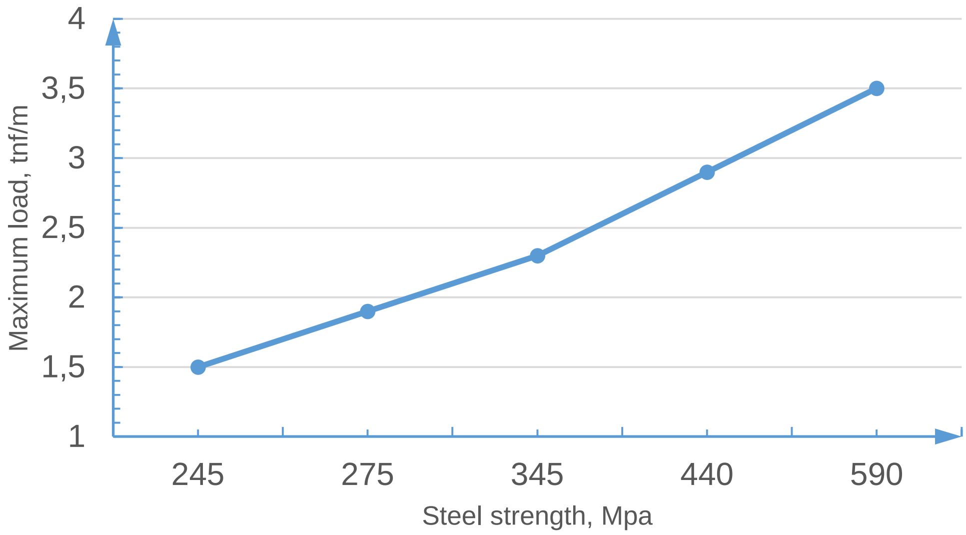


Chart 2.3. Maximum load – steel strength relation

- **Truss adjusted weight**

In order to determine the dependence of the truss bearing capacity from the adjusted weight, there were several analytical schemes modeled in SCAD Office program complex with different thickness of the chords and main diagonals sections thickness.

For calculated trusses, the adjusted weight and the maximum (critical) load were determined. Results are shown in the table 2.4 and on the chart 2.4.

Table 2.4. Maximum load - adjusted truss weight relation

Span	Maximum load per unit length	Adjusted weight	Total truss weight
[m]	[t/m]	[kg/m^2]	[kg]
24	2,3	10,42	1501
	2,4	11,07	1594
	2,7	11,93	1718
	2,9	12,51	1801
	3,3	13,61	1960

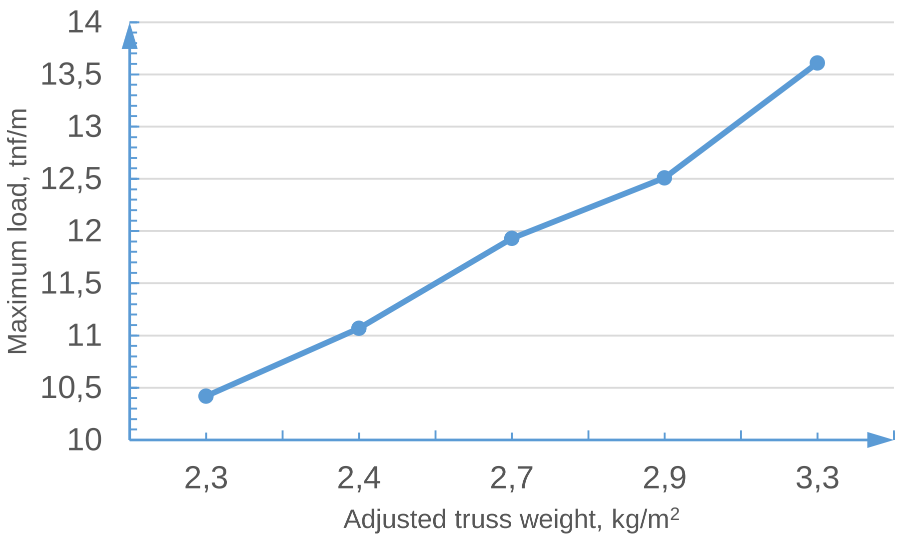


Chart 2.4. Metal consumption on loading dependence for 24 meters span truss

- **With verticals or without it**

It was important to choose the truss configuration – with or without verticals. Two analytical schemes were modeled in SCAD. In case with verticals, the effective length of the upper chord is 1.5 meters (because the purlins step is 1.5 meters too). In case without verticals this step is equal 3 meters, and there can happen loss of stability because of buckling.

The calculation results (elements efficiency) under the same loading are shown at figures 2.15-2.16. After that, the maximum (critical) load was calculated for both variants (table 2.5).

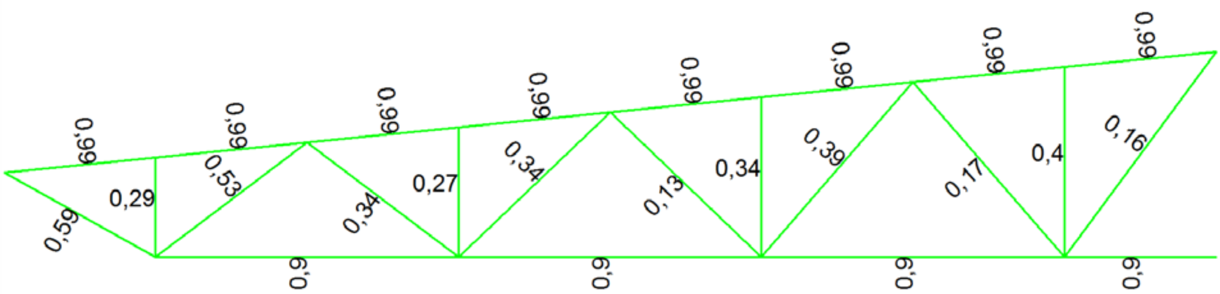


Figure 2.15 Elements efficiency in 24 meters span truss elements with 2.3 tnf/m loading (with verticals)

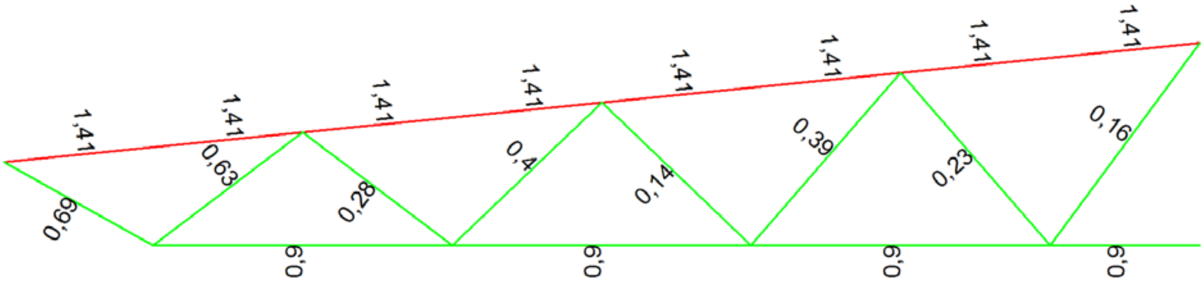


Figure 2.16. Elements efficiency in 24 meters span truss elements with $2.3 \ tnf/m$ loading (without verticals)

Table 2.5. Maximum load – truss configuration relation

Truss type	Maximum load [tnf/m]
With verticals	2,3
Without verticals	1,9

Analysis results of the behavior of this truss configuration:

- Increasing truss height will increase the structure bearing capacity;
- Increasing upper chord slope will increase the structure bearing capacity;
- Increasing steel strength will increase the structure bearing capacity;
- Increasing main elements section thickness will increase the structure bearing capacity;
- Truss bearing capacity is higher with verticals.

3. Truss calculation in SCAD Office program complex

3.1. Analytical truss scheme

All calculations were performed for two-dimensional analytical model in SCAD Office. Because of limited page width, in this thesis work the figures represent truss halves to make figures easy to read. It is valid because trusses and loads are symmetrical.

The joints between truss members and chords in RHS profiles trusses are welded, the Russian building code SP 16.13330.2011 “Steel structures” [1] allows constructors to calculate two dimensional truss joints like a pin-connected joints in several cases:

- If elements cross-section is L-, or T-profile;
- H-, or pipe-profile, when $h/l \leq 1/10$.

These conditions are performed but it was decided at the meeting with my tutor and chief to calculate joints as a rigid connections to increase the bearing capacity due to bending moment accounting and to make the analytical scheme closer to the real construction.

Also, it was decided to use vertical members in this standardized truss series to decrease the upper chord effective length and to decrease the purlins spacing. The shorter the effective length the more stable the element.

Analytical half schemes of 24-, 30- and 36-meter trusses are presented respectively on figures 3.1, 3.2 and 3.3.

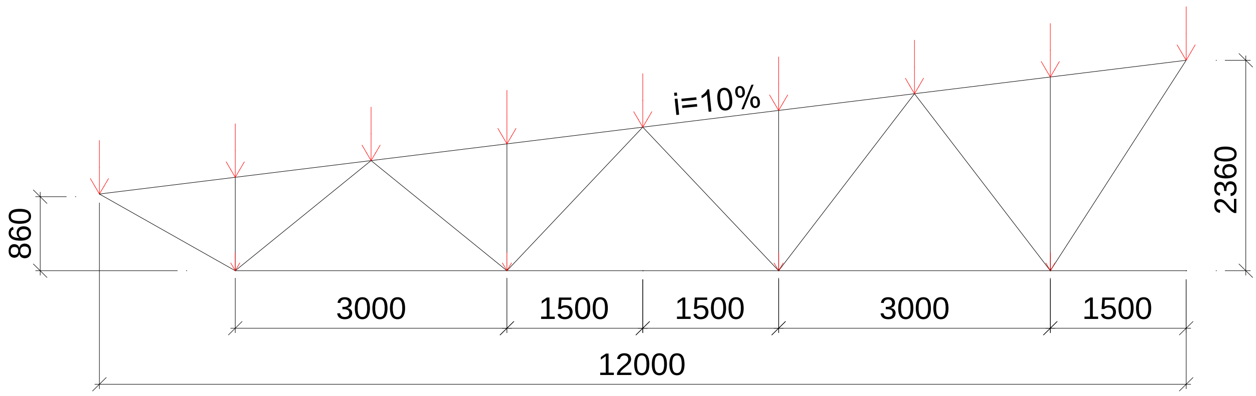


Figure 3.1. A half of the 24-meters truss analytical scheme

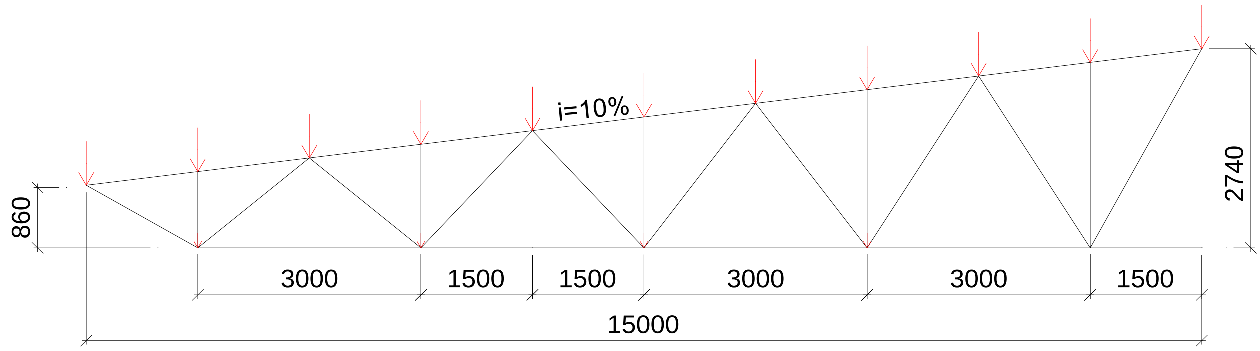


Figure 3.2. A half of the 30-meters truss analytical scheme

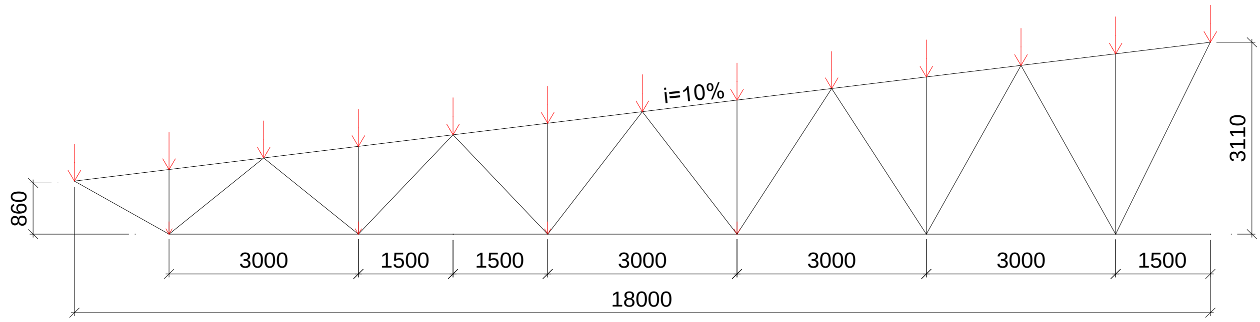


Figure 3.3. A half of the 36-meters truss analytical scheme

Firstly, a series of standardized trusses was designed with loads applied distributed to the upper chord. In this case bending moment in elements increased consequently the required metal consumption increased too. Subsequently, the company's chief did not approve this analytical scheme and it was decided to arrange the covering over purlins. Thus, it was decided to make the load concentrated in the nodes of the truss, the load transmitted from the purlins.

The truss spacing is 6 meters, structures out-of-plane spacing is 1.5 meters - for upper chord and 3 meters – for the bottom chord.

Bottom chord connections between truss halves was accepted slip-critical high-strength bolts joint (friction connection). Upper chord connection was accepted a flange connection with bolts.

Loads were calculated in accordance with SP 20.13330.2011 "loads and effects", design loads values are presented in table 3.1.

Table 3.1 Load values

Loads	Technological load	Constant load	Snow load				
			Snow area				
			II	III	IV	V	VI
Design load, Q, t/m^2	0.03	0.07	0.12	0.18	0.24	0.32	0.40

The transition from a distributed to a joint load occurs by following formulas:

$$q = Q \cdot L, \quad (3.1)$$

where q – line-distributed load; L – truss spacing.

$$F = q \cdot x, \quad (3.2)$$

where F – joint load; x – purlins spacing.

Joint load calculation example in IV snow area:

$$F = 0.03 \cdot 6 \cdot 1.5 + 0.07 \cdot 6 \cdot 1.5 + 0.24 \cdot 6 \cdot 1.5 = 0.27 + 0.63 + 2.16 = 3.06\ tnf$$

In IV snow area the summary joint load equal 3.06 ton-force.

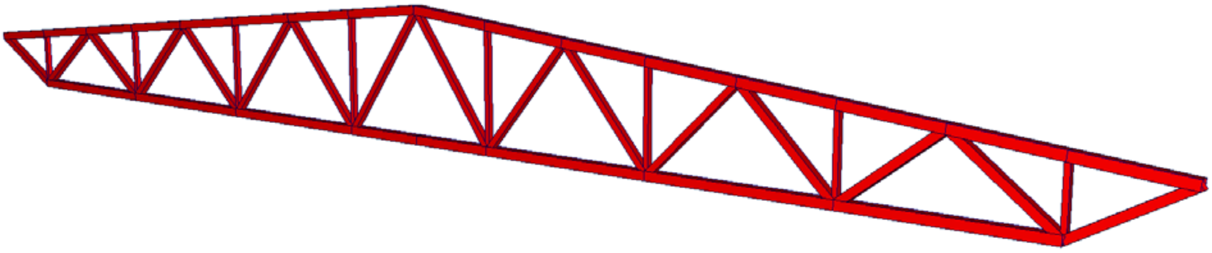


Figure 3.4. 3d view of the 24-meters truss analytical scheme in SCAD Office

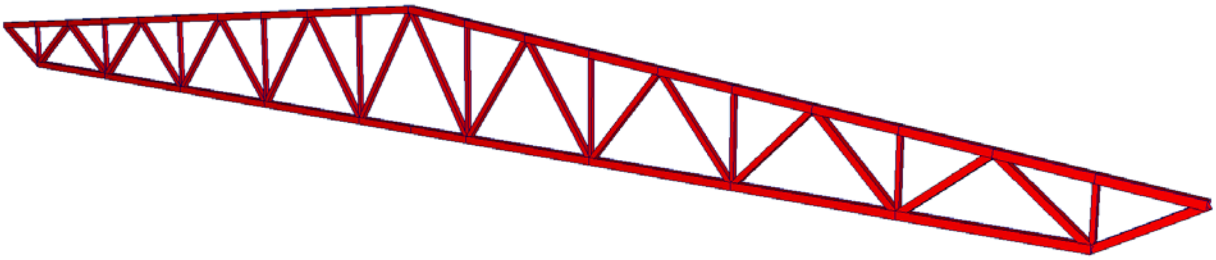


Figure 3.5. 3d view of the 30-meters truss analytical scheme in SCAD Office

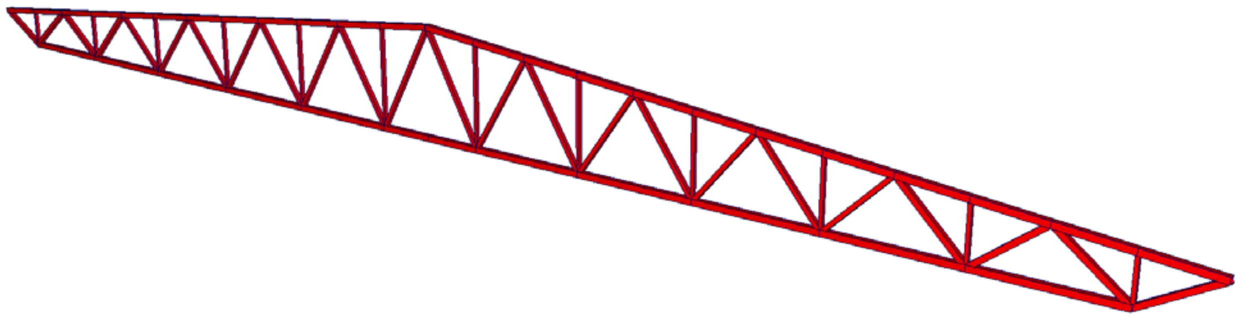


Figure 3.6. 3d view of the 36-meters truss analytical scheme in SCAD Office

The first stage was 36-meter truss calculation in IV snow area. According to the strength and stability analysis 140x140x8 (mm) cross-section square profile was selected for both chords. Where 140 mm - square side size and 8 mm – pipe wall thickness.

The second stage was 24-meter truss calculation with 140 mm square side size but with the lowest possible pipe wall thickness in accordance with the product assortment (5 mm).

After all performed calculation truss chords and members were decided to be made from RHS square pipes with the following sizes:

a) The upper and the bottom chords – 140x140 (mm), thickness from 5 to 8 (mm);
b) The diagonal members – 120x120x4 (mm) – for main diagonals and 100x100x4 (mm) – for other diagonals;
c) The vertical members – 80x80x4 (mm).

Also in this thesis different steel was used for different truss elements:

a) Chords and main diagonal members was performed from S345 steel;
b) Other diagonal members and vertical members were performed from S245 steel.

3.2. Calculation results from SCAD Office

3.2.1. Axial stresses and bearing capacity analysis

All trusses elements were checked in SCAD Office post processor “Steel elements bearing capacity and stability examination”.

Elements flexibility was accepted equal 400 – for element in tension, and 150 – for element in compression.

On next figures (Figures 3.7 – 3.32) axial stresses in truss elements under the summary loads and the elements efficiency coefficients are presented.

- **24-meter trusses:**

– **Design linear load 2.3 tnf/m**

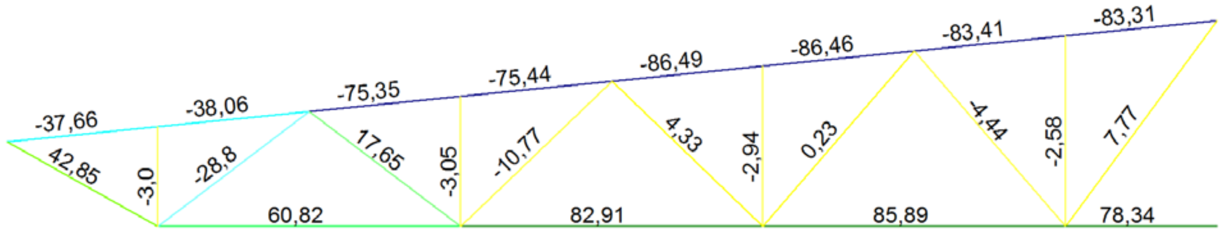


Fig. 3.7. Axial stresses in 24 meters span truss elements with 2.3 tnf/m loading

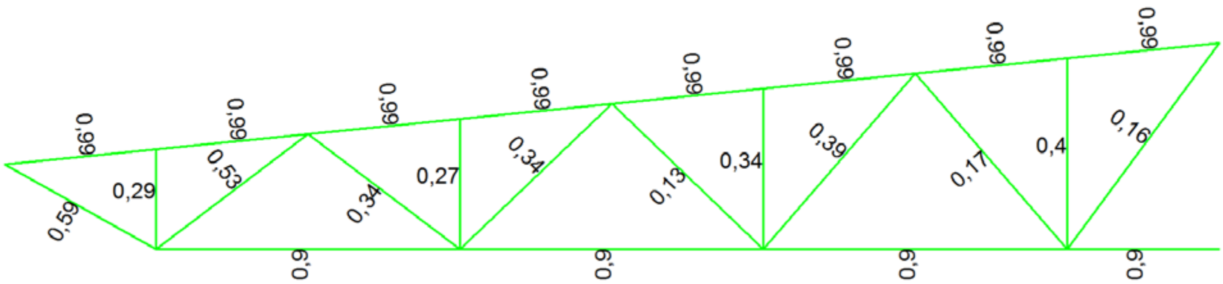


Fig. 3.8. Elements efficiency in 24 meters span truss elements with 2.3 tnf/m loading

– **Design linear load 2.4 tnf/m**

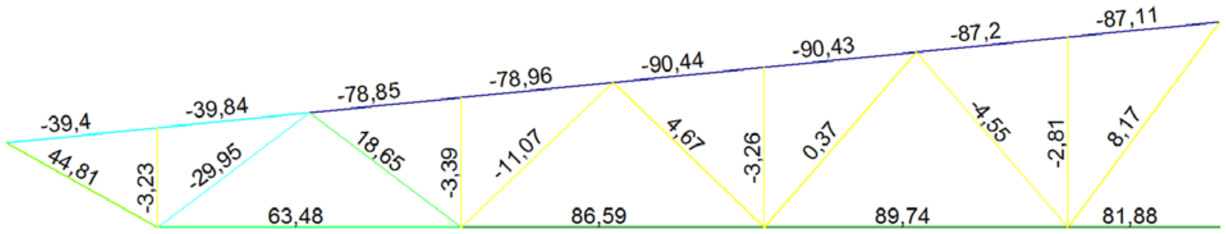


Fig. 3.9. Axial stresses in 24 meters span truss elements with $2.4\ tnf/m$ loading

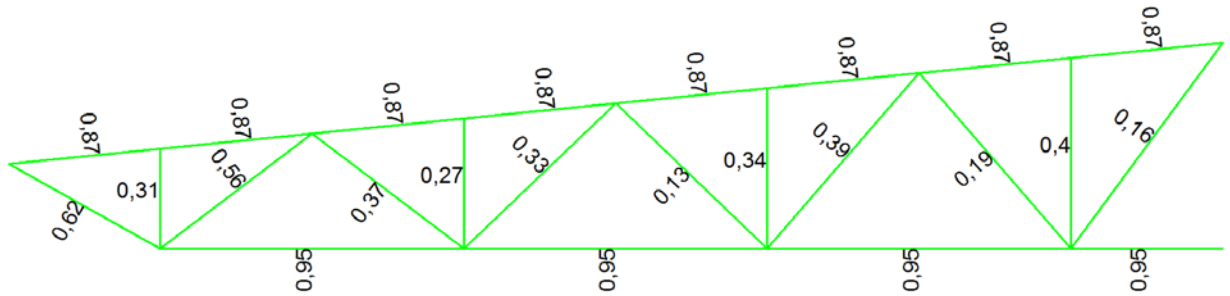


Fig. 3.10. Elements efficiency in 24 meters span truss elements with $2.4\ tnf/m$ loading

– **Design linear load 2.7 tnf/m**

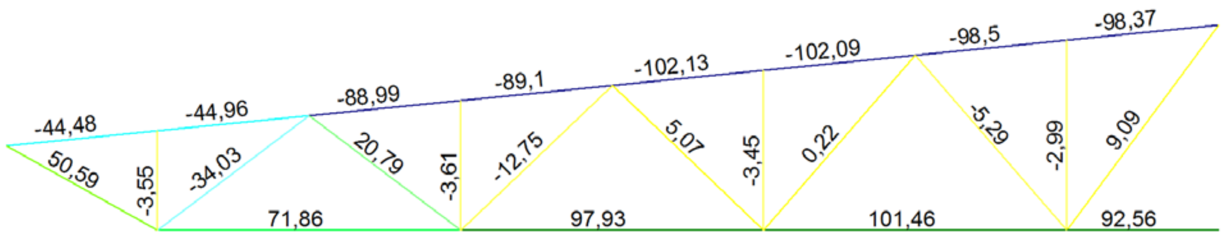


Fig. 3.11. Axial stresses in 24 meters span truss elements with $2.7\ tnf/m$ loading

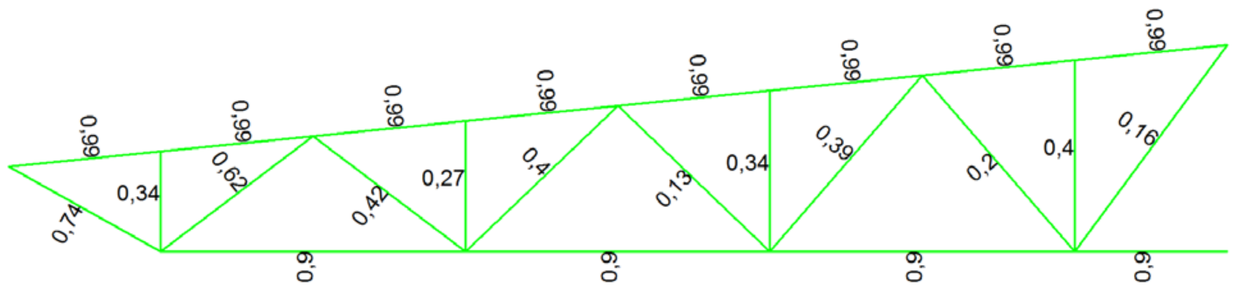


Fig. 3.12. Elements efficiency in 24 meters span truss elements with $2.7\ tnf/m$ loading

– **Design linear load 2.9 tnf/m**

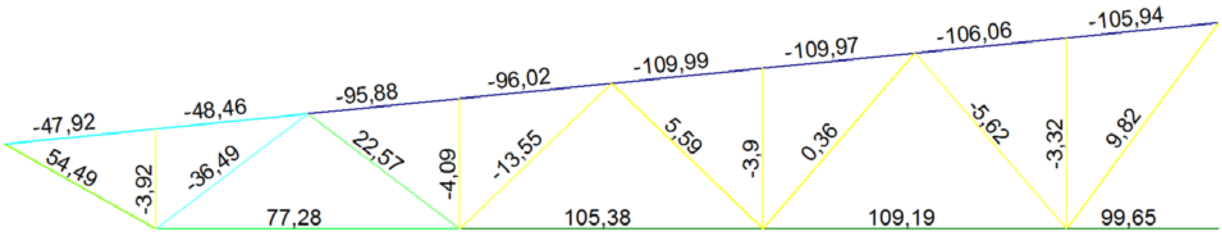


Fig. 3.13. Axial stresses in 24 meters span truss elements with $2.9\ tnf/m$ loading

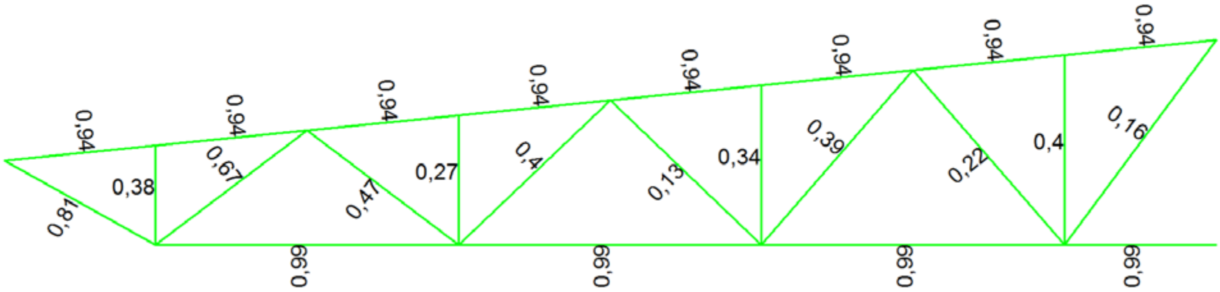


Fig. 3.14. Elements efficiency in 24 meters span truss elements with $2.9\ tnf/m$ loading

– **Design linear load 3.3 tnf/m**

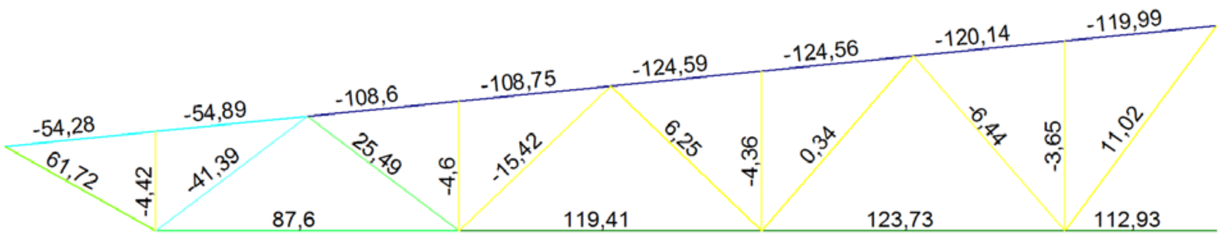


Fig. 3.15. Axial stresses in 24 meters span truss elements with $3.3\ tnf/m$ loading

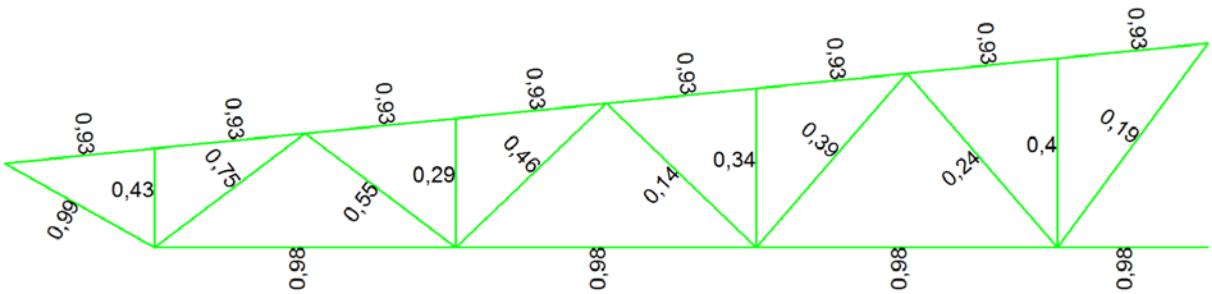


Fig. 3.16. Elements efficiency in 24 meters span truss elements with $3.3\ tnf/m$ loading

- **30-meter trusses:**

– **Design linear load 1.5 tnf/m**

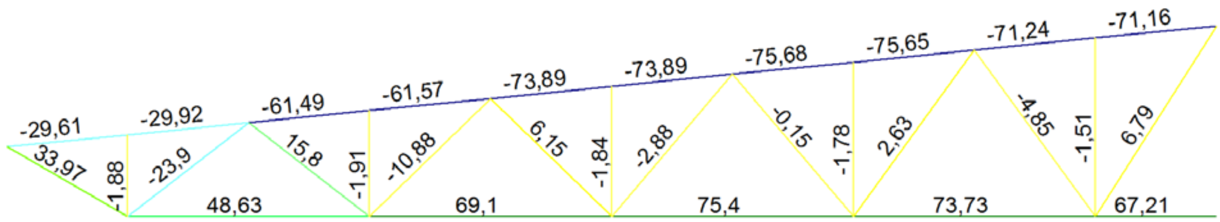


Fig. 3.17. Axial stresses in 30 meters span truss elements with1.5 tnf/m loading

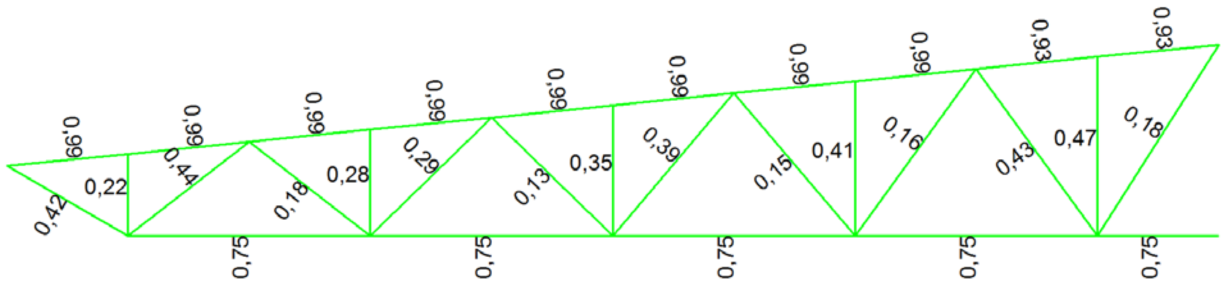


Fig. 3.18. Elements efficiency in 30 meters span truss elements with 1.5 tnf/m loading

– **Design linear load 1.7** $\boldsymbol{tnf/m}$

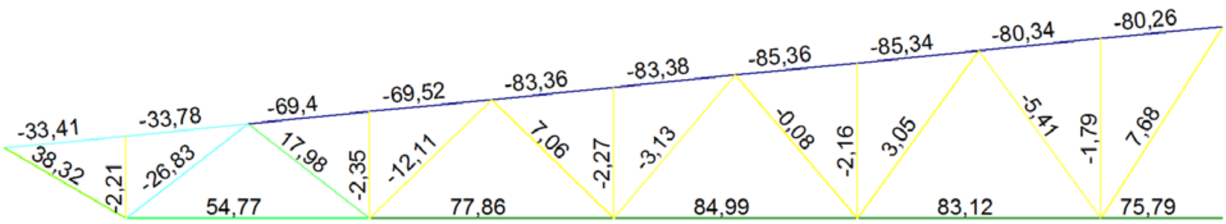


Fig. 3.19. Axial stresses in 30 meters span truss elements with 1.7 tnf/m loading

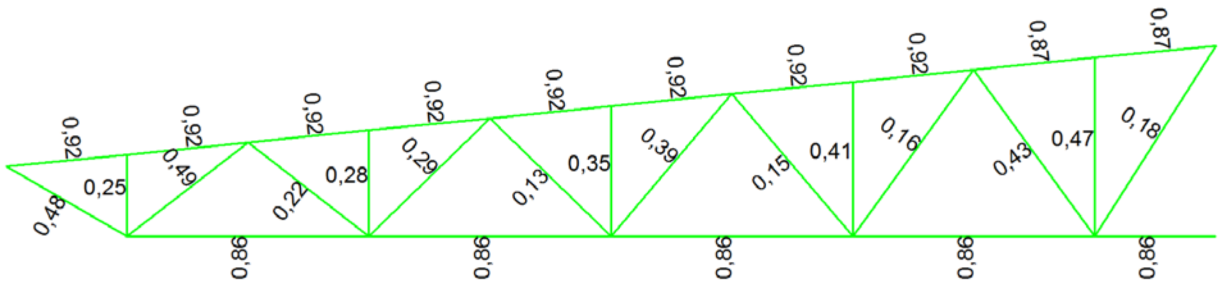


Fig. 3.20. Elements efficiency in 30 meters span truss elements with 1.7 tnf/m loading

– **Design linear load 2.1** $\boldsymbol{tnf/m}$

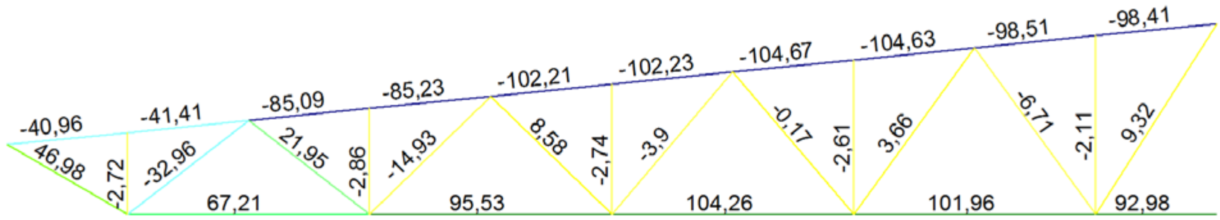


Fig. 3.21. Axial stresses in 30 meters span truss elements with 2.1 tnf/m loading

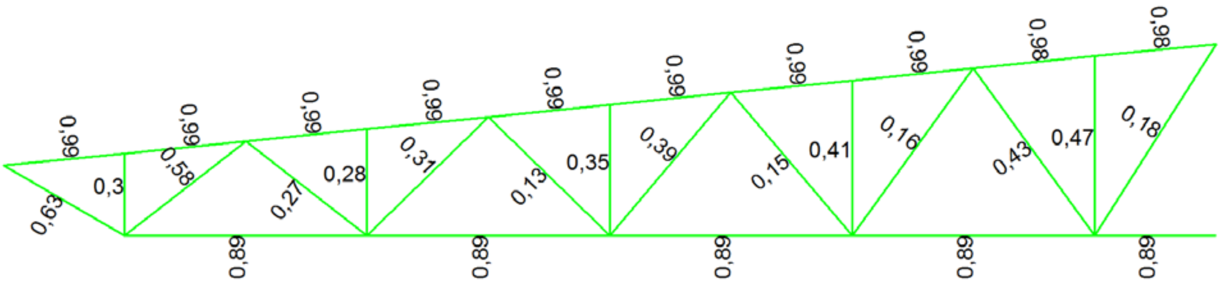


Fig. 3.22. Elements efficiency in 30 meters span truss elements with $2.1\ tnf/m$ loading

– **Design linear load 2.3 tnf/m**

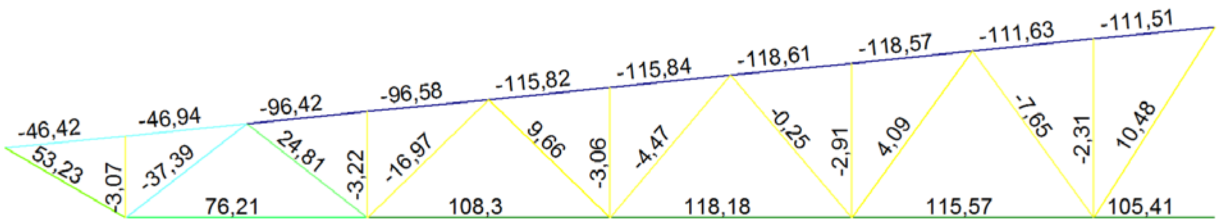


Fig. 3.23. Axial stresses in 30 meters span truss elements with $2.3\ tnf/m$ loading

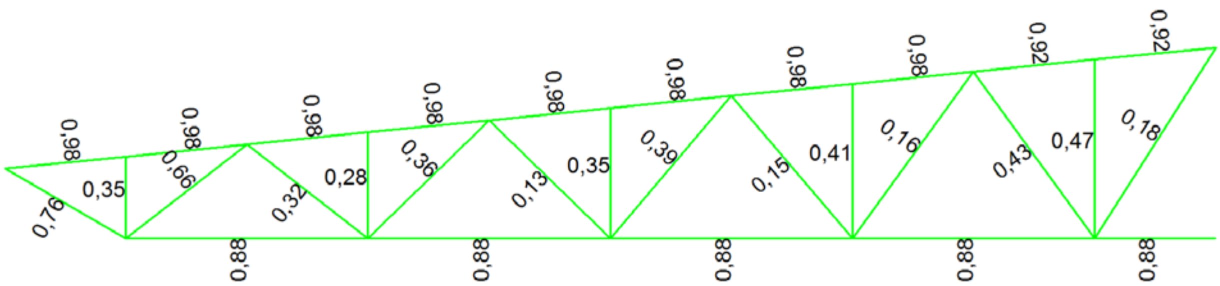


Fig. 3.24. Elements efficiency in 30 meters span truss elements with $2.3\ tnf/m$ loading

- **36-meter trusses:**

– **Design linear load 1.3 tnf/m**

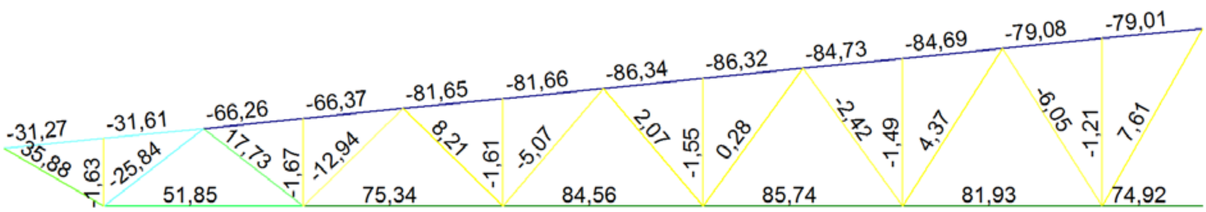


Fig. 3.25. Axial stresses in 36 meters span truss elements with $1.3\ tnf/m$ loading

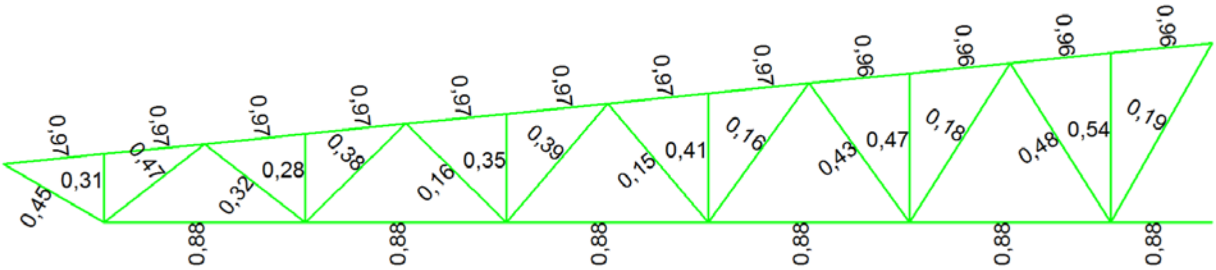


Fig. 3.26. Elements efficiency in 36 meters span truss elements with 1.3 tnf/m loading

– **Design linear load 1.7 tnf/m**

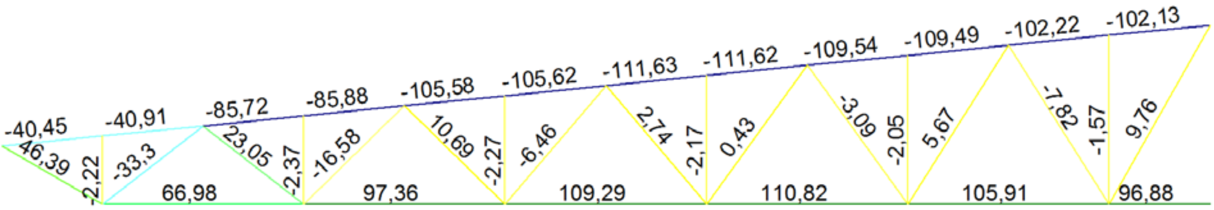


Fig. 3.27. Axial stresses in 36 meters span truss elements with 1.7 tnf/m loading

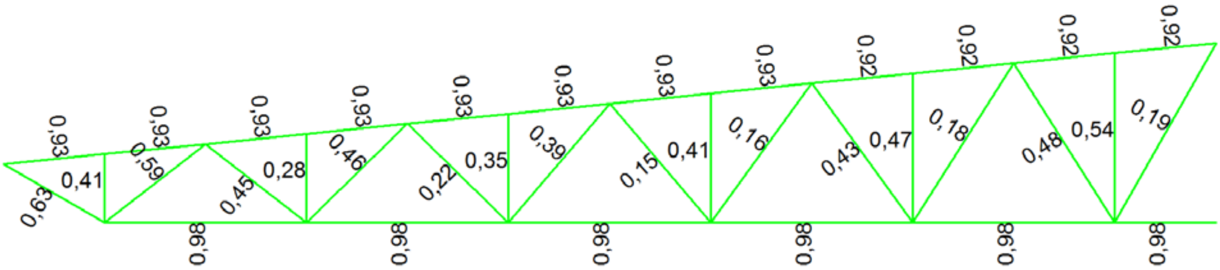


Fig. 3.28. Elements efficiency in 36 meters span truss elements with 1.7 tnf/m loading

– **Design linear load 1.9 tnf/m**

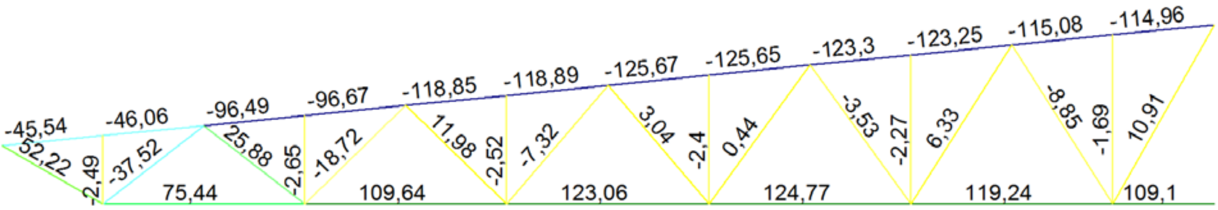


Fig. 3.29. Axial stresses in 36 meters span truss elements with 1.9 tnf/m loading

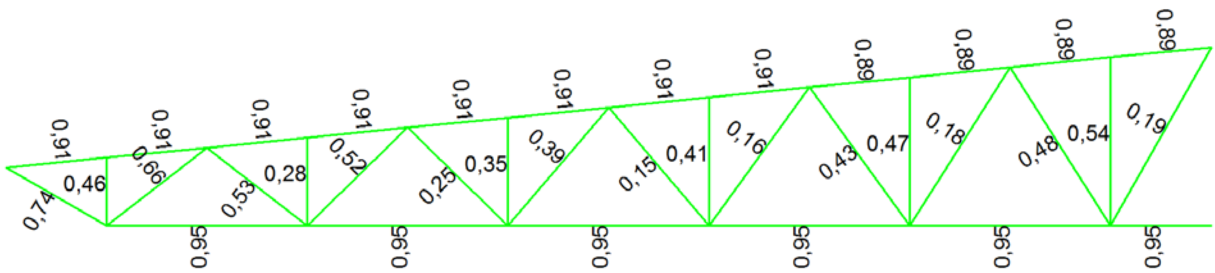


Fig. 3.30. Elements efficiency in 36 meters span truss elements with 1.9 tnf/m loading

– **Design linear load 2.1 tnf/m**

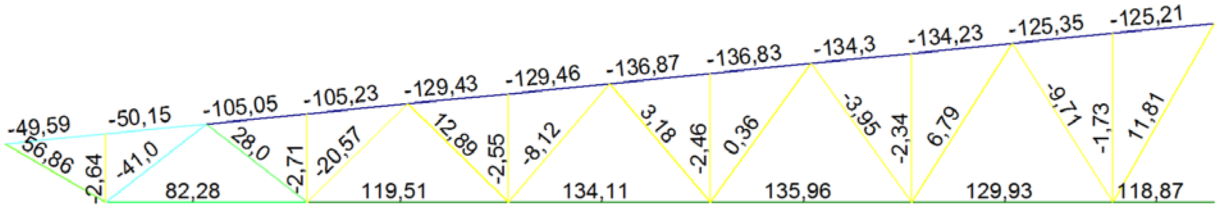


Fig. 3.31. Axial stresses in 36 meters span truss elements with $2.1\ tnf/m$ loading

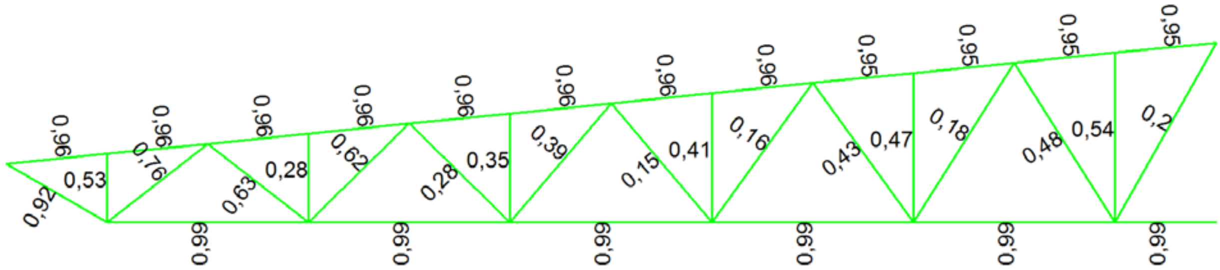


Fig. 3.32. Elements efficiency in 36 meters span truss elements with $2.1\ tnf/m$ loading

3.2.2. Deformations analysis

Calculated deformations were checked and compared with the allowable for the most loaded trusses. According to SP 20.13330.2011, the allowable vertical deflection is $l/250$, where l – truss span.

According to SP 20.13330.2011, vertical deflection should be calculated from the effect of constant loads and long-acting loads.

On the Figure 3.33 24 - meter truss half is presented. The biggest vertical deflection is 69.81 mm. The allowable vertical deflection in accordance to aesthetics-psychological requirements is $24000/250 = 96\ mm$.

Deflections in 30- and 36 – meter trusses are presented respectively on figures 3.34 and 3.35.

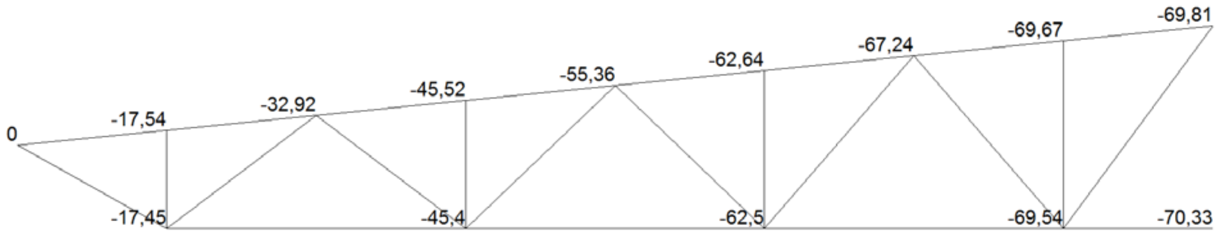


Fig. 3.33. Vertical deflections in the most loaded 24-meter truss

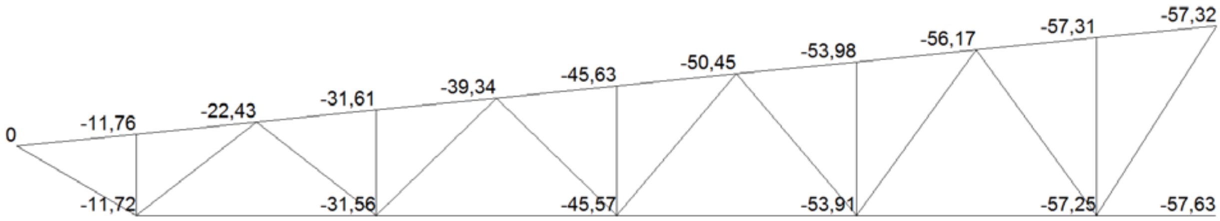


Fig. 3.34. Vertical deflections in the most loaded 30-meter truss

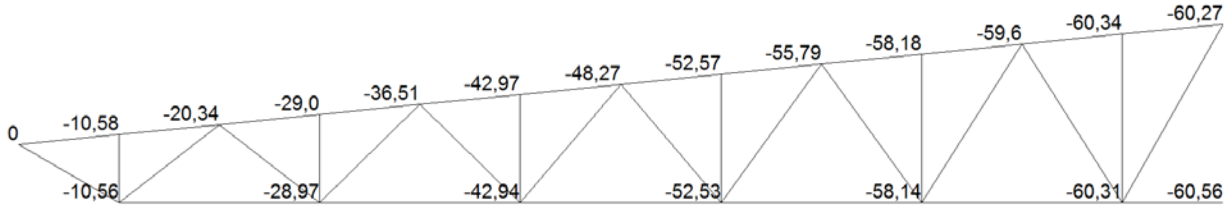


Fig. 3.35. Vertical deflections in the most loaded 36-meter truss

Vertical deflections of all calculated trusses satisfy the requirements.

After all calculations, 13 standard trusses were included to the series. All trusses are combinations of 14 standard truss sections. Chords cross-sections of accepted trusses are presented in Tables 3.2 and 3.3

Table 3.2 Chords cross-sections of 24- and 30-meter trusses

Truss ID	T24/1	T24/2	T24/3	T24/4	T24/5	T30/1	T30/2	T30/3	T30/4
UC section	140x5	140x6	140x6	140x7	140x8	140x5	140x6	140x7	140x8
BC section	140x5	140x5	140x6	140x6	140x7	140x5	140x5	140x6	140x7

Table 3.3 Chords cross-sections of 36-meter truss

Truss ID	T36/1	T36/2	T36/3	T36/4
UC section	140x5	140x7	140x8	140x8
BC section	140x5	140x6	140x7	140x8

4. BIM creation using Tekla Structures software

All trusses included in this standardized series were modeled in BIM software Tekla Structures. Tekla has a certificate of «building SMART» organization.

BIM - the process of creating and managing information about the construction project at all stages of the life cycle.

Tekla Structures is the software of information modeling of buildings (BIM) which allows creating and operating 3D models of buildings and constructions of any complexity from any material. The Tekla Structures models can be used at all stages of construction from sketches to production, installation and management of construction works.

Work basis in this program is BIM modeling: instead of drawing two-dimensional plans, facades and sections, the detailed three-dimensional model of the building with a portrayal of all joints, connections which combines both physical model, and analytical is created. Then it can be used for various types of the analysis, for example, receiving full project documentation. Thus, scope of the Tekla Structures program is full structural process of construction of objects from conceptual design to building process.

Tekla Structures has the special interface for creating drawings, which is directly connected with the model. Tekla Structures allows creating drawings with not only plans and sections, but also any detailing that is very useful during the work with metal constructions. Drawings are created in the separate folder, but remain connected with the model so that modification of model updates drawings. However, the changes made in drawings, do not lead to model updating.

3d BIM models of calculated trusses are presented on figures 4.1, 4.2 and 4.3.

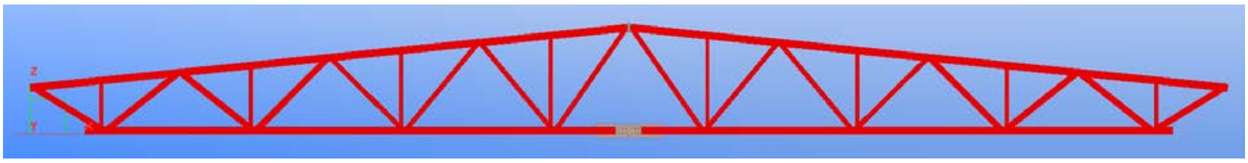


Figure 4.1. Informational model of 24-meter truss in Tekla Structures

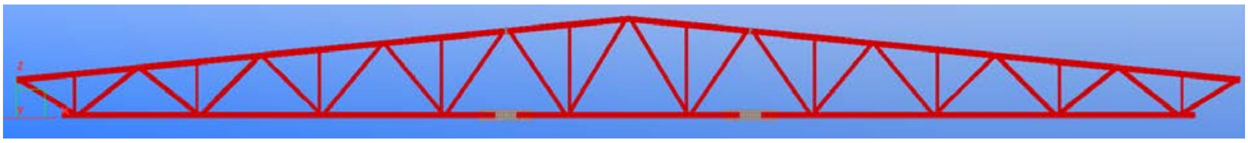


Figure 4.2. Informational model of 30-meter truss in Tekla Structures

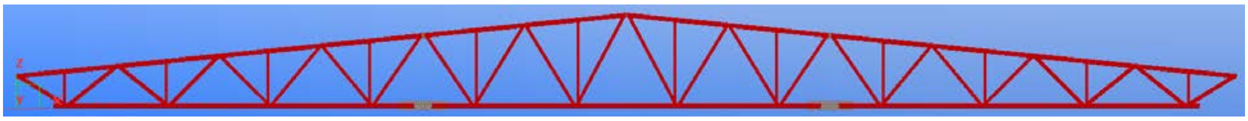


Figure 4.3. Informational model of 36-meter truss in Tekla Structures

Bottom chord slip-critical high-strength bolts joint is presented on the Figure 4.4.

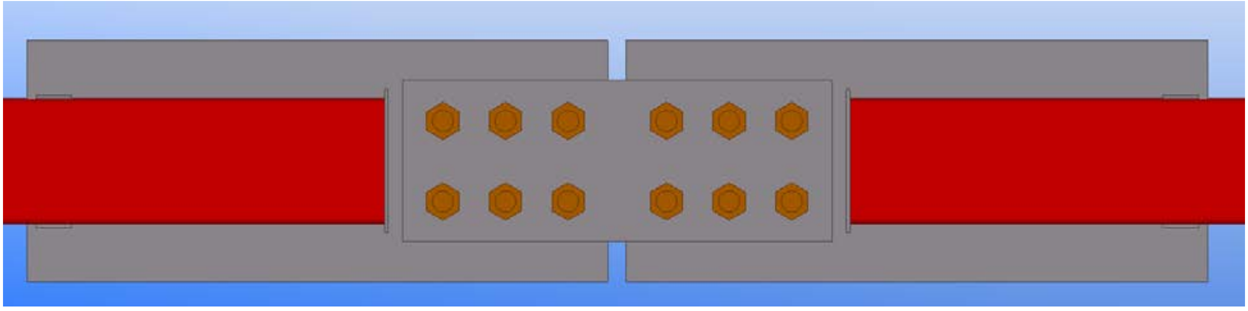


Figure 4.4.Bottom chord connection

Upper chord flange connection with bolts is presented on the Figure 4.5.

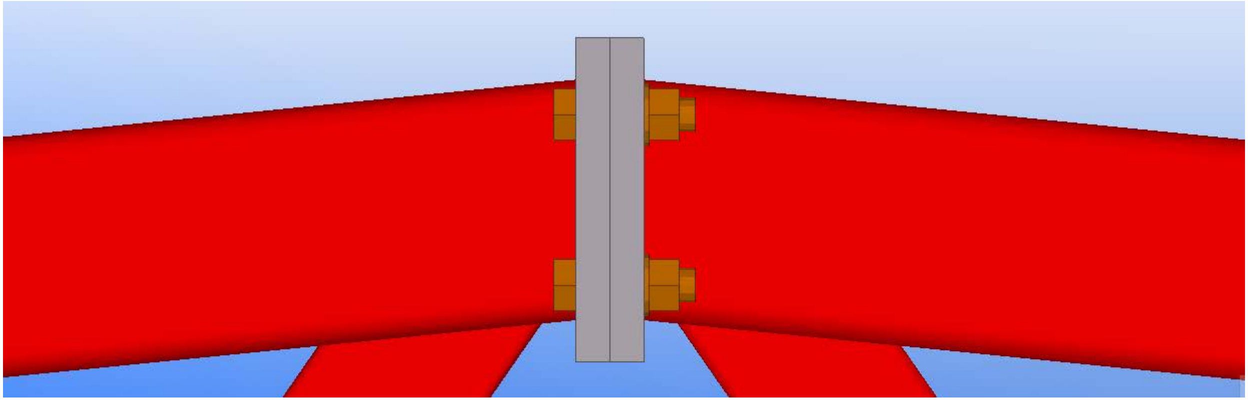


Figure 4.5.Upper chord connection

After detailed BIM model creation, it is necessary to numerate all the elements and whole constructions. The identical elements have the same IDs. If there are some any difference in holes, for example, so elements must have different IDs but it depends on numeration settings. Such element can have the same IDs in Tekla in case of special settings.

After the numeration it is possible to obtain all the drawings automatically, without any drawing by hand. In Tekla there are Russian environment which contains all GOST drawing configurations and settings. From those drawings, metal consumption of every standard section was obtained.

4.1. Elements and constructions numeration in Tekla Structures.

- **Trusses numeration**

T	18/	1
Identification of the truss, belonging to the truss series	Truss span	Index, dependent on sections combination

- **Constructions numeration**

E	10	12/	1
Identification of the section, belonging to the truss series	Roofing slope (10%)	Section length	Index, dependent on UC and BC webs thickness

- **Details numeration**

E	1	4	1
Identification of the element, belonging to the truss series	Element type index: 1 – UC; 2 – BC; 3 – D; 4 – Gusset or pipe closer; 5 – Flange.	Section type index: 4 – 12 meters section; 5 – 6 meters section; 6 – 12 meters middle section	Chords cross-section index: 1 – 140X5.0; 2 – 140X6.0; 3 – 140X7.0; 4 –140X8.0.

Construction drawings are presented in Appendix D

5. Elements bearing capacity analysis

To increase a calculations accuracy and to make calculations faster and easier in case of different truss sizes it was decided to make all calculations template (program) using Microsoft Office Excel software. This program was made to automate the process of calculation.

Automation of a calculation process is one more example how standardization helps to make quite simple but routine work faster, simpler and more accurate when the program is clear for user and works correctly.

All the calculations were made in compliance with Russian code SP16.13330.2011“Steel structures”. Those calculations are shown in Appendix A

A bearing capacity calculation example for elements of the 36 m truss in IV snow area is presented below.

5.1. Truss elements cross-sections

The first stage of the program in Microsoft Office Excel software was the appointment of standard cross-sections, which we were allowed to use in our standard truss design series. The limit was depended on cross-sections used in Ruukki Rus. These cross-sections are presented in table 5.1

Table 5.1 Cross-section selection table

Index	Cross-section	Section height	Wall thickness	Cross section area	In-plane moment of inertia
-	-	h	t	A	I_z
-	(mm)	cm	cm	cm^2	cm^4
1	(square) 180X180X7.0	18	0,7	48,2	2372,1
2	(square) 180X180X6.0	18	0,6	41,4	2063,5
3	(square) 160X160X8.0	16	0,8	48,7	1836,9
4	(square) 160X160X7.0	16	0,7	42,8	1640,8
5	(square) 160X160X6.0	16	0,6	36,8	1435,1
6	(square) 160X160X5.0	16	0,5	30,7	1214,6

7	(square) 140X140X9.0	14	0,9	47,16	1355
8	(square) 140X140X8.0	14	0,8	42,24	1231
9	(square) 140X140X7.0	14	0,7	37,24	1100
10	(square) 140X140X6.0	14	0,6	32,16	964,3
11	(square) 140X140X5.0	14	0,5	26,9	808,4
12	(square) 120X120X6.0	12	0,6	27,36	594,2
13	(square) 120X120X4.0	12	0,4	18,5	408,5
14	(square) 100X100X4.0	10	0,4	15,36	236,3
15	(square) 80X80X4.0	8	0,4	12,16	117,3
16	(square) 50X50X3.0	5	0,3	5,5	19,9

So it is enough only to change the cross-section index (from table 5.1) for elements to change cross-section characteristics used in calculations in Microsoft Excel program.

5.2. Elements stability calculation

All stresses (N, M in three sections of each element) in truss elements were received from SCAD Office program complex.

Because trusses were modeled in SCAD Office with rigid joints, there are bending moments in almost every element in-plane (M_z). Because analytical scheme is two-dimensional there are not any out-of-plane bending moments (M_y).

In formulas given below are denoted:

N – axial stress in the element section (compressing/stretching stress), $[tnf]$;

M_z – in-plane bending moment in the element section, $[tnf \cdot m]$;

A – cross-section area, $[cm^2]$;

R_y – steel design resistance, for S255 equal to 2,4 $^{t}/_{cm^2}$, for S345 – 3,35 $^{t}/_{cm^2}$;

E – modulus of elasticity, for steel equal to 2100, [$^{t}/_{cm^2}$];

W_z – in-plane cross-section sectional modulus, $[cm^3]$;

γ_c – coefficient of the conditions of work accepted equal to 1;

λ_{xoz} – in-plane element flexibility;

The calculations of element were made by next formulas:

- Bearing capacity analysis of eccentrically-compressed and eccentrically-stretched steel elements;

$$\frac{N}{A \cdot R_y \cdot \gamma_c} + \frac{M_z}{c_z \cdot W_{z,min} \cdot R_y \cdot \gamma_c} \leq 1, \tag{5.1}$$

where N, M_z – axial stress and bending moment modulus in case of the worst combination; c_z – coefficient, accepted from [table E.1, 1].

Calculation of the sectional modulus:

$$W_{z,min} = \frac{\mathrm{I}}{\frac{h}{2}} \tag{5.2}$$

Where I – in-plane moment of inertia, cm^4, h –cross-section height, cm.

- Stability calculation of eccentrically-compressed elements;

$$\frac{N}{\varphi_{ez} \cdot A \cdot R_y \cdot \gamma_c} + \frac{M_z}{c_z \cdot \delta_z \cdot W_{z,min} \cdot R_y \cdot \gamma_c} \leq 1, \tag{5.3}$$

where φ_{ez} – stability coefficient in case of eccentrically-compressed elements, accepted from [table D.3, 1] and depended on the relative flexibility $\overline{\lambda_z}$ and eccentricity adjusted ratio m_{ef}, δ_z – coefficient, calculated by the formula:

$$m_{ef} = \eta \cdot m, \tag{5.4}$$

where η – coefficient of cross-section shape influence, equal to 1 [1].

$$m = \frac{e \cdot A}{W_z}, \tag{5.5}$$

where e – eccentricity, calculated by the formula:

$$e = \frac{M}{N}, \tag{5.6}$$

$$\delta_z = 1 - \frac{0.1 \cdot N \cdot \overline{\lambda_z}^2}{A \cdot R_y}, \tag{5.7}$$

where $\overline{\lambda_z}$ – elements in-plane relative flexibility, calculated by the formula:

$$\overline{\lambda_z} = \lambda_{xoz} \cdot \sqrt{R_y / E}, \tag{5.8}$$

where λ_{xoz} calculated by the formula:

$$\lambda_{xoz} = \frac{L_{efxoz}}{i}, \tag{5.9}$$

where L_{efxoz} – effective in-plan length, cm, i – inertia radius, calculated by the formula:

$$i = \sqrt{\frac{I_z}{A}}, \tag{5.10}$$

if $\overline{\lambda_z} \leq 1$, than $\delta_z = 1.0$

- Buckling elements resistance analysis

$$\frac{\lambda_{xoz}}{\lambda_{max}} \leq 1, \tag{5.11}$$

The maximum tension elements flexibility is 400 [table 33, 1].

The maximum compressed elements flexibility was calculated by the formula:

$$\lambda_{max} = 180 - 60 \cdot \alpha, \tag{5.12}$$

where α – coefficient not less than 0,5, and equal to:

$$\alpha = \frac{N}{\varphi \cdot A \cdot R_y \cdot \gamma_c}, \tag{5.13}$$

where φ – coefficient of element stability under central compression. If $\overline{\lambda_z} \geq 0.4$, than φ is calculated by the formula:

$$\varphi = \frac{0.5 \cdot (\delta - \sqrt{\delta^2 - 39.48 \cdot \overline{\lambda}_z^{\,2}})}{\overline{\lambda}_z^{\,2}}, \tag{5.14}$$

where $\delta -$ the coefficient, calculated by the formula:

$$\delta = 9.87 \cdot \left(1 - \alpha + \beta \cdot \overline{\lambda}_z\right) + \overline{\lambda}_z^{\,2}, \tag{5.15}$$

where $\alpha\ and\ \beta -$ coefficients, accepted $\alpha = 0.03;\ \beta = 0.06$ [table 7, 1].

5.2.1. Example of upper chord (further - UC) element in 36 meters truss in IV snow area calculation

Initial data:

Table 5.2 Initial data for UC calculation

Element	index	Cross-section	N, t	M_z, tm	M_y, tm	h, cm	t, cm	A, cm^2	I_z, cm^4
UC	8	(square) 140X140X8.0	-141.08	0.68	0.0	14	0.8	42.24	1231

$M_y = 0$, because analytical scheme is two-dimensional and there are not any out-of plane stresses.

- First step of element calculation is bearing capacity analysis of eccentrically-compressed and eccentrically-stretched steel elements:

$$W_{z,min} = \frac{1231}{\frac{14}{2}} = 175.86\ cm^3$$

$$\frac{141.08}{42.24 \cdot 3.35 \cdot 1.0} + \frac{0.68 \cdot 100}{1.04 \cdot 175.86 \cdot 3.35 \cdot 1.0} = 0{,}997 \leq 1,$$

The bearing capacity of the UC is provided.

- Second step is eccentrically-compressed elements stability calculation:

$$i = \sqrt{\frac{1231}{42.24}} = \sqrt{29.14}\ sm^2 = 5.4\ cm,$$

In this case $L_{efxoz} = 1.5\ m$, effective length of the UC element equal to step of adjoining elements.

$$\lambda_{xoz} = \frac{150}{5.4} = 27.8,$$

$$\overline{\lambda_z} = 27.8 \cdot \sqrt{3.35/_{2100}} = 1.11,$$

$$\delta_z = 1 - \frac{0.1 \cdot (-141.08) \cdot 1.11^2}{42.24 \cdot 3.35} = 1.12,$$

$$e = \frac{0.68 \cdot 100}{141.08} = 0.48\ cm,$$

$$m = \frac{0.48 \cdot 42.24}{175.86} = 0.116,$$

$$m_{ef} = 0.116,$$

$$\overline{\lambda_z} = 1.11$$

$\varphi_{ez} = 0.881$ [table D.3, 1],

$$\frac{141.08}{0.881 \cdot 42.24 \cdot 3.35 \cdot 1.0} + \frac{68}{1.04 \cdot 1.12 \cdot 175.86 \cdot 3.35 \cdot 1.0} = 0.87 + 0.09 = 0.96 \leq 1,$$

The stability of the UC is provided.

- Third step is an elements buckling resistance analysis:

$$\lambda_{xoz} = 27.8,$$

$$\overline{\lambda_z} = 1.11,$$

$$\delta = 9.87 \cdot (1 - 0.03 + 0.06 \cdot 1.11) + 1.11^2 = 11.46,$$

$$\varphi = \frac{0.5 \cdot (11.46 - \sqrt{11.46^2 - 39.48 \cdot 1.11^2})}{1.11^2} = 0.96$$

$$\alpha = \frac{141.08}{0.96 \cdot 42.24 \cdot 3.35 \cdot 1.0} = 1.04,$$

$$\lambda_{max} = 180 - 60 \cdot 1.04 = 117.6 = 118,$$

$$\frac{27.8}{118} = 0.24 \leq 1,$$

Buckling resistance of the UC is provided.

The last step is choosing the maximum coefficient. For UC critical factor is bearing capacity of eccentrically compressed element (0.997).

For stretched elements, it is not required to check the stability of eccentrically compressed elements.

A bearing capacity calculation example for eccentrically compressed element of the 36 m truss in IV snow area is presented below.

5.2.2. Example of main diagonal (further – D1) element in 36 meters truss in IV snow area calculation

Table 5.3 Initial data for D1 calculation

Element	index	Cross-section	N, t	M_z, tm	M_y, tm	h, cm	t, cm	A, cm^2	I_z, cm^4
D1	13	(square) 120X120X4.0	56.9	0.18	0.0	12	0,4	18,5	408,5

- First step of element calculation is bearing capacity analysis of eccentrically-stretched steel element:

$$W_{z,min} = \frac{408.5}{\frac{12}{2}} = 68.08\ cm^3$$

$$\frac{56.9}{18.5 \cdot 3.35 \cdot 1.0} + \frac{0.18 \cdot 100}{1.04 \cdot 68.08 \cdot 3.35 \cdot 1.0} = 0{,}92 \leq 1,$$

The bearing capacity of the D1 is provided.

- Second step is a buckling element resistance analysis:

$$i = \sqrt{\frac{408.5}{18.5}} = \sqrt{22.08}\ sm^2 = 4.7\ cm,$$

$$\lambda_{xoz} = \frac{173}{4.7} = 36.8,$$

$$\lambda_{max} = 400,$$

$$\frac{36.8}{400} = 0.092 \leq 1,$$

Buckling resistance of the UC is provided.

The last step is choosing the maximum coefficient. For UC critical factor is bearing capacity of eccentrically compressed element (0.92).

Elements stability calculations are presented in Appendix A.

6. Strength calculation of truss elements to chords joints

Truss elements are connected with chords by welding. According to SP 16.13330.2011 [1] three points in every joint should be examined:

- Chord’s web bearing capacity in place of connection whit truss members
- Truss member bearing capacity near the connection with the chord
- Welding strength

The joints examination results are presented in Appendix B.

In formulas given below are denoted:

N – axial stress in the truss member, $[tnf]$;

M – in-plane bending moment in truss member near the connection with chords, $[tnf \cdot m]$;

F – axial stress in the chord from the stretched truss member side, $[tnf]$;

A – chord’s cross-section area, $[cm^2]$;

t – chord’s wall thickness, $[cm]$;

R_y – chord’s steel design resistance, $[{}^{t}/_{cm^2}]$;

α – contact angle between chord and truss member, [degree].

A_d – member’s cross-section area, $[cm^2]$;

R_{yd} – member’s steel design resistance, $\left[{}^{t}/_{cm^2}\right]$;

t_d – member’s wall thickness, $[cm]$;

6.1. Web bearing capacity calculation

The scheme of joints numeration is presented on figure 6.1.

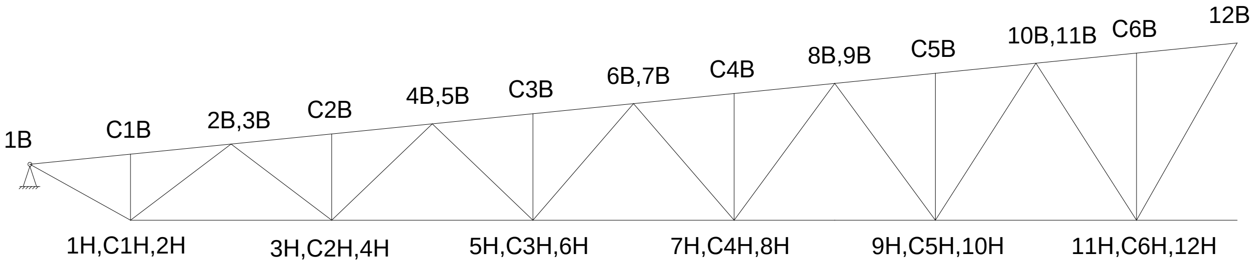


Figure 6.1. Joints numeration

There are several different connection variants. Methods of calculation are different for them too. The scheme of different connection types is shown on the figure 6.1.

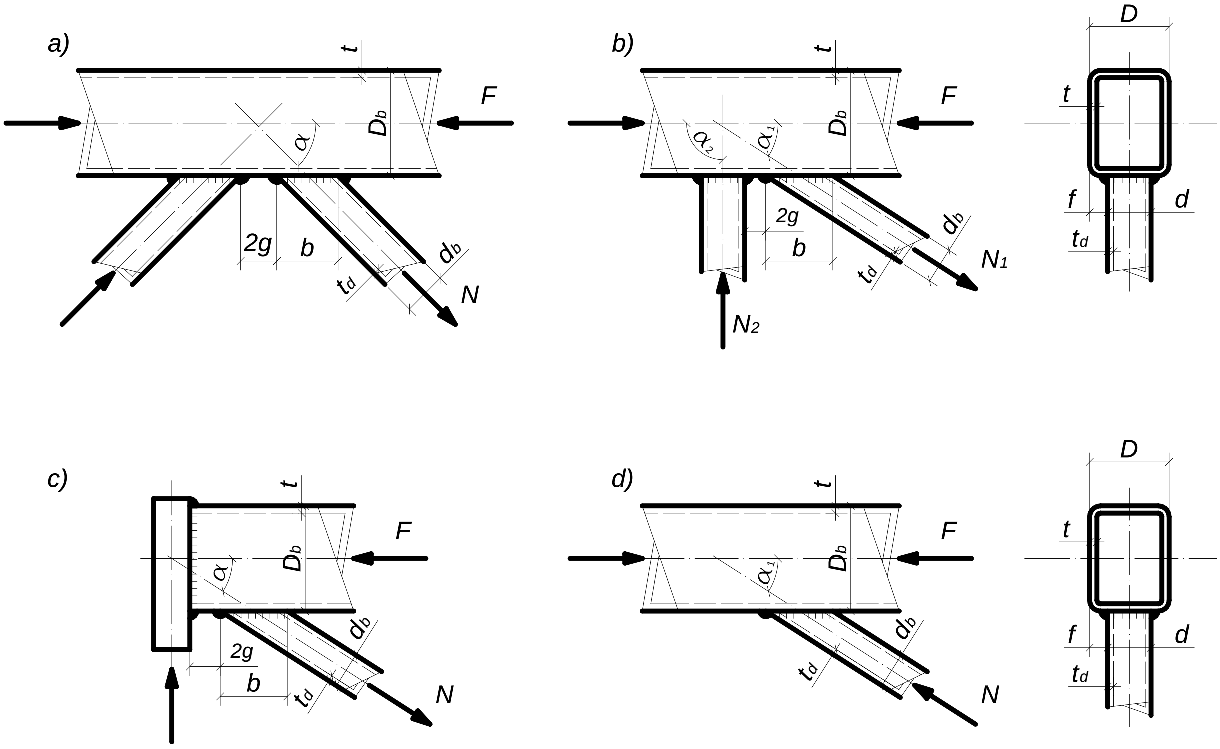
- In case of adjoining of two or more number of elements with different axial stress signs to the chord from one side (Figure 6.2, a, b), and also of one element to the heel joint (Figure 6.2, c) and when $d/D \leq 0.9$ and $g/b \leq 0.25$, the bearing capacity of each element web's should be checked by the formula:

$$\left(N + \frac{1.5 \cdot M}{d_b}\right) \cdot \frac{(0.4 + 1.8 \cdot g/b) \cdot f \cdot \sin\alpha}{\gamma_c \cdot \gamma_d \cdot \gamma_D \cdot R_y \cdot t^2 (b + g + \sqrt{2 \cdot D \cdot f})} \leq 1, \quad (6.1)$$

where γ_d – coefficient of a member axial stress influence ($\gamma_d = 1.2$ if tension, and $\gamma_d = 1.0$ in other cases); γ_D – coefficient of a chord axial stress influence. If there is a compression in a chord than if $|F|/(A \cdot R_y) > 0.5$,

$$\gamma_D = 1.5 - |F|/(A \cdot R_y), \quad (6.2)$$

In other cases $\gamma_D = 1.0$; $b -$ length of intersection line between the chord and the truss member, $b = d_b/\sin\alpha$; $g -$ a half distance between webs of closely-spaced members; $f = (D - d)/2$.



a – K-shaped truss joint in triangular web; b - K-shaped truss joint in case of a diagonal web; c - heel joint; d – Y-shaped joint

Figure 6.2. Joints types in trusses made of RHS-profile.

- Chord's web bearing capacity in Y-shaped joints (Figure 6.2, d) in case if $g/b > 0.25$ should be checked by the formula:

$$\frac{(N + 1.7 \cdot M/d_b) \cdot f \cdot \sin\alpha}{\gamma_c \cdot \gamma_d \cdot \gamma_D \cdot R_y \cdot t^2 (b + g + 2 \cdot \sqrt{2 \cdot D \cdot f})} \leq 1, \quad (6.3)$$

- Lateral web's bearing capacity in place of compressed element connection and in case if $d/D \geq 0.85$ should be checked by the formula:

$$\frac{N \cdot \sin^2\alpha}{2 \cdot \gamma_c \cdot \gamma_t \cdot k \cdot R_y \cdot t \cdot d_b} \leq 1, \quad (6.4)$$

where γ_t – the coefficient of chord thickness influence, in case if $D_b/t \geq 25$, $\gamma_t = 0.8$, in other cases $\gamma_t = 1.0$; k – the coefficient, equal:

If $4 \cdot (t/D_b)^2 - R_y/E \leq 0$ $\quad$ $k = 3.6 \cdot (t/D_b)^2 \cdot E/R_y$

If $0 < 4 \cdot (t/D_b)^2 - R_y/E < 6 \cdot 10^{-4}$ $\quad$ $k = 0.9 + 670 \cdot (t/D_b)^2 - 170 \cdot R_y/E$

in other cases $\quad$ $k = 1.0$

- Bearing capacity calculation of the truss member near the connection with the chord

In the first case (Figure 6.2, a,b,c):

$$\frac{(N + 0.5 \cdot M/d_b) \cdot (1.4 + 0.018 \cdot D/t) \cdot \sin\alpha}{\gamma_c \cdot \gamma_d \cdot k \cdot R_{yd} \cdot A_d} \leq 1, \tag{6.5}$$

In the second case (Figure 4.1, d) and if $g/b > 0.25$:

$$(N + \frac{0.5 \cdot M}{d_b}) \cdot \frac{[1 + 0.01 \cdot (3 + 5 \cdot d/D - 0.1 \cdot d_b/t_d) \cdot D/t] \cdot \sin\alpha}{\gamma_c \cdot \gamma_d \cdot k \cdot R_{yd} \cdot A_d} \leq 1, \tag{6.6}$$

- Welding strength calculation

Welding strength in members to chord connections should be checked by the formula:

In the first case (Figure 6.2, a,b,c):

$$(N + \frac{0.5 \cdot M}{d_b}) \cdot \frac{(1.06 + 0.014 \cdot D/t) \cdot \sin\alpha}{\beta_f \cdot k_f \cdot \gamma_c \cdot R_{wf} \cdot (2 \cdot d_b/\sin\alpha + d)} \leq 1, \tag{6.7}$$

In the second case (Figure 4.1, d) and if $g/b > 0.25$:

$$(N + \frac{0.5 \cdot M}{d_b}) \frac{[1 + 0.01 \cdot (3 + 5 \cdot d/D - 0.1 \cdot d_b/t_d) \cdot D/t] \cdot \sin\alpha}{4 \cdot \beta_f \cdot k_f \cdot d_b \cdot \gamma_c \cdot R_{wf}} \leq 1, \tag{6.8}$$

where β_f – the coefficient admitted equal to 1.0 [table 39,1]; k_f – weld leg [table 38, 1]; $R_{wf} = 1.8\ t/sm^2$ – welding connection design resistance.

6.1.1. Joints bearing capacity calculation example

- Web bearing capacity calculation of D1 and UC joint in 36 meters truss in IV snow area:

$$g = 1\ cm,$$

$$b = d_b/\sin\alpha = 12/\sin 36^\circ = 12/0.588 = 20.4\ cm,$$

$$\frac{g}{b} = \frac{1}{b} = \frac{1}{d_b/\sin\alpha} = \frac{1}{12/\sin 36^{\circ}} = \frac{1}{12/0.588} = 0.05,$$

$$\frac{d}{D} = \frac{12}{14} = 0.857,$$

This joint is the heel joint and also the factors $d/D \leq 0.9$ and $g/b \leq 0.25$ are satisfied, there Is the first case.

Bending moments and axial forces values were taken from SCAD Office calculation results in three sections of every finite element.

$$M = 0.097\ t \cdot m = 9{,}7\ t \cdot sm,$$

$$\gamma_d = 1.2,$$

$$|F|/\left(A \cdot R_y\right) = 51.12/(42.2 \cdot 3.35) = 0.36 < 0.5,$$

$$\gamma_D = 1.0,$$

$$f = \frac{(14-12)}{2} = 1\ sm,$$

$$\left(58.61 + \frac{1.5 \cdot 9.7}{12}\right) \cdot \frac{(0.4 + 1.8 \cdot 1/20.4) \cdot 1 \cdot \sin 36^{\circ}}{1 \cdot 1.2 \cdot 1 \cdot 3.35 \cdot 0.8^2\left(20.4 + 1 + \sqrt{2 \cdot 14 \cdot 1}\right)} = 0{,}25 < 1,$$

Bearing capacity is provided.

- Member bearing capacity calculation of D1 and UC connection near the join in 36 meters truss in IV snow area:

$$4 \cdot \left(\frac{t}{D_b}\right)^2 - \frac{R_y}{E} = 4 \cdot \left(\frac{0.8}{14}\right)^2 - \frac{3.35}{2100} = 0.0115 > 6 \cdot 10^{-4},$$

$$k = 1.0,$$

$$\frac{(58.61 + 0.5 \cdot 9.7/12) \cdot (1.4 + 0.018 \cdot 14/0.8) \cdot \sin 36^{\circ}}{1 \cdot 1.2 \cdot 1 \cdot 3.35 \cdot 18.5} = 0.8 \leq 1,$$

Bearing capacity is provided.

- Welding calculation of D1 and UC connection in 36 meters truss in IV snow area:

The weld leg was admitted equal to 0.5 cm because the thickest element has 0.8 cm thickness.

$$\left(58.61+\frac{0.5\cdot 9.7}{12}\right)\cdot\ \frac{(1.06+0.014\cdot 14/0.8)\cdot\sin 36^{\circ}}{1\cdot 0.5\cdot 1\cdot 1.8\cdot(2\cdot 12/\sin 36^{\circ}+12)}=0.952\leq 1,$$

Welding strength is provided.

7. Calculation of the slip-critical high-strength bolts joint of the bottom chord (BC)

The BC connection is shown on the figure 7.1. 3D view of this connection is shown on the figure 7.2.

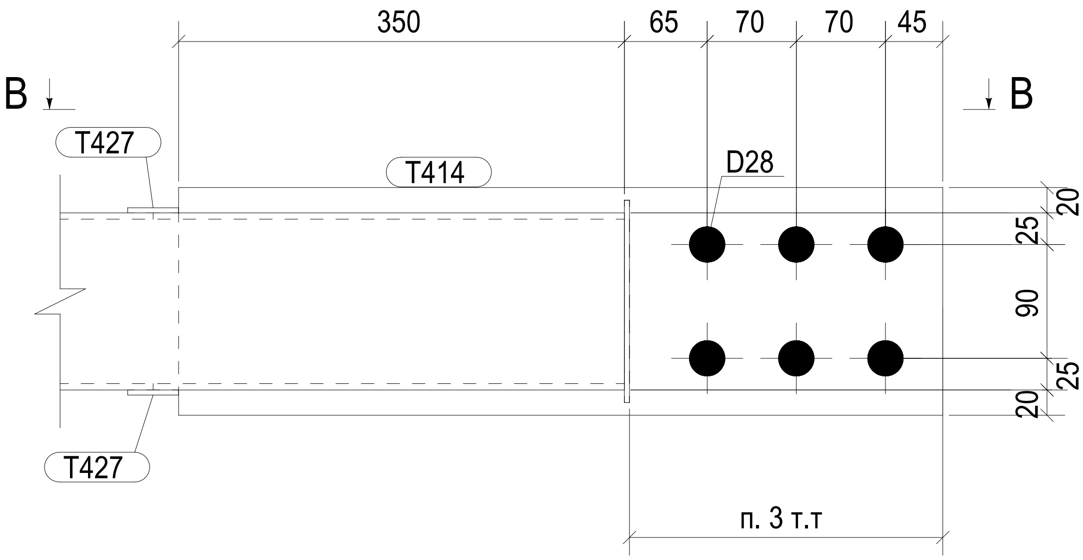


Figure 7.1. A half of the BC joint.

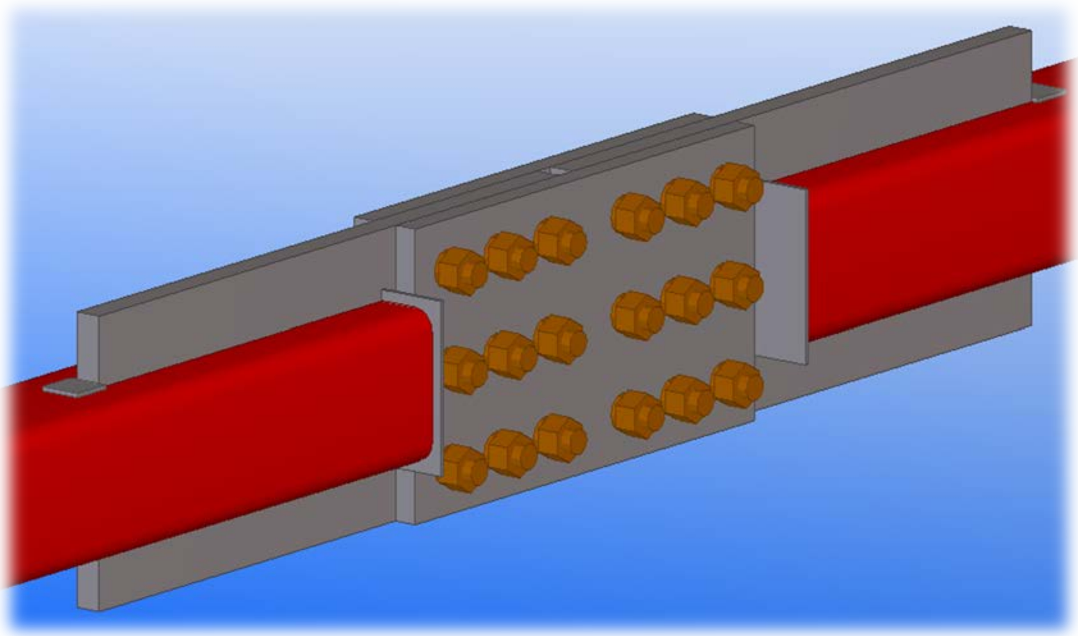


Figure 7.2. BC joint model in Tekla.

- Stress design value of the bolt, which can be apprehended by every plane of friction of the elements pulled together with one high-strength bolt can be determined by the formula:

$$Q_{bn} = \frac{R_{bn} \cdot A_{bn} \cdot \mu}{\gamma_h}, \tag{7.1}$$

where R_{bn} – tension design resistance of the high-strength bolt; A_{bn} – bolt thread sectional area; μ – friction coefficient; γ_h – coefficient, admitted from table 42 [1].

- The axial force in this joint goes through the gravity center of the connection consequently there are equal stresses in every bolt. The number of bolts should be calculated by the formula:

$$n \geq \frac{N}{Q_{bn} \cdot k \cdot \gamma_b \cdot \gamma_c}, \tag{7.2}$$

where Q_{bn} – stress design value of the bolt; k – the number of friction planes; γ_c – coefficient of the conditions of work; γ_b – coefficient of the friction connection work condition.

$\gamma_b = 0.8$, if $n < 5$; $\gamma_b = 0.9$, if $5 \leq n < 10$; $\gamma_b = 1.0$, if $n \geq 10$

- Bolts efficiency calculation

$$\theta = \frac{n \cdot 100}{N_b}, \tag{7.3}$$

where θ – the coefficient of bolt strength use.

- Gusset strength calculation

$$\frac{N}{A_n \cdot R_y} < 1, \tag{7.4}$$

- Flange strength calculation

For flange strength calculation the same formula is used as for gusset calculation.

$$\frac{N}{A_n \cdot R_y} < 1, \tag{7.5}$$

- Welding strength calculation

Welding strength depends on the weld leg, on the welding length and on the steel design resistance:

$$\frac{N}{\beta_f \cdot k_f \cdot \gamma_c \cdot R_{wf} \cdot L_f} < 1, \qquad (7.6)$$

where β_f – the coefficient admitted equal to 1.0 [table 39,1]; k_f – weld leg [table 38, 1]; $R_{wf} = 215\ N/mm^2$ – welding connection design resistance; L_f – welding length.

7.1. Calculation of the slip-critical high-strength bolts joint example

The joints examination results are presented in Appendix C.

The initial data for of the slip-critical high-strength bolts joint calculation is presented in table 7.1.

Table 7.1 Initial data for BC joint calculation

<table>
<tr><td rowspan="9">N, t
136</td><td colspan="8">Plates</td></tr>
<tr><td colspan="4">Gusset</td><td colspan="4">Flange</td></tr>
<tr><td>Thickness</td><td>Height</td><td>Area</td><td rowspan="2">R_y,
N/mm^2</td><td>Thickness</td><td>Height</td><td>Amount</td><td rowspan="2">R_y,
N/mm^2</td></tr>
<tr><td>t_g, mm</td><td>h_g, mm</td><td>t_g, mm^2</td><td>t_p, mm</td><td>h_p, mm</td><td>$units$</td></tr>
<tr><td>25</td><td>220</td><td>5500</td><td>300</td><td>22</td><td>220</td><td>2</td><td>300</td></tr>
<tr><td colspan="8">Bolts</td></tr>
<tr><td>Bolt diameter</td><td>Drilling diameter</td><td>Quantity of bolts across</td><td>Quantity of bolts down</td><td>Total of bolts</td><td>Characteristic bolts resistance</td><td>Design bolts resistance</td><td>Bolt section area</td></tr>
<tr><td>d_b, mm</td><td>d_d, mm</td><td>$layers$</td><td>$layers$</td><td>N_b, units</td><td>R_{bun},
N/mm^2</td><td>R_{bh},
N/mm^2</td><td>A_{bh},
mm^2</td></tr>
<tr><td>24</td><td>27</td><td>3</td><td>3</td><td>9</td><td>1078</td><td>755</td><td>353</td></tr>
</table>

Connected details are processed by the wire brush (steel brush), the friction coefficient after this process admitted equal $\mu = 0.35$; $\gamma_h = 1.17$.

$$Q_{bn} = \frac{R_{bn} \cdot A_{bn} \cdot \mu}{\gamma_h} = \frac{755 \cdot 353 \cdot 0.35}{1.17} = 79726.71\ N = 8.12\ t.$$

$$n \geq \frac{N}{Q_{bn} \cdot k \cdot \gamma_b \cdot \gamma_c} = \frac{136}{8.12 \cdot 2 \cdot 0.9 \cdot 1} = 8.37,$$

The strength of this slip-critical high-strength bolt joint is provided.

- Bolts efficiency calculation

$$\theta = \frac{n \cdot 100}{N_b} = \frac{8.37 \cdot 100}{9} = 93\%,$$

Because $\theta = 93\%$ the strength reserve is enough.

- Gusset strength calculation

$$\frac{N}{A_n \cdot R_y} = \frac{1334160}{5500 \cdot 300} = 0.81 < 1,$$

Gusset strength is provided.

- Flange strength calculation

$$\frac{N}{A_n \cdot R_y} = \frac{1334160}{4840 \cdot 300} = 0.92 < 1,$$

Flange strength is provided.

- Welding strength calculation

The length of a welding was admitted equal to 400 mm (summary welding length was 1600 mm).

$$\frac{N}{\beta_f \cdot k_f \cdot \gamma_c \cdot R_{wf} \cdot L_f} = \frac{1334160}{0.7 \cdot 7 \cdot 0.8 \cdot 215 \cdot 1600} = 0.99 < 1,$$

Welding strength is provided.

8. Calculation results

As a result of all calculations, 13 trusses were taken in the series. The maximum load per unit length for every truss and the adjusted weight are presented in table 8.1.

Table 8.1 Initial data for BC joint calculation

Span, m	Truss ID	UC section	BC section	Total truss weight, kg	Truss spacing, m	Maximum loads per unit length, t/m	Adjusted weight kg/m^2
24	T24/1	140x5	140x5	1520	6	2.3	10.42
	T24/2	140x6	140x5	1614		2.4	11.07
	T24/3	140x6	140x6	1695		2.7	11.93
	T24/4	140x7	140x6	1778		2.9	12.51
	T24/5	140x8	140x7	1937		3.3	13.61
30	T30/1	140x5	140x5	1968		1.5	10.9
	T30/2	140x6	140x5	2084		1.7	11.6
	T30/3	140x7	140x6	2290		2.1	12.7
	T30/4	140x8	140x7	2489		2.3	13.8
36	T36/1	140x5	140x5	2400		1.3	11.1
	T36/2	140x7	140x6	2790		1.7	12.9
	T36/3	140x8	140x7	3031		1.9	14
	T36/4	140x8	140x8	3147		2.1	14.6

These 13 trusses were combined from 14 standard sections. Every section was calculated in SCAD Office; also all calculations were checked in Microsoft Excel.

Also, five standardized types of BC joints were admitted after calculation for different stresses. Joints characteristics are presented in table 8.2.

Table 8.2 Summary table of the BC connection joints

Joint ID	Gussets		Flanges		Bolts	Welding		Applicability in trusses
	h_g	t_g	h_p	t_p	Amount	Total length	Welding leg	
	mm	mm	mm	mm	$units$	mm	mm	
E521	180	16	180	16	6	1400	5	T24/1, T30/1, T36/1, T24/2, T30/2
E531	220	25	220	16	9	1600	6	T24/3, T24/4
E532	220	25	220	18	9	1600	6	T24/5, T30/3, T30/4, T36/2
E533	220	25	220	20	9	1600	7	T36/3
E534	220	25	220	22	9	1600	8	T36/4

From table 8.2 the bottom chord joints applicability in different trusses becomes clear.

9. Construction drawings

Construction drawings of 14 standard sections were created:

1) Section E10121, 12-meter length;
2) Section E10122, 12-meter length;
3) Section E10123, 12-meter length;
4) Section E10124, 12-meter length;
5) Section E10125, 12-meter length;
6) Section E10126, 12-meter length;
7) Section E10121*, 12-meter length;
8) Section E10123*, 12-meter length;
9) Section E10124*, 12-meter length;

10) Section E10125*, 12-meter length;

11) Section E10061, 6-meter length;

12) Section E10062, 6-meter length;

13) Section E10063, 6-meter length;

14) Section E10064, 6-meter length;

The table 9.1 indicates trusses components.

Table 9.1. Truss elements combinations

Truss ID	Truss structure	
	Truss sections combination	Connection element
T24/1	E10121x2	E521
T24/2	E10122x2	E521
T24/3	E10123x2	E531
T24/4	E10124x2	E531
T24/5	E10125x2	E532
T30/1	E10121x2+E10061	E521
T30/2	E10122x2+E10062	E521
T30/3	E10124x2+E10063	E532
T30/4	E10125x2+E10064	E532
T36/1	E10121x2+E10121*	E521
T36/2	E10124x2+E10123*	E532
T36/3	E10125x2+E10124*	E533
T36/4	E10126x2+E10125*	E534

Construction drawings are presented in Appendix D.

10. Conclusion

In this research truss constructions were calculated in accordance with the requirements set before the research start.

The most important result is an album of standardized truss structures. This album contains all information for customers to make preliminary calculation such as maximum load per unit length, adjusted weight, total truss weight and others. Also, this album helps designers to consult customers and to make projects.

Trusses of the developed series are quite similar on metal consumption at small loading and up to 8% more favourably at big loadings in comparison with Molodechno truss series, and have the following advantages:

1) The height of trusses is 200 mm less, which allows easy transportation (not oversized).

2) Trusses chords have the same dimensions of the cross sections, which reduces the number of standard elements.

For 30 and 36 meters span truss structures, we decided to avoid the maximum height of 2.5 meters limit. 30 and 36 meters span trusses would need a substantial increase of upper and bottom chord cross-sections to have the same bearing capacity. Trusses would be heavy and not optimal.

3) Metal consumption of 10% slope trusses with large span are significantly lower than metal consumption of 2% slope trusses [24]. So for small spans (up to 24 meters) of warehouse buildings it is appropriate to apply the truss with 2% slope, at large spans - with a 10% slope.

This performed work was not the first Ruukki Rus experience in truss standardization. This research was performed because previous researches were successful. The ultimate goal of further researches is to come to automatic truss and other constructions production. It is difficult task for a long period of time requiring a lot of researches and preparations. For example, it is necessary to explore the level of welding residual stresses and deformations.

Standardization of structures and industrial automation contributes to increasing the operating speed of the enterprise, to accelerate the design and manufacturing process. Reduces the human impact on the result. Makes this possible to create a stock of materials, which also reduces the production time. Consequently, building becomes easier.

FIGURES

TABLES

CHARTS

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APPENDIXES

Appendix A. Element’s stability analysis (13 pages)
Appendix B. Truss members to chords connections inspection (13 pages)
Appendix C. Bottom chord friction connections calculation (1 page)
Appendix D. Truss sections drawings (14 pages)
Appendix E. Truss selection table for customers (1 page)

APPENDIX A

Table A.1. 24-meter truss elements stability analysis under 2.3 t/m per unit length

Element	Element cross-section	Axial stress	In-plane bending moment	In-plane effective length	Out-of-plane effective length	Design resistance	Eccentricity	In-plane moment of inertia	Section area	Sectional modulus	In-plane flexibility	Conventional in-plane flexibility	Out-of-plane flexibility	Conventional out-of-plane flexibility	Ultimate flexibility	Eccentrically-compressed (stretched) elements use factor	Eccentrically-compressed elements stability use factor	In-plane buckling resistanse	Maximum use factor
		N	Mz	l_{efxoz}	l_{efxoy}	Ry	e_z	I	A	W_c	λ_{xoz}	$\lambda_{conv.xoz}$	λ_{xoy}	$\lambda_{conv.xoy}$	λ_{max}				
		tnf	tnf*m	cm	cm	tnf/cm²	cm	cm⁴	cm²	cm³	□		□			□	□		
UC	(square) 140X140X5.0	-86,5	0,50	150	150	3,45	0,58	808,4	26,9	115,5	27	1,1	30	1,2	120	0,93	0,99	0,23	0,99
BC	(square) 140X140X5.0	85,9	0,57	300	600	3,45	0,66	808,4	26,9	115,5	55	2,2	120	4,9	400	0,93		0,14	0,93
D1	(square) 120X120X4.0	42,9	0,23	173	173	3,45	0,54	408,5	18,5	68,1	37	1,5	40	1,6	400	0,67		0,09	0,67
D2	(square) 120X120X4.0	-28,8	0,16	190	190	3,45	0,56	408,5	18,5	68,1	40	1,6	44	1,8	179	0,52	0,61	0,23	0,61
D3	(square) 120X120X4.0	17,7	0,24	190	190	2,55	1,36	408,5	18,5	68,1	40	1,4	44	1,5	400	0,51		0,10	0,51
D4	(square) 120X120X4.0	-10,8	0,19	209	209	2,55	1,76	408,5	18,5	68,1	44	1,5	49	1,7	180	0,33	0,42	0,25	0,42
D5	(square) 100X100X4.0	4,3	0,09	209	209	2,55	2,08	236,3	15,4	47,3	53	1,9	59	2,0	400	0,18		0,13	0,18
D6	(square) 100X100X4.0	0,2	0,07	231	231	2,55	30,43	236,3	15,4	47,3	59	2,1	65	2,3	400	0,06		0,15	0,16
D7	(square) 100X100X4.0	-4,4	0,05	231	231	2,55	1,13	236,3	15,4	47,3	59	2,1	65	2,3	180	0,15	0,20	0,33	0,36
D8	(square) 100X100X4.0	7,8	0,07	255	255	2,55	0,90	236,3	15,4	47,3	65	2,3	72	2,5	400	0,25		0,16	0,25
V1	(square) 80X80X4.0	-3,0	0,23	101	101	2,55	7,67	117,3	12,2	29,3	33	1,1	36	1,2	180	0,39	0,56	0,18	0,56
V2	(square) 80X80X4.0	-3,1	0,06	131	131	2,55	1,97	117,3	12,2	29,3	42	1,5	46	1,6	180	0,18	0,22	0,23	0,26
V3	(square) 80X80X4.0	-2,9	0,00	161	161	2,55	0,00	117,3	12,2	29,3	52	1,8	57	2,0	180	0,09		0,29	0,32
V4	(square) 80X80X4.0	-2,6	0,03	191	191	2,55	1,16	117,3	12,2	29,3	61	2,1	68	2,4	180	0,12	0,17	0,34	0,38

Table A.2. 24-meter truss elements stability analysis under 2.4 t/m per unit length

Element	Element cross-section	Axial stress	In-plane bending moment	In-plane effective length	Out-of-plane effective length	Design resistance	Eccentricity	In-plane moment of inertia	Section area	Sectional modulus	In-plane flexibility	Conventional in-plane flexibility	Out-of-plane flexibility	Conventional out-of-plane flexibility	Ultimate flexibility	Eccentrically-compressed (stretched) elements use factor	Eccentrically-compressed elements stability use factor	In-plane buckling resistanse	Maximum use factor
		N	Mz	l_{efxoz}	l_{efxoy}	Ry	e_z	I	A	W_c	λ_{xoz}	$\lambda_{conv.xoz}$	λ_{xoy}	$\lambda_{conv.xoy}$	λ_{max}				
		tnf	tnf*m	cm	cm	tnf/cm²	cm	cm⁴	cm²	cm³	□		□			□	□		
UC	(square) 140X140X6.0	-90,4	0,56	150	150	3,45	0,62	964,3	32,2	137,8	27	1,1	30	1,2	127	0,82	0,98	0,22	0,98
BC	(square) 140X140X5.0	89,7	0,56	300	600	3,45	0,62	808,4	26,9	115,5	55	2,2	120	4,9	400	0,97		0,14	0,97
D1	(square) 120X120X4.0	44,8	0,21	173	173	3,45	0,47	408,5	18,5	68,1	37	1,5	40	1,6	400	0,70		0,09	0,70
D2	(square) 120X120X4.0	-30,0	0,18	190	190	3,45	0,60	408,5	18,5	68,1	40	1,6	44	1,8	177	0,54	0,64	0,23	0,64
D3	(square) 120X120X4.0	18,7	0,27	190	190	2,55	1,45	408,5	18,5	68,1	40	1,4	44	1,5	400	0,54		0,10	0,54
D4	(square) 120X120X4.0	-11,1	0,16	209	209	2,55	1,45	408,5	18,5	68,1	44	1,5	49	1,7	180	0,32	0,40	0,25	0,40
D5	(square) 100X100X4.0	4,7	0,11	209	209	2,55	2,36	236,3	15,4	47,3	53	1,9	59	2,0	400	0,21		0,13	0,21
D6	(square) 100X100X4.0	0,4	0,08	231	231	2,55	21,62	236,3	15,4	47,3	59	2,1	65	2,3	400	0,07		0,15	0,16
D7	(square) 100X100X4.0	-4,6	0,06	231	231	2,55	1,32	236,3	15,4	47,3	59	2,1	65	2,3	180	0,16	0,22	0,33	0,36
D8	(square) 100X100X4.0	8,2	0,05	255	255	2,55	0,61	236,3	15,4	47,3	65	2,3	72	2,5	400	0,25		0,16	0,25
V1	(square) 80X80X4.0	-3,2	0,25	101	101	2,55	7,74	117,3	12,2	29,3	33	1,1	36	1,2	180	0,43	0,61	0,18	0,61
V2	(square) 80X80X4.0	-3,4	0,07	131	131	2,55	2,06	117,3	12,2	29,3	42	1,5	46	1,6	180	0,20	0,25	0,23	0,26
V3	(square) 80X80X4.0	-3,3	0,00	161	161	2,55	0,00	117,3	12,2	29,3	52	1,8	57	2,0	180	0,11		0,29	0,32
V4	(square) 80X80X4.0	-2,8	0,03	191	191	2,55	1,07	117,3	12,2	29,3	61	2,1	68	2,4	180	0,13	0,18	0,34	0,38

Table A.3. 24-meter truss elements stability analysis under 2.7 t/m per unit length

Element	Element cross-section	Axial stress	In-plane bending moment	In-plane effective length	Out-of-plane effective length	Design resistance	Eccentricity	In-plane moment of inertia	Section area	Sectional modulus	In-plane flexibility	Conventional in-plane flexibility	Out-of-plane flexibility	Conventional out-of-plane flexibility	Ultimate flexibility	Eccentrically-compressed (stretched) elements use factor	Eccentrically-compressed elements stability use factor	In-plane buckling resistanse	Maximum use factor
		N	Mz	l_{efxoz}	l_{efxoy}	Ry	e_z	I	A	Wc	λ_{xoz}	$\lambda_{conv.xoz}$	λ_{xoy}	$\lambda_{conv.xoy}$	λ_{max}				
		tnf	tnf*m	cm	cm	tnf/cm^2	cm	cm^4	cm^2	cm^3	☐		☐			☐	☐		
UC	(square) 140X140X6.0	102,1	0,61	150	150	3,45	0,60	964,3	32,2	137,8	27	1,1	30	1,2	400	0,92		0,07	0,92
BC	(square) 140X140X6.0	101,5	0,69	300	600	3,45	0,68	964,3	32,2	137,8	55	2,2	121	4,9	400	0,92		0,14	0,92
D1	(square) 120X120X4.0	50,6	0,24	173	173	3,45	0,47	408,5	18,5	68,1	37	1,5	40	1,6	400	0,79		0,09	0,79
D2	(square) 120X120X4.0	-34,0	0,15	190	190	3,45	0,44	408,5	18,5	68,1	40	1,6	44	1,8	173	0,59	0,70	0,23	0,70
D3	(square) 120X120X4.0	20,8	0,27	190	190	2,55	1,30	408,5	18,5	68,1	40	1,4	44	1,5	400	0,59		0,10	0,59
D4	(square) 120X120X4.0	-12,8	0,21	209	209	2,55	1,65	408,5	18,5	68,1	44	1,5	49	1,7	180	0,39	0,48	0,25	0,48
D5	(square) 100X100X4.0	5,1	0,09	209	209	2,55	1,78	236,3	15,4	47,3	53	1,9	59	2,0	400	0,20		0,13	0,20
D6	(square) 100X100X4.0	0,2	0,07	231	231	2,55	31,82	236,3	15,4	47,3	59	2,1	65	2,3	400	0,06		0,15	0,16
D7	(square) 100X100X4.0	-5,3	0,05	231	231	2,55	0,95	236,3	15,4	47,3	59	2,1	65	2,3	180	0,17	0,23	0,33	0,36
D8	(square) 100X100X4.0	9,1	0,07	255	255	2,55	0,77	236,3	15,4	47,3	65	2,3	72	2,5	400	0,29		0,16	0,29
V1	(square) 80X80X4.0	-3,6	0,28	101	101	2,55	7,89	117,3	12,2	29,3	33	1,1	36	1,2	180	0,47	0,68	0,18	0,68
V2	(square) 80X80X4.0	-3,6	0,08	131	131	2,55	2,22	117,3	12,2	29,3	42	1,5	46	1,6	180	0,22	0,27	0,23	0,27
V3	(square) 80X80X4.0	-3,5	0,00	161	161	2,55	0,00	117,3	12,2	29,3	52	1,8	57	2,0	180	0,11		0,29	0,32
V4	(square) 80X80X4.0	-3,0	0,03	191	191	2,55	1,00	117,3	12,2	29,3	61	2,1	68	2,4	180	0,14	0,19	0,34	0,38

Table A.4. 24-meter truss elements stability analysis under 2.9 t/m per unit length

Element	Element cross-section	Axial stress	In-plane bending moment	In-plane effective length	Out-of-plane effective length	Design resistance	Eccentricity	In-plane moment of inertia	Section area	Sectional modulus	In-plane flexibility	Conventional in-plane flexibility	Out-of-plane flexibility	Conventional out-of-plane flexibility	Ultimate flexibility	Eccentrically-compressed (stretched) elements use factor	Eccentrically-compressed elements stability use factor	In-plane buckling resistanse	Maximum use factor
		N	Mz	l_{efxoz}	l_{efxoy}	Ry	e_z	I	A	Wc	λ_{xoz}	$\lambda_{conv.xoz}$	λ_{xoy}	$\lambda_{conv.xoy}$	λ_{max}				
		tnf	tnf*m	cm	cm	tnf/cm^2	cm	cm^4	cm^2	cm^3	☐		☐			☐	☐		
UC	(square) 140X140X7.0	-110,0	0,66	150	150	3,45	0,60	1100,0	37,2	157,1	28	1,1	30	1,2	124	0,86	0,94	0,22	0,94
BC	(square) 140X140X6.0	109,2	0,70	300	600	3,45	0,64	964,3	32,2	137,8	55	2,2	121	4,9	400	0,99		0,14	0,99
D1	(square) 120X120X4.0	54,5	0,23	173	173	3,45	0,42	408,5	18,5	68,1	37	1,5	40	1,6	400	0,85		0,09	0,85
D2	(square) 120X120X4.0	-36,5	0,18	190	190	3,45	0,49	408,5	18,5	68,1	40	1,6	44	1,8	170	0,65	0,76	0,24	0,76
D3	(square) 120X120X4.0	22,6	0,30	190	190	2,55	1,33	408,5	18,5	68,1	40	1,4	44	1,5	400	0,64		0,10	0,64
D4	(square) 120X120X4.0	-13,6	0,18	209	209	2,55	1,33	408,5	18,5	68,1	44	1,5	49	1,7	180	0,39	0,47	0,25	0,47
D5	(square) 100X100X4.0	5,6	0,11	209	209	2,55	1,97	236,3	15,4	47,3	53	1,9	59	2,0	400	0,23		0,13	0,23
D6	(square) 100X100X4.0	0,4	0,08	231	231	2,55	22,22	236,3	15,4	47,3	59	2,1	65	2,3	400	0,07		0,15	0,16
D7	(square) 100X100X4.0	-5,6	0,06	231	231	2,55	1,07	236,3	15,4	47,3	59	2,1	65	2,3	180	0,19	0,25	0,33	0,36
D8	(square) 100X100X4.0	9,8	0,06	255	255	2,55	0,61	236,3	15,4	47,3	65	2,3	72	2,5	400	0,30		0,16	0,30
V1	(square) 80X80X4.0	-3,9	0,31	101	101	2,55	7,91	117,3	12,2	29,3	33	1,1	36	1,2	180	0,53	0,75	0,18	0,75
V2	(square) 80X80X4.0	-4,1	0,08	131	131	2,55	1,96	117,3	12,2	29,3	42	1,5	46	1,6	180	0,23	0,30	0,23	0,30
V3	(square) 80X80X4.0	-3,9	0,00	161	161	2,55	0,00	117,3	12,2	29,3	52	1,8	57	2,0	180	0,13		0,29	0,32
V4	(square) 80X80X4.0	-3,3	0,03	191	191	2,55	0,90	117,3	12,2	29,3	61	2,1	68	2,4	180	0,15	0,20	0,34	0,38

Table A.5. 24-meter truss elements stability analysis under 3.3 t/m per unit length

Element	Element cross-section	Axial stress	In-plane bending moment	In-plane effective length	Out-of-plane effective length	Design resistance	Eccentricity	In-plane moment of inertia	Section area	Sectional modulus	In-plane flexibility	Conventional in-plane flexibility	Out-of-plane flexibility	Conventional out-of-plane flexibility	Ultimate flexibility	Eccentrically-compressed (stretched) elements use factor	Eccentrically-compressed elements stability use factor	In-plane buckling resistanse	Maximum use factor
		N	Mz	l_{efxoz}	l_{efxoy}	Ry	e_z	I	A	W_c	λ_{xoz}	$\lambda_{conv.xoz}$	λ_{xoy}	$\lambda_{conv.xoy}$	λ_{max}				
		tnf	tnf*m	cm	cm	tnf/cm²	cm	cm⁴	cm²	cm³	□		□			□	□		
UC	(square) 140X140X8.0	-124,6	0,77	150	150	3,45	0,62	1231,0	42,2	175,9	28	1,1	31	1,2	124	0,86	0,93	0,22	0,93
BC	(square) 140X140X7.0	123,7	0,82	300	600	3,45	0,66	1100,0	37,2	157,1	55	2,2	121	4,9	400	0,96		0,14	0,96
D1	(square) 120X120X4.0	61,7	0,24	173	173	3,45	0,39	408,5	18,5	68,1	37	1,5	40	1,6	400	0,97		0,09	0,97
D2	(square) 120X120X4.0	-41,4	0,17	190	190	3,45	0,41	408,5	18,5	68,1	40	1,6	44	1,8	165	0,72	0,84	0,24	0,84
D3	(square) 120X120X4.0	25,5	0,33	190	190	2,55	1,29	408,5	18,5	68,1	40	1,4	44	1,5	400	0,72		0,10	0,72
D4	(square) 120X120X4.0	-15,4	0,20	209	209	2,55	1,30	408,5	18,5	68,1	44	1,5	49	1,7	180	0,44	0,53	0,25	0,53
D5	(square) 100X100X4.0	6,3	0,11	209	209	2,55	1,76	236,3	15,4	47,3	53	1,9	59	2,0	400	0,25		0,13	0,25
D6	(square) 100X100X4.0	0,3	0,08	231	231	2,55	23,53	236,3	15,4	47,3	59	2,1	65	2,3	400	0,07		0,15	0,16
D7	(square) 100X100X4.0	-6,4	0,06	231	231	2,55	0,93	236,3	15,4	47,3	59	2,1	65	2,3	180	0,21	0,27	0,33	0,36
D8	(square) 100X100X4.0	11,0	0,06	255	255	2,55	0,54	236,3	15,4	47,3	65	2,3	72	2,5	400	0,33		0,16	0,33
V1	(square) 80X80X4.0	-4,4	0,35	101	101	2,55	7,92	117,3	12,2	29,3	33	1,1	36	1,2	180	0,59	0,85	0,18	0,85
V2	(square) 80X80X4.0	-4,6	0,10	131	131	2,55	2,17	117,3	12,2	29,3	42	1,5	46	1,6	180	0,28	0,34	0,23	0,34
V3	(square) 80X80X4.0	-4,4	0,00	161	161	2,55	0,00	117,3	12,2	29,3	52	1,8	57	2,0	180	0,14		0,29	0,32
V4	(square) 80X80X4.0	-3,7	0,04	191	191	2,55	1,10	117,3	12,2	29,3	61	2,1	68	2,4	180	0,17	0,24	0,34	0,38

Table A.6. 30-meter truss elements stability analysis under 1.5 t/m per unit length

Element	Element cross-section	Axial stress	In-plane bending moment	In-plane effective length	Out-of-plane effective length	Design resistance	Eccentricity	In-plane moment of inertia	Section area	Sectional modulus	In-plane flexibility	Conventional in-plane flexibility	Out-of-plane flexibility	Conventional out-of-plane flexibility	Ultimate flexibility	Eccentrically-compressed (stretched) elements use factor	Eccentrically-compressed elements stability use factor	In-plane buckling resistanse	Maximum use factor
		N	Mz	l_{efxoz}	l_{efxoy}	Ry	e_z	I	A	W_c	λ_{xoz}	$\lambda_{conv.xoz}$	λ_{xoy}	$\lambda_{conv.xoy}$	λ_{Max}				
		tnf	tnf*m	cm	cm	tnf/cm^2	cm	cm^4	cm^2	cm^3	□		□			□	□		
UC	(square) 140X140X5.0	-75,7	0,37	150	150	3,45	0,49	808,4	26,9	115,5	27	1,1	30	1,2	127	0,82	0,99	0,22	0,99
BC	(square) 140X140X5.0	75,4	0,45	300	600	3,45	0,60	808,4	26,9	115,5	55	2,2	120	4,9	400	0,81		0,14	0,81
D1	(square) 120X120X4.0	34,0	0,17	173	173	3,45	0,50	408,5	18,5	68,1	37	1,5	40	1,6	400	0,53		0,09	0,53
D2	(square) 120X120X4.0	-23,9	0,11	190	190	3,45	0,46	408,5	18,5	68,1	40	1,6	44	1,8	180	0,42	0,50	0,22	0,50
D3	(square) 120X120X4.0	15,8	0,19	190	190	2,55	1,20	408,5	18,5	68,1	40	1,4	44	1,5	400	0,44		0,10	0,44
D4	(square) 120X120X4.0	-10,9	0,16	209	209	2,55	1,47	408,5	18,5	68,1	44	1,5	49	1,7	180	0,32	0,39	0,25	0,39
D5	(square) 100X100X4.0	6,2	0,08	209	209	2,55	1,30	236,3	15,4	47,3	53	1,9	59	2,0	400	0,22		0,13	0,22
D6	(square) 100X100X4.0	-2,9	0,06	231	231	2,55	2,08	236,3	15,4	47,3	59	2,1	65	2,3	180	0,12	0,17	0,33	0,36
D7	(square) 100X100X4.0	-0,2	0,05	231	231	2,55	33,33	236,3	15,4	47,3	59	2,1	65	2,3	180	0,04	0,07	0,33	0,36
D8	(square) 100X100X4.0	2,6	0,05	255	255	2,55	1,90	236,3	15,4	47,3	65	2,3	72	2,5	400	0,11		0,16	0,18
D9	(square) 100X100X4.0	-4,9	0,04	255	255	2,55	0,82	236,3	15,4	47,3	65	2,3	72	2,5	180	0,16	0,21	0,36	0,40
D10	(square) 100X100X4.0	6,8	0,04	280	280	2,55	0,59	236,3	15,4	47,3	71	2,5	79	2,7	400	0,21		0,18	0,21
V1	(square) 80X80X4.0	-1,9	0,18	101	101	2,55	9,57	117,3	12,2	29,3	33	1,1	36	1,2	180	0,29	0,43	0,18	0,43
V2	(square) 80X80X4.0	-1,9	0,06	131	131	2,55	3,14	117,3	12,2	29,3	42	1,5	46	1,6	180	0,14	0,17	0,23	0,26
V3	(square) 80X80X4.0	-1,8	0,01	161	161	2,55	0,54	117,3	12,2	29,3	52	1,8	57	2,0	180	0,07	0,21	0,29	0,32
V4	(square) 80X80X4.0	-1,8	0,01	191	191	2,55	0,56	117,3	12,2	29,3	61	2,1	68	2,4	180	0,07	0,12	0,34	0,38
V5	(square) 80X80X4.0	-1,5	0,02	221	221	2,55	1,32	117,3	12,2	29,3	71	2,5	78	2,7	180	0,07	0,09	0,40	0,43

Table A.7. 30-meter truss elements stability analysis under 1.7 t/m per unit length

Element	Element cross-section	Axial stress	In-plane bending moment	In-plane effective length	Out-of-plane effective length	Design resistance	Eccentricity	In-plane moment of inertia	Section area	Sectional modulus	In-plane flexibility	Conventional in-plane flexibility	Out-of-plane flexibility	Conventional out-of-plane flexibility	Ultimate flexibility	Eccentrically-compressed (stretched) elements use factor	Eccentrically-compressed elements stability use factor	In-plane buckling resistanse	Maximum use factor
		N	Mz	l_{efxoz}	l_{efxoy}	Ry	e_z	I	A	W_c	λ_{xoz}	$\lambda_{conv.xoz}$	λ_{xoy}	$\lambda_{conv.xoy}$	λ_{max}				
		tnf	tnf*m	cm	cm	tnf/cm^2	cm	cm^4	cm^2	cm^3	□		□			□	□		
UC	(square) 140X140X6.0	-85,4	0,49	150	150	3,45	0,57	964,3	32,2	137,8	27	1,1	30	1,2	130	0,77	0,97	0,21	0,97
BC	(square) 140X140X5.0	85,0	0,48	300	600	3,45	0,56	808,4	26,9	115,5	55	2,2	120	4,9	400	0,92		0,14	0,92
D1	(square) 120X120X4.0	38,3	0,17	173	173	3,45	0,44	408,5	18,5	68,1	37	1,5	40	1,6	400	0,60		0,09	0,60
D2	(square) 120X120X4.0	-26,8	0,14	190	190	3,45	0,52	408,5	18,5	68,1	40	1,6	44	1,8	180	0,48	0,57	0,22	0,57
D3	(square) 120X120X4.0	18,0	0,23	190	190	2,55	1,28	408,5	18,5	68,1	40	1,4	44	1,5	400	0,51		0,10	0,51
D4	(square) 120X120X4.0	-12,1	0,14	209	209	2,55	1,16	408,5	18,5	68,1	44	1,5	49	1,7	180	0,33	0,40	0,25	0,40
D5	(square) 100X100X4.0	7,1	0,10	209	209	2,55	1,42	236,3	15,4	47,3	53	1,9	59	2,0	400	0,26		0,13	0,26
D6	(square) 100X100X4.0	-3,1	0,06	231	231	2,55	1,92	236,3	15,4	47,3	59	2,1	65	2,3	180	0,13	0,18	0,33	0,36
D7	(square) 100X100X4.0	-0,1	0,06	231	231	2,55	75,00	236,3	15,4	47,3	59	2,1	65	2,3	180	0,05	0,15	0,33	0,36
D8	(square) 100X100X4.0	3,1	0,07	255	255	2,55	2,30	236,3	15,4	47,3	65	2,3	72	2,5	400	0,13		0,16	0,18
D9	(square) 100X100X4.0	-5,4	0,03	255	255	2,55	0,55	236,3	15,4	47,3	65	2,3	72	2,5	180	0,16	0,21	0,36	0,40
D10	(square) 100X100X4.0	7,7	0,03	280	280	2,55	0,39	236,3	15,4	47,3	71	2,5	79	2,7	400	0,22		0,18	0,22
V1	(square) 80X80X4.0	-2,2	0,21	101	101	2,55	9,50	117,3	12,2	29,3	33	1,1	36	1,2	180	0,34	0,50	0,18	0,50
V2	(square) 80X80X4.0	-2,4	0,07	131	131	2,55	2,98	117,3	12,2	29,3	42	1,5	46	1,6	180	0,17	0,20	0,23	0,26
V3	(square) 80X80X4.0	-2,3	0,01	161	161	2,55	0,44	117,3	12,2	29,3	52	1,8	57	2,0	180	0,09	0,25	0,29	0,32
V4	(square) 80X80X4.0	-2,2	0,01	191	191	2,55	0,46	117,3	12,2	29,3	61	2,1	68	2,4	180	0,08	0,14	0,34	0,38
V5	(square) 80X80X4.0	-1,8	0,02	221	221	2,55	1,12	117,3	12,2	29,3	71	2,5	78	2,7	180	0,08	0,10	0,40	0,43

Table A.8. 30-meter truss elements stability analysis under 2.1 t/m per unit length

Element	Element cross-section	Axial stress	In-plane bending moment	In-plane effective length	Out-of-plane effective length	Design resistance	Eccentricity	In-plane moment of inertia	Section area	Sectional modulus	In-plane flexibility	Conventional in-plane flexibility	Out-of-plane flexibility	Conventional out-of-plane flexibility	Ultimate flexibility	Eccentrically-compressed (stretched) elements use factor	Eccentrically-compressed elements stability use factor	In-plane buckling resistanse	Maximum use factor
		N	Mz	l_{efxoz}	l_{efxoy}	Ry	e_z	I	A	W_c	λ_{xoz}	$\lambda_{conv.xoz}$	λ_{xoy}	$\lambda_{conv.xoy}$	λ_{max}				
		tnf	tnf*m	cm	cm	tnf/cm^2	cm	cm^4	cm^2	cm^3	□		□			□	□		
UC	(square) 140X140X7.0	-104,7	0,60	150	150	3,45	0,57	1100,0	37,2	157,1	28	1,1	30	1,2	127	0,82	0,98	0,22	0,98
BC	(square) 140X140X6.0	104,3	0,63	300	600	3,45	0,60	964,3	32,2	137,8	55	2,2	121	4,9	400	0,94		0,14	0,94
D1	(square) 120X120X4.0	47,0	0,18	173	173	3,45	0,38	408,5	18,5	68,1	37	1,5	40	1,6	400	0,74		0,09	0,74
D2	(square) 120X120X4.0	-33,0	0,14	190	190	3,45	0,42	408,5	18,5	68,1	40	1,6	44	1,8	174	0,57	0,68	0,23	0,68
D3	(square) 120X120X4.0	22,0	0,27	190	190	2,55	1,23	408,5	18,5	68,1	40	1,4	44	1,5	400	0,61		0,10	0,61
D4	(square) 120X120X4.0	-14,9	0,17	209	209	2,55	1,14	408,5	18,5	68,1	44	1,5	49	1,7	180	0,41	0,49	0,25	0,49
D5	(square) 100X100X4.0	8,6	0,11	209	209	2,55	1,28	236,3	15,4	47,3	53	1,9	59	2,0	400	0,31		0,13	0,31
D6	(square) 100X100X4.0	-3,9	0,06	231	231	2,55	1,54	236,3	15,4	47,3	59	2,1	65	2,3	180	0,15	0,20	0,33	0,36
D7	(square) 100X100X4.0	-0,2	0,06	231	231	2,55	35,29	236,3	15,4	47,3	59	2,1	65	2,3	180	0,05	0,09	0,33	0,36
D8	(square) 100X100X4.0	3,7	0,07	255	255	2,55	1,91	236,3	15,4	47,3	65	2,3	72	2,5	400	0,15		0,16	0,18
D9	(square) 100X100X4.0	-6,7	0,04	255	255	2,55	0,60	236,3	15,4	47,3	65	2,3	72	2,5	180	0,20	0,27	0,36	0,40
D10	(square) 100X100X4.0	9,3	0,04	280	280	2,55	0,43	236,3	15,4	47,3	71	2,5	79	2,7	400	0,27		0,18	0,27
V1	(square) 80X80X4.0	-2,7	0,27	101	101	2,55	9,93	117,3	12,2	29,3	33	1,1	36	1,2	180	0,43	0,64	0,18	0,64
V2	(square) 80X80X4.0	-2,9	0,09	131	131	2,55	3,15	117,3	12,2	29,3	42	1,5	46	1,6	180	0,21	0,25	0,23	0,26
V3	(square) 80X80X4.0	-2,7	0,02	161	161	2,55	0,73	117,3	12,2	29,3	52	1,8	57	2,0	180	0,11	0,32	0,29	0,32
V4	(square) 80X80X4.0	-2,6	0,02	191	191	2,55	0,77	117,3	12,2	29,3	61	2,1	68	2,4	180	0,11	0,18	0,34	0,38
V5	(square) 80X80X4.0	-2,1	0,03	221	221	2,55	1,42	117,3	12,2	29,3	71	2,5	78	2,7	180	0,11	0,13	0,40	0,43

Table A.9. 30-meter truss elements stability analysis under 2.3 t/m per unit length

Element	Element cross-section	Axial stress	In-plane bending moment	In-plane effective length	Out-of-plane effective length	Design resistance	Eccentricity	In-plane moment of inertia	Section area	Sectional modulus	In-plane flexibility	Conventional in-plane flexibility	Out-of-plane flexibility	Conventional out-of-plane flexibility	Ultimate flexibility	Eccentrically-compressed (stretched) elements use factor	Eccentrically-compressed elements stability use factor	In-plane buckling resistanse	Maximum use factor
		N	Mz	l_{efxoz}	l_{efxoy}	Ry	e_z	I	A	W_c	λ_{xoz}	$\lambda_{conv.xoz}$	λ_{xoy}	$\lambda_{conv.xoy}$	λ_{Max}				
		tnf	tnf*m	cm	cm	tnf/cm^2	cm	cm^4	cm^2	cm^3	☐		☐			☐	☐		
UC	(square) 140X140X8.0	-118,6	0,65	150	150	3,45	0,55	1231,0	42,2	175,9	28	1,1	31	1,2	127	0,81	0,98	0,22	0,98
BC	(square) 140X140X7.0	118,2	0,71	300	600	3,45	0,60	1100,0	37,2	157,1	55	2,2	121	4,9	400	0,92		0,14	0,92
D1	(square) 120X120X4.0	53,2	0,18	173	173	3,45	0,34	408,5	18,5	68,1	37	1,5	40	1,6	400	0,83		0,09	0,83
D2	(square) 120X120X4.0	-37,4	0,13	190	190	3,45	0,35	408,5	18,5	68,1	40	1,6	44	1,8	169	0,64	0,75	0,24	0,75
D3	(square) 120X120X4.0	24,8	0,28	190	190	2,55	1,13	408,5	18,5	68,1	40	1,4	44	1,5	400	0,68		0,10	0,68
D4	(square) 120X120X4.0	-17,0	0,18	209	209	2,55	1,06	408,5	18,5	68,1	44	1,5	49	1,7	180	0,46	0,55	0,25	0,55
D5	(square) 100X100X4.0	9,7	0,11	209	209	2,55	1,14	236,3	15,4	47,3	53	1,9	59	2,0	400	0,33		0,13	0,33
D6	(square) 100X100X4.0	-4,5	0,06	231	231	2,55	1,34	236,3	15,4	47,3	59	2,1	65	2,3	180	0,16	0,22	0,33	0,36
D7	(square) 100X100X4.0	-0,3	0,06	231	231	2,55	24,00	236,3	15,4	47,3	59	2,1	65	2,3	180	0,05	0,09	0,33	0,36
D8	(square) 100X100X4.0	4,1	0,07	255	255	2,55	1,71	236,3	15,4	47,3	65	2,3	72	2,5	400	0,16		0,16	0,18
D9	(square) 100X100X4.0	-7,7	0,04	255	255	2,55	0,52	236,3	15,4	47,3	65	2,3	72	2,5	180	0,23	0,30	0,36	0,40
D10	(square) 100X100X4.0	10,5	0,04	280	280	2,55	0,38	236,3	15,4	47,3	71	2,5	79	2,7	400	0,30		0,18	0,30
V1	(square) 80X80X4.0	-3,1	0,30	101	101	2,55	9,77	117,3	12,2	29,3	33	1,1	36	1,2	180	0,48	0,71	0,18	0,71
V2	(square) 80X80X4.0	-3,2	0,10	131	131	2,55	3,11	117,3	12,2	29,3	42	1,5	46	1,6	180	0,23	0,28	0,23	0,28
V3	(square) 80X80X4.0	-3,1	0,02	161	161	2,55	0,65	117,3	12,2	29,3	52	1,8	57	2,0	180	0,12	0,36	0,29	0,36
V4	(square) 80X80X4.0	-2,9	0,02	191	191	2,55	0,69	117,3	12,2	29,3	61	2,1	68	2,4	180	0,12	0,20	0,34	0,38
V5	(square) 80X80X4.0	-2,3	0,03	221	221	2,55	1,30	117,3	12,2	29,3	71	2,5	78	2,7	180	0,11	0,14	0,40	0,43

Table A.10. 36-meter truss elements stability analysis under 1.3 t/m per unit length

Element	Element cross-section	Axial stress	In-plane bending moment	In-plane effective length	Out-of-plane effective length	Design resistance	Eccentricity	In-plane moment of inertia	Section area	Sectional modulus	In-plane flexibility	Conventional in-plane flexibility	Out-of-plane flexibility	Conventional out-of-plane flexibility	Ultimate flexibility	Eccentrically-compressed (stretched) elements use factor	Eccentrically-compressed elements stability use factor	In-plane buckling resistanse	Maximum use factor
		N	Mz	l_{efxoz}	l_{efxoy}	Ry	e_z	I	A	W_c	λ_{xoz}	$\lambda_{conv.xoz}$	λ_{xoy}	$\lambda_{conv.xoy}$	λ_{max}				
		tnf	tnf*m	cm	cm	tnf/cm²	cm	cm⁴	cm²	cm³	□		□			□	□		
UC	(square) 140X140X5.0	-86,3	0,38	150	150	3,45	0,44	808,4	26,9	115,5	27	1,1	30	1,2	120	0,93	0,97	0,23	0,97
BC	(square) 140X140X5.0	85,7	0,49	300	600	3,45	0,57	808,4	26,9	115,5	55	2,2	120	4,9	400	0,93		0,14	0,93
D1	(square) 120X120X4.0	35,9	0,18	173	173	3,45	0,50	408,5	18,5	68,1	37	1,5	40	1,6	400	0,56		0,09	0,56
D2	(square) 120X120X4.0	-25,8	0,12	190	190	3,45	0,46	408,5	18,5	68,1	40	1,6	44	1,8	180	0,45	0,54	0,22	0,54
D3	(square) 120X120X4.0	17,7	0,21	190	190	2,55	1,18	408,5	18,5	68,1	40	1,4	44	1,5	400	0,49		0,10	0,49
D4	(square) 120X120X4.0	-12,9	0,17	209	209	2,55	1,31	408,5	18,5	68,1	44	1,5	49	1,7	180	0,37	0,45	0,25	0,45
D5	(square) 100X100X4.0	8,2	0,09	209	209	2,55	1,10	236,3	15,4	47,3	53	1,9	59	2,0	400	0,28		0,13	0,28
D6	(square) 100X100X4.0	-5,1	0,07	231	231	2,55	1,38	236,3	15,4	47,3	59	2,1	65	2,3	180	0,19	0,25	0,33	0,36
D7	(square) 100X100X4.0	2,1	0,06	231	231	2,55	2,90	236,3	15,4	47,3	59	2,1	65	2,3	400	0,10		0,15	0,16
D8	(square) 100X100X4.0	0,3	0,05	255	255	2,55	17,86	236,3	15,4	47,3	65	2,3	72	2,5	400	0,05		0,16	0,18
D9	(square) 100X100X4.0	-2,4	0,06	255	255	2,55	2,48	236,3	15,4	47,3	65	2,3	72	2,5	180	0,11	0,16	0,36	0,40
D10	(square) 100X100X4.0	4,4	0,06	280	280	2,55	1,37	236,3	15,4	47,3	71	2,5	79	2,7	400	0,16		0,18	0,20
D11	(square) 100X100X4.0	-6,1	0,04	280	280	2,55	0,66	236,3	15,4	47,3	71	2,5	79	2,7	180	0,19	0,26	0,40	0,44
D12	(square) 100X100X4.0	7,6	0,03	305	305	2,55	0,39	236,3	15,4	47,3	78	2,7	86	3,0	400	0,22		0,19	0,22
V1	(square) 80X80X4.0	-1,6	0,20	101	101	2,55	12,27	117,3	12,2	29,3	33	1,1	36	1,2	180	0,31	0,47	0,18	0,47
V2	(square) 80X80X4.0	-1,7	0,07	131	131	2,55	4,19	117,3	12,2	29,3	42	1,5	46	1,6	180	0,14	0,17	0,23	0,26
V3	(square) 80X80X4.0	-1,6	0,02	161	161	2,55	1,24	117,3	12,2	29,3	52	1,8	57	2,0	180	0,08	0,23	0,29	0,32
V4	(square) 80X80X4.0	-1,6	0,00	191	191	2,55	0,00	117,3	12,2	29,3	61	2,1	68	2,4	180	0,05		0,34	0,38
V5	(square) 80X80X4.0	-1,5	0,02	221	221	2,55	1,34	117,3	12,2	29,3	71	2,5	78	2,7	180	0,07	0,10	0,40	0,43
V6	(square) 80X80X4.0	-1,2	0,02	251	251	2,55	1,65	117,3	12,2	29,3	81	2,8	89	3,1	180	0,06	0,07	0,45	0,49

Table A.11. 36-meter truss elements stability analysis under 1.7 t/m per unit length

Element	Element cross-section	Axial stress	In-plane bending moment	In-plane effective length	Out-of-plane effective length	Design resistance	Eccentricity	In-plane moment of inertia	Section area	Sectional modulus	In-plane flexibility	Conventional in-plane flexibility	Out-of-plane flexibility	Conventional out-of-plane flexibility	Ultimate flexibility	Eccentrically-compressed (stretched) elements use factor	Eccentrically-compressed elements stability use factor	In-plane buckling resistanse	Maximum use factor
		N	Mz	l_{efxoz}	l_{efxoy}	Ry	e_z	I	A	W_c	λ_{xoz}	$\lambda_{conv.xoz}$	λ_{xoy}	$\lambda_{conv.xoy}$	$\lambda_{мах}$				
		tnf	tnf*m	cm	cm	tnf/cm²	cm	cm⁴	cm²	cm³	☐		☐			☐	☐		
UC	(square) 140X140X7.0	-111,6	0,59	150	150	3,45	0,53	1100,0	37,2	157,1	28	1,1	30	1,2	124	0,87	0,93	0,22	0,93
BC	(square) 140X140X6.0	110,8	0,61	300	600	3,45	0,55	964,3	32,2	137,8	55	2,2	121	4,9	400	0,98		0,14	0,98
D1	(square) 120X120X4.0	46,4	0,17	173	173	3,45	0,37	408,5	18,5	68,1	37	1,5	40	1,6	400	0,73		0,09	0,73
D2	(square) 120X120X4.0	-33,3	0,13	190	190	3,45	0,39	408,5	18,5	68,1	40	1,6	44	1,8	174	0,57	0,68	0,23	0,68
D3	(square) 120X120X4.0	23,1	0,26	190	190	2,55	1,13	408,5	18,5	68,1	40	1,4	44	1,5	400	0,63		0,10	0,63
D4	(square) 120X120X4.0	-16,6	0,17	209	209	2,55	1,03	408,5	18,5	68,1	44	1,5	49	1,7	180	0,45	0,53	0,25	0,53
D5	(square) 100X100X4.0	10,7	0,11	209	209	2,55	1,03	236,3	15,4	47,3	53	1,9	59	2,0	400	0,36		0,13	0,36
D6	(square) 100X100X4.0	-6,5	0,06	231	231	2,55	0,93	236,3	15,4	47,3	59	2,1	65	2,3	180	0,21	0,28	0,33	0,36
D7	(square) 100X100X4.0	2,7	0,07	231	231	2,55	2,55	236,3	15,4	47,3	59	2,1	65	2,3	400	0,13		0,15	0,16
D8	(square) 100X100X4.0	0,4	0,06	255	255	2,55	13,95	236,3	15,4	47,3	65	2,3	72	2,5	400	0,06		0,16	0,18
D9	(square) 100X100X4.0	-3,1	0,05	255	255	2,55	1,62	236,3	15,4	47,3	65	2,3	72	2,5	180	0,12	0,17	0,36	0,40
D10	(square) 100X100X4.0	5,7	0,07	280	280	2,55	1,23	236,3	15,4	47,3	71	2,5	79	2,7	400	0,20		0,18	0,20
D11	(square) 100X100X4.0	-7,8	0,04	280	280	2,55	0,51	236,3	15,4	47,3	71	2,5	79	2,7	180	0,23	0,31	0,40	0,44
D12	(square) 100X100X4.0	9,8	0,03	305	305	2,55	0,31	236,3	15,4	47,3	78	2,7	86	3,0	400	0,27		0,19	0,27
V1	(square) 80X80X4.0	-2,2	0,26	101	101	2,55	11,71	117,3	12,2	29,3	33	1,1	36	1,2	180	0,41	0,61	0,18	0,61
V2	(square) 80X80X4.0	-2,4	0,09	131	131	2,55	3,80	117,3	12,2	29,3	42	1,5	46	1,6	180	0,19	0,23	0,23	0,26
V3	(square) 80X80X4.0	-2,3	0,03	161	161	2,55	1,32	117,3	12,2	29,3	52	1,8	57	2,0	180	0,11	0,32	0,29	0,32
V4	(square) 80X80X4.0	-2,2	0,00	191	191	2,55	0,00	117,3	12,2	29,3	61	2,1	68	2,4	180	0,07		0,34	0,38
V5	(square) 80X80X4.0	-2,1	0,02	221	221	2,55	0,98	117,3	12,2	29,3	71	2,5	78	2,7	180	0,09	0,12	0,40	0,43
V6	(square) 80X80X4.0	-1,6	0,03	251	251	2,55	1,91	117,3	12,2	29,3	81	2,8	89	3,1	180	0,09	0,10	0,45	0,49

Table A.12. 36-meter truss elements stability analysis under 1.9 t/m per unit length

Element	Element cross-section	Axial stress	In-plane bending moment	In-plane effective length	Out-of-plane effective length	Design resistance	Eccentricity	In-plane moment of inertia	Section area	Sectional modulus	In-plane flexibility	Conventional in-plane flexibility	Out-of-plane flexibility	Conventional out-of-plane flexibility	Ultimate flexibility	Eccentrically-compressed (stretched) elements use factor	Eccentrically-compressed elements stability use factor	In-plane buckling resistanse	Maximum use factor
		N	Mz	l_{efxoz}	l_{efxoy}	Ry	e_z	I	A	W_c	λ_{xoz}	$\lambda_{conv.xoz}$	λ_{xoy}	$\lambda_{conv.xoy}$	λ_{Max}				
		tnf	tnf*m	cm	cm	tnf/cm^2	cm	cm^4	cm^2	cm^3	☐		☐			☐	☐		
UC	(square) 140X140X8.0	-125,7	0,65	150	150	3,45	0,52	1231,0	42,2	175,9	28	1,1	31	1,2	124	0,86	0,91	0,22	0,91
BC	(square) 140X140X7.0	124,8	0,49	300	600	3,45	0,39	1100,0	37,2	157,1	55	2,2	121	4,9	400	0,97		0,14	0,97
D1	(square) 120X120X4.0	52,2	0,17	173	173	3,45	0,33	408,5	18,5	68,1	37	1,5	40	1,6	400	0,82		0,09	0,82
D2	(square) 120X120X4.0	-37,5	0,12	190	190	3,45	0,32	408,5	18,5	68,1	40	1,6	44	1,8	169	0,64	0,75	0,24	0,75
D3	(square) 120X120X4.0	25,9	0,28	190	190	2,55	1,08	408,5	18,5	68,1	40	1,4	44	1,5	400	0,70		0,10	0,70
D4	(square) 120X120X4.0	-18,7	0,18	209	209	2,55	0,96	408,5	18,5	68,1	44	1,5	49	1,7	180	0,50	0,59	0,25	0,59
D5	(square) 100X100X4.0	12,0	0,12	209	209	2,55	1,00	236,3	15,4	47,3	53	1,9	59	2,0	400	0,40		0,13	0,40
D6	(square) 100X100X4.0	-7,3	0,07	231	231	2,55	0,96	236,3	15,4	47,3	59	2,1	65	2,3	180	0,24	0,31	0,33	0,36
D7	(square) 100X100X4.0	3,0	0,07	231	231	2,55	2,30	236,3	15,4	47,3	59	2,1	65	2,3	400	0,13		0,15	0,16
D8	(square) 100X100X4.0	0,4	0,06	255	255	2,55	13,64	236,3	15,4	47,3	65	2,3	72	2,5	400	0,06		0,16	0,18
D9	(square) 100X100X4.0	-3,5	0,06	255	255	2,55	1,70	236,3	15,4	47,3	65	2,3	72	2,5	180	0,14	0,19	0,36	0,40
D10	(square) 100X100X4.0	6,3	0,07	280	280	2,55	1,11	236,3	15,4	47,3	71	2,5	79	2,7	400	0,22		0,18	0,22
D11	(square) 100X100X4.0	-8,9	0,05	280	280	2,55	0,56	236,3	15,4	47,3	71	2,5	79	2,7	180	0,27	0,36	0,40	0,44
D12	(square) 100X100X4.0	10,9	0,03	305	305	2,55	0,27	236,3	15,4	47,3	78	2,7	86	3,0	400	0,30		0,19	0,30
V1	(square) 80X80X4.0	-2,5	0,30	101	101	2,55	12,05	117,3	12,2	29,3	33	1,1	36	1,2	180	0,47	0,70	0,18	0,70
V2	(square) 80X80X4.0	-2,7	0,11	131	131	2,55	4,15	117,3	12,2	29,3	42	1,5	46	1,6	180	0,23	0,26	0,23	0,26
V3	(square) 80X80X4.0	-2,5	0,04	161	161	2,55	1,59	117,3	12,2	29,3	52	1,8	57	2,0	180	0,13	0,37	0,29	0,37
V4	(square) 80X80X4.0	-2,4	0,00	191	191	2,55	0,00	117,3	12,2	29,3	61	2,1	68	2,4	180	0,08		0,34	0,38
V5	(square) 80X80X4.0	-2,3	0,03	221	221	2,55	1,32	117,3	12,2	29,3	71	2,5	78	2,7	180	0,11	0,15	0,40	0,43
V6	(square) 80X80X4.0	-1,7	0,03	251	251	2,55	1,78	117,3	12,2	29,3	81	2,8	89	3,1	180	0,09	0,11	0,45	0,49

Table A.13. 36-meter truss elements stability analysis under 2.1 t/m per unit length

Element	Element cross-section	Axial stress	In-plane bending moment	In-plane effective length	Out-of-plane effective length	Design resistance	Eccentricity	In-plane moment of inertia	Section area	Sectional modulus	In-plane flexibility	Conventional in-plane flexibility	Out-of-plane flexibility	Conventional out-of-plane flexibility	Ultimate flexibility	Eccentrically-compressed (stretched) elements use factor	Eccentrically-compressed elements stability use factor	In-plane buckling resistanse	Maximum use factor
		N	Mz	l_{efxoz}	l_{efxoy}	Ry	e_z	I	A	W_c	λ_{xoz}	$\lambda_{conv.xoz}$	λ_{xoy}	$\lambda_{conv.xoy}$	λ_{max}				
		tnf	tnf*m	cm	cm	tnf/cm²	cm	cm⁴	cm²	cm³	□		□			□	□		
UC	(square) 140X140X8.0	-136,9	0,66	150	150	3,45	0,48	1231,0	42,2	175,9	28	1,1	31	1,2	119	0,94	0,96	0,23	0,96
BC	(square) 140X140X8.0	136,0	0,81	300	600	3,45	0,60	1231,0	42,2	175,9	56	2,3	122	5,0	400	0,93		0,14	0,93
D1	(square) 120X120X4.0	56,9	0,18	173	173	3,45	0,32	408,5	18,5	68,1	37	1,5	40	1,6	400	0,89		0,09	0,89
D2	(square) 120X120X4.0	-41,0	0,10	190	190	3,45	0,24	408,5	18,5	68,1	40	1,6	44	1,8	165	0,68	0,80	0,24	0,80
D3	(square) 120X120X4.0	28,0	0,28	190	190	2,55	1,00	408,5	18,5	68,1	40	1,4	44	1,5	400	0,75		0,10	0,75
D4	(square) 120X120X4.0	-20,6	0,22	209	209	2,55	1,07	408,5	18,5	68,1	44	1,5	49	1,7	180	0,56	0,67	0,25	0,67
D5	(square) 100X100X4.0	12,9	0,11	209	209	2,55	0,85	236,3	15,4	47,3	53	1,9	59	2,0	400	0,42		0,13	0,42
D6	(square) 100X100X4.0	-8,1	0,08	231	231	2,55	0,99	236,3	15,4	47,3	59	2,1	65	2,3	180	0,27	0,35	0,33	0,36
D7	(square) 100X100X4.0	3,2	0,07	231	231	2,55	2,20	236,3	15,4	47,3	59	2,1	65	2,3	400	0,14		0,15	0,16
D8	(square) 100X100X4.0	0,4	0,05	255	255	2,55	13,89	236,3	15,4	47,3	65	2,3	72	2,5	400	0,05		0,16	0,18
D9	(square) 100X100X4.0	-4,0	0,07	255	255	2,55	1,77	236,3	15,4	47,3	65	2,3	72	2,5	180	0,16	0,22	0,36	0,40
D10	(square) 100X100X4.0	6,8	0,07	280	280	2,55	1,03	236,3	15,4	47,3	71	2,5	79	2,7	400	0,23		0,18	0,23
D11	(square) 100X100X4.0	-9,7	0,05	280	280	2,55	0,51	236,3	15,4	47,3	71	2,5	79	2,7	180	0,29	0,39	0,40	0,44
D12	(square) 100X100X4.0	11,8	0,03	305	305	2,55	0,25	236,3	15,4	47,3	78	2,7	86	3,0	400	0,33		0,19	0,33
V1	(square) 80X80X4.0	-2,6	0,32	101	101	2,55	12,12	117,3	12,2	29,3	33	1,1	36	1,2	180	0,50	0,74	0,18	0,74
V2	(square) 80X80X4.0	-2,7	0,12	131	131	2,55	4,43	117,3	12,2	29,3	42	1,5	46	1,6	180	0,24	0,28	0,23	0,28
V3	(square) 80X80X4.0	-2,6	0,04	161	161	2,55	1,57	117,3	12,2	29,3	52	1,8	57	2,0	180	0,13	0,38	0,29	0,38
V4	(square) 80X80X4.0	-2,5	0,00	191	191	2,55	0,00	117,3	12,2	29,3	61	2,1	68	2,4	180	0,08		0,34	0,38
V5	(square) 80X80X4.0	-2,3	0,03	221	221	2,55	1,28	117,3	12,2	29,3	71	2,5	78	2,7	180	0,11	0,16	0,40	0,43
V6	(square) 80X80X4.0	-1,7	0,04	251	251	2,55	2,31	117,3	12,2	29,3	81	2,8	89	3,1	180	0,11	0,12	0,45	0,49

APPENDIX B

Table B.1. 24-meter truss connections inspection under 2.3 t/m per unit length

№		1U	1B	2B	2U	3U	3B	4B	4U	5U	5B	6B	6U	7U	7B	8B	8U	V1U	V1B	V2U	V2B	V3U	V3B	V4U	V4B
M	Tnf*cm	5,60	23,30	1,80	15,70	24,40	6,70	19,20	9,30	8,80	6,50	6,10	6,90	4,90	5,30	6,70	1,50	-18,10	23,30	-6,90	6,10	0,20	-0,70	2,70	-4,40
N	Tnf	42,85	41,40	28,80	28,80	17,65	15,81	10,77	10,77	4,33	2,29	0,23	0,23	4,44	4,32	7,77	7,77	3,00	3,00	3,05	3,05	2,94	2,94	2,58	2,58
F	Tnf	-37,66	60,82	60,82	-37,66	-37,66	82,91	82,91	-75,35	-75,35	85,89	85,89	-75,35	-75,35	78,34	78,34	-86,49	-83,31	42,85	-83,31	17,65	0,00	4,34	0,00	7,77
R_y	Tnf/cm2	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	2,55	3,45	2,55	3,45	2,55
E	Tnf/cm2	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100
A	cm^2	26,90	26,90	26,90	26,90	26,90	26,90	26,90	26,90	26,90	26,90	26,90	26,90	26,90	26,90	26,90	26,90	26,90	18,50	26,90	18,50	26,90	15,36	26,90	15,36
D	cm	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	12,00	14,00	12,00	14,00	10,00	14,00	10,00
D_b	cm	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	12,00	14,00	12,00	14,00	10,00	14,00	10,00
t	cm	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,40	0,50	0,40	0,50	0,40	0,50	0,40
α	degree	35,00	29,00	37,00	31,00	43,00	37,00	44,00	38,00	49,00	44,00	49,00	43,00	55,00	49,00	54,00	48,00	84,00	61,00	84,00	53,00	84,00	46,00	84,00	41,00
R_{yd}	Tnf/cm2	3,45	3,45	3,45	3,45	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55
Ad	cm^2	18,50	18,50	18,50	18,50	18,50	18,50	18,50	18,50	15,36	15,36	15,36	15,36	15,36	15,36	15,36	15,36	12,16	12,16	12,16	12,16	12,16	12,16	12,16	12,16
d	cm	12,00	12,00	12,00	12,00	12,00	12,00	12,00	12,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00
db	cm	12,00	12,00	12,00	12,00	12,00	12,00	12,00	12,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00
td	cm	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40
g	cm	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
R_{wf}	Tnf/cm2	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84
b	cm	20,92	24,75	19,94	23,30	17,60	19,94	17,28	19,49	13,25	14,40	13,25	14,66	12,21	13,25	12,36	13,46	8,04	9,15	8,04	10,02	8,04	11,12	8,04	12,19
f	cm	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	3,00	2,00	3,00	2,00	3,00	1,00	3,00	1,00
d/D		0,86	0,86	0,86	0,86	0,86	0,86	0,86	0,86	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,57	0,67	0,57	0,67	0,57	0,80	0,57	0,80
g/d		0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13
Y_c		1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
Yd	f axial stre	1,20	1,20	1,00	1,00	1,20	1,20	1,00	1,00	1,20	1,20	1,20	1,20	1,00	1,00	1,20	1,20	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
Y_D		1,00	1,00	1,00	1,00	1,00	1,00	1,00	0,69	0,69	1,00	1,00	0,69	0,69	1,00	1,00	0,57	0,60	1,00	0,60	1,00	1,00	1,00	1,00	1,00
Yt		0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80
k_f	cm	0,50	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40
Chord's web use factor		0,43	0,29	0,31	0,23	0,25	0,17	0,16	0,12	0,30	0,10	0,04	0,05	0,38	0,22	0,36	0,49	-0,08	0,82	0,35	0,53	0,35	0,17	0,37	0,09
Truss member use factor		0,61	0,51	0,52	0,45	0,43	0,33	0,32	0,28	0,15	0,07	0,02	0,02	0,19	0,17	0,27	0,24	0,11	0,24	0,16	0,17	0,18	0,12	0,17	0,09
Welding strength use factor		0,72	0,66	0,66	0,51	0,53	0,37	0,34	0,27	0,19	0,09	0,02	0,02	0,22	0,19	0,37	0,31	0,15	0,30	0,21	0,20	0,24	0,13	0,22	0,09

Table B.2. 24-meter truss connections inspection under 2.4 t/m per unit length

№		1U	1B	2B	2U	3U	3B	4B	4U	5U	5B	6B	6U	7U	7B	8B	8U	V1U	V1B	V2U	V2B	V3U	V3B	V4U	V4B
M	Tnf*cm	6,10	21,40	-0,90	17,80	27,40	2,80	15,70	11,40	10,50	4,40	4,50	8,00	6,20	3,70	5,50	2,40	-19,50	25,10	-7,20	6,60	0,20	-0,70	2,70	-4,40
N	Tnf	44,81	43,24	29,95	29,95	18,65	16,61	11,07	11,07	4,67	2,41	0,37	0,37	4,55	4,42	8,17	8,17	3,23	3,23	3,39	3,39	3,26	3,26	2,81	2,81
F	Tnf	-39,40	63,48	63,48	-39,40	-39,40	86,59	86,59	-78,85	-78,85	89,74	89,74	-78,85	-78,85	81,88	81,88	-90,44	-87,11	44,82	-87,11	18,65	0,00	4,68	0,00	8,17
R_y	Tnf/cm2	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	2,55	3,45	2,55	3,45	2,55
E	Tnf/cm2	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100
A	cm^2	32,16	26,90	26,90	32,16	32,16	26,90	26,90	32,16	32,16	26,90	26,90	32,16	32,16	26,90	26,90	32,16	32,16	18,50	32,16	18,50	32,16	15,36	32,16	15,36
D	cm	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	12,00	14,00	12,00	14,00	10,00	14,00	10,00
D_b	cm	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	12,00	14,00	12,00	14,00	10,00	14,00	10,00
t	cm	0,60	0,50	0,50	0,60	0,60	0,50	0,50	0,60	0,60	0,50	0,50	0,60	0,60	0,50	0,50	0,60	0,60	0,40	0,60	0,40	0,60	0,40	0,60	0,40
α	degree	35,00	29,00	37,00	31,00	43,00	37,00	44,00	38,00	49,00	44,00	49,00	43,00	55,00	49,00	54,00	48,00	84,00	61,00	84,00	53,00	84,00	46,00	84,00	41,00
R_{yd}	Tnf/cm2	3,45	3,45	3,45	3,45	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55
Ad	cm^2	18,50	18,50	18,50	18,50	18,50	18,50	18,50	18,50	15,36	15,36	15,36	15,36	15,36	15,36	15,36	15,36	12,16	12,16	12,16	12,16	12,16	12,16	12,16	12,16
d	cm	12,00	12,00	12,00	12,00	12,00	12,00	12,00	12,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00
db	cm	12,00	12,00	12,00	12,00	12,00	12,00	12,00	12,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00
td	cm	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40
g	cm	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
R_{wf}	Tnf/cm2	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84
b	cm	20,92	24,75	19,94	23,30	17,60	19,94	17,28	19,49	13,25	14,40	13,25	14,66	12,21	13,25	12,36	13,46	8,04	9,15	8,04	10,02	8,04	11,12	8,04	12,19
f	cm	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	3,00	2,00	3,00	2,00	3,00	1,00	3,00	1,00
d/D		0,86	0,86	0,86	0,86	0,86	0,86	0,86	0,86	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,57	0,67	0,57	0,67	0,57	0,80	0,57	0,80
g/d		0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13
Y_c		1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
Yd	f axial stre	1,20	1,20	1,00	1,00	1,20	1,20	1,00	1,00	1,20	1,20	1,20	1,20	1,00	1,00	1,20	1,20	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
Y_D		1,00	1,00	1,00	1,00	1,00	1,00	1,00	0,79	0,79	1,00	1,00	0,79	0,79	1,00	1,00	0,68	0,71	1,00	0,71	1,00	1,00	1,00	1,00	1,00
Yt		1,00	0,80	0,80	1,00	1,00	0,80	0,80	1,00	1,00	0,80	0,80	1,00	1,00	0,80	0,80	1,00	1,00	0,80	1,00	0,80	1,00	0,80	1,00	0,80
k_f	cm	0,50	0,40	0,40	0,50	0,50	0,40	0,40	0,50	0,50	0,40	0,40	0,50	0,50	0,40	0,40	0,50	0,50	0,40	0,50	0,40	0,50	0,40	0,50	0,40
Chord's web use factor		0,30	0,31	0,33	0,16	0,17	0,18	0,16	0,08	0,20	0,09	0,04	0,04	0,24	0,21	0,37	0,30	-0,05	0,88	0,23	0,59	0,27	0,19	0,27	0,10
Truss member use factor		0,61	0,53	0,54	0,45	0,43	0,34	0,33	0,27	0,15	0,07	0,02	0,02	0,18	0,17	0,28	0,24	0,12	0,26	0,17	0,19	0,19	0,14	0,17	0,10
Welding strength use factor		0,72	0,69	0,68	0,41	0,43	0,38	0,35	0,21	0,16	0,09	0,02	0,02	0,17	0,19	0,39	0,25	0,13	0,32	0,18	0,22	0,20	0,15	0,19	0,10

Table B.3. 24-meter truss connections inspection under 2.7 t/m per unit length

№		1U	1B	2B	2U	3U	3B	4B	4U	5U	5B	6B	6U	7U	7B	8B	8U	V1U	V1B	V2U	V2B	V3U	V3B	V4U	V4B
M	Tnf*cm	7,30	23,90	1,40	15,30	26,70	4,50	20,50	8,20	9,00	6,40	6,00	7,00	4,80	5,20	6,80	1,20	-21,70	27,80	-8,50	7,60	0,20	-0,60	3,10	-5,00
N	Tnf	50,59	48,87	34,03	34,03	20,79	18,62	12,75	12,75	5,07	2,67	0,22	0,22	5,29	5,16	9,09	9,09	3,55	3,55	3,61	3,61	3,45	3,45	2,99	2,99
F	Tnf	-44,49	71,86	71,86	-44,49	-44,49	97,93	97,93	-88,99	-88,99	101,46	101,46	-88,99	-88,99	92,56	92,56	-102,13	-98,38	50,59	-98,38	20,79	0,00	5,07	0,00	9,09
R_y	Tnf/cm2	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	2,55	3,45	2,55	3,45	2,55
E	Tnf/cm2	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100
A	cm^2	32,16	32,16	32,16	32,16	32,16	32,16	32,16	32,16	32,16	32,16	32,16	32,16	32,16	32,16	32,16	32,16	32,16	18,50	32,16	18,50	32,16	15,36	32,16	15,36
D	cm	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	12,00	14,00	12,00	14,00	10,00	14,00	10,00
D_b	cm	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	12,00	14,00	12,00	14,00	10,00	14,00	10,00
t	cm	0,60	0,60	0,60	0,60	0,60	0,60	0,60	0,60	0,60	0,60	0,60	0,60	0,60	0,60	0,60	0,60	0,60	0,40	0,60	0,40	0,60	0,40	0,60	0,40
α	degree	35,00	29,00	37,00	31,00	43,00	37,00	44,00	38,00	49,00	44,00	49,00	43,00	55,00	49,00	54,00	48,00	84,00	61,00	84,00	53,00	84,00	46,00	84,00	41,00
R_{yd}	Tnf/cm2	3,45	3,45	3,45	3,45	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55
Ad	cm^2	18,50	18,50	18,50	18,50	18,50	18,50	18,50	18,50	15,36	15,36	15,36	15,36	15,36	15,36	15,36	15,36	12,16	12,16	12,16	12,16	12,16	12,16	12,16	12,16
d	cm	12,00	12,00	12,00	12,00	12,00	12,00	12,00	12,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00
db	cm	12,00	12,00	12,00	12,00	12,00	12,00	12,00	12,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00
td	cm	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40
g	cm	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
R_{wf}	Tnf/cm2	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84
b	cm	20,92	24,75	19,94	23,30	17,60	19,94	17,28	19,49	13,25	14,40	13,25	14,66	12,21	13,25	12,36	13,46	8,04	9,15	8,04	10,02	8,04	11,12	8,04	12,19
f	cm	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	3,00	2,00	3,00	2,00	3,00	1,00	3,00	1,00
d/D		0,86	0,86	0,86	0,86	0,86	0,86	0,86	0,86	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,57	0,67	0,57	0,67	0,57	0,80	0,57	0,80
g/d		0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13
Y_c		1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
Yd	f axial stre	1,20	1,20	1,00	1,00	1,20	1,20	1,00	1,00	1,20	1,20	1,20	1,20	1,00	1,00	1,20	1,20	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
Y_D		1,00	1,00	1,00	1,00	1,00	1,00	1,00	0,70	0,70	1,00	1,00	0,70	0,70	1,00	1,00	0,58	0,61	1,00	0,61	1,00	1,00	1,00	1,00	1,00
Yt		1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	0,80	1,00	0,80	1,00	0,80	1,00	0,80
k_f	cm	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,40	0,50	0,40	0,50	0,40	0,50	0,40
Chord's web use factor		0,33	0,23	0,25	0,18	0,19	0,14	0,12	0,10	0,23	0,08	0,03	0,04	0,30	0,18	0,29	0,39	0,13	0,97	0,27	0,64	0,29	0,20	0,29	0,10
Truss member use factor		0,69	0,57	0,58	0,51	0,48	0,36	0,36	0,31	0,16	0,08	0,02	0,02	0,21	0,19	0,30	0,26	0,13	0,29	0,18	0,20	0,20	0,15	0,19	0,10
Welding strength use factor		0,82	0,59	0,60	0,46	0,48	0,33	0,31	0,24	0,17	0,08	0,02	0,01	0,20	0,17	0,33	0,28	0,14	0,35	0,19	0,23	0,22	0,16	0,20	0,10

Table B.4. 24-meter truss connections inspection under 2.9 t/m per unit length

№		1U	1B	2B	2U	3U	3B	4B	4U	5U	5B	6B	6U	7U	7B	8B	8U	V1U	V1B	V2U	V2B	V3U	V3B	V4U	V4B
M	Tnf*cm	8,10	23,10	-0,90	17,60	30,40	1,20	18,30	10,40	10,90	4,80	4,90	8,20	6,10	4,10	6,00	2,00	-21,70	27,80	-8,50	7,60	0,20	-0,60	3,10	-5,00
N	Tnf	54,49	52,59	36,49	36,49	22,57	20,11	13,55	13,55	5,59	2,88	0,36	0,36	5,62	5,47	9,82	9,82	3,92	3,92	4,09	4,09	3,90	3,90	3,32	3,32
F	Tnf	-47,92	77,28	77,28	-47,92	-47,92	105,38	105,38	-95,88	-95,88	109,19	109,19	-95,88	-95,88	99,65	99,65	-109,99	-105,94	54,49	-105,94	22,57	0,00	5,59	0,00	9,82
R_y	Tnf/cm2	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	2,55	3,45	2,55	3,45	2,55
E	Tnf/cm2	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100
A	cm^2	37,24	32,16	32,16	37,24	37,24	32,16	32,16	37,24	37,24	32,16	32,16	37,24	37,24	32,16	32,16	37,24	37,24	18,50	37,24	18,50	37,24	15,36	37,24	15,36
D	cm	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	12,00	14,00	12,00	14,00	10,00	14,00	10,00
D_b	cm	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	12,00	14,00	12,00	14,00	10,00	14,00	10,00
t	cm	0,70	0,60	0,60	0,70	0,70	0,60	0,60	0,70	0,70	0,60	0,60	0,70	0,70	0,60	0,60	0,70	0,70	0,40	0,70	0,40	0,70	0,40	0,70	0,40
α	degree	35,00	29,00	37,00	31,00	43,00	37,00	44,00	38,00	49,00	44,00	49,00	43,00	55,00	49,00	54,00	48,00	84,00	61,00	84,00	53,00	84,00	46,00	84,00	41,00
R_{yd}	Tnf/cm2	3,45	3,45	3,45	3,45	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55
Ad	cm^2	18,50	18,50	18,50	18,50	18,50	18,50	18,50	18,50	15,36	15,36	15,36	15,36	15,36	15,36	15,36	15,36	12,16	12,16	12,16	12,16	12,16	12,16	12,16	12,16
d	cm	12,00	12,00	12,00	12,00	12,00	12,00	12,00	12,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00
db	cm	12,00	12,00	12,00	12,00	12,00	12,00	12,00	12,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00
td	cm	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40
g	cm	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
R_{wf}	Tnf/cm2	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84
b	cm	20,92	24,75	19,94	23,30	17,60	19,94	17,28	19,49	13,25	14,40	13,25	14,66	12,21	13,25	12,36	13,46	8,04	9,15	8,04	10,02	8,04	11,12	8,04	12,19
f	cm	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	3,00	2,00	3,00	2,00	3,00	1,00	3,00	1,00
d/D		0,86	0,86	0,86	0,86	0,86	0,86	0,86	0,86	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,57	0,67	0,57	0,67	0,57	0,80	0,57	0,80
g/d		0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13
Y_c		1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
Yd	f axial stre	1,20	1,20	1,00	1,00	1,20	1,20	1,00	1,00	1,20	1,20	1,20	1,20	1,00	1,00	1,20	1,20	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
Y_D		1,00	1,00	1,00	1,00	1,00	1,00	1,00	0,75	0,75	1,00	1,00	0,75	0,75	1,00	1,00	0,64	0,68	1,00	0,68	1,00	1,00	1,00	1,00	1,00
Yt		1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	0,80	1,00	0,80	1,00	0,80	1,00	0,80
k_f	cm	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,40	0,50	0,40	0,50	0,40	0,50	0,40
Chord's web use factor		0,31	0,25	0,27	0,17	0,18	0,15	0,13	0,09	0,18	0,08	0,03	0,03	0,22	0,18	0,30	0,28	0,11	0,91	0,22	0,70	0,24	0,23	0,24	0,12
Truss member use factor		0,72	0,62	0,63	0,53	0,51	0,39	0,38	0,32	0,17	0,08	0,02	0,02	0,22	0,20	0,32	0,28	0,14	0,31	0,20	0,23	0,22	0,17	0,20	0,12
Welding strength use factor		0,85	0,64	0,64	0,48	0,50	0,35	0,32	0,25	0,18	0,08	0,02	0,02	0,21	0,18	0,36	0,29	0,15	0,38	0,21	0,26	0,24	0,18	0,21	0,12

Table B.5. 24-meter truss connections inspection under 3.3 t/m per unit length

№		1U	1B	2B	2U	3U	3B	4B	4U	5U	5B	6B	6U	7U	7B	8B	8U	V1U	V1B	V2U	V2B	V3U	V3B	V4U	V4B
M	Tnf*cm	9,90	23,60	-0,80	16,80	32,50	-0,60	20,10	9,00	11,00	4,90	4,90	8,20	5,90	4,30	6,30	1,60	-27,50	35,10	-10,70	9,90	0,03	-0,40	3,70	-5,80
N	Tnf	61,72	59,58	41,39	41,39	25,49	22,72	15,42	15,42	6,25	3,22	0,34	0,34	6,44	6,28	11,02	11,02	4,42	4,42	4,60	4,60	4,36	4,36	3,65	3,65
F	Tnf	-54,74	88,33	88,33	-54,74	-54,74	120,42	120,42	-109,51	-109,51	124,77	124,77	-109,51	-109,51	113,88	113,88	-125,63	-120,99	62,23	-120,99	25,70	0,00	6,31	0,00	11,11
R_y	Tnf/cm2	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	2,55	3,45	2,55	3,45	2,55
E	Tnf/cm2	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100
A	cm^2	42,24	37,24	37,24	42,24	42,24	37,24	37,24	42,24	42,24	37,24	37,24	42,24	42,24	37,24	37,24	42,24	42,24	18,50	42,24	18,50	42,24	15,36	42,24	15,36
D	cm	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	12,00	14,00	12,00	14,00	10,00	14,00	10,00
D_b	cm	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	12,00	14,00	12,00	14,00	10,00	14,00	10,00
t	cm	0,80	0,70	0,70	0,80	0,80	0,70	0,70	0,80	0,80	0,70	0,70	0,80	0,80	0,70	0,70	0,80	0,80	0,40	0,80	0,40	0,80	0,40	0,80	0,40
α	degree	35,00	29,00	37,00	31,00	43,00	37,00	44,00	38,00	49,00	44,00	49,00	43,00	55,00	49,00	54,00	48,00	84,00	61,00	84,00	53,00	84,00	46,00	84,00	41,00
R_{yd}	Tnf/cm2	3,45	3,45	3,45	3,45	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55
Ad	cm^2	18,50	18,50	18,50	18,50	18,50	18,50	18,50	18,50	15,36	15,36	15,36	15,36	15,36	15,36	15,36	15,36	12,16	12,16	12,16	12,16	12,16	12,16	12,16	12,16
d	cm	12,00	12,00	12,00	12,00	12,00	12,00	12,00	12,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00
db	cm	12,00	12,00	12,00	12,00	12,00	12,00	12,00	12,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00
td	cm	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40
g	cm	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
R_{wf}	Tnf/cm2	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84
b	cm	20,92	24,75	19,94	23,30	17,60	19,94	17,28	19,49	13,25	14,40	13,25	14,66	12,21	13,25	12,36	13,46	8,04	9,15	8,04	10,02	8,04	11,12	8,04	12,19
f	cm	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	3,00	2,00	3,00	2,00	3,00	1,00	3,00	1,00
d/D		0,86	0,86	0,86	0,86	0,86	0,86	0,86	0,86	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,57	0,67	0,57	0,67	0,57	0,80	0,57	0,80
g/d		0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13
Y_c		1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
Yd	f axial stre	1,20	1,20	1,00	1,00	1,20	1,20	1,00	1,00	1,20	1,20	1,20	1,20	1,00	1,00	1,20	1,20	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
Y_D		1,00	1,00	1,00	1,00	1,00	1,00	1,00	0,75	0,75	1,00	1,00	0,75	0,75	1,00	1,00	0,64	0,67	1,00	0,67	1,00	1,00	1,00	1,00	1,00
Yt		1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	0,80	1,00	0,80	1,00	0,80	1,00	0,80
k_f	cm	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,40	0,50	0,40	0,50	0,40	0,50	0,40
Chord's web use factor		0,31	0,24	0,26	0,17	0,18	0,14	0,13	0,09	0,15	0,06	0,02	0,02	0,19	0,15	0,25	0,24	0,20	0,81	0,18	0,82	0,20	0,26	0,20	0,13
Truss member use factor		0,80	0,67	0,69	0,58	0,55	0,42	0,42	0,35	0,19	0,09	0,02	0,02	0,24	0,22	0,34	0,30	0,15	0,36	0,22	0,26	0,24	0,19	0,21	0,13
Welding strength use factor		0,94	0,70	0,70	0,52	0,55	0,38	0,35	0,27	0,20	0,09	0,02	0,02	0,23	0,20	0,38	0,32	0,16	0,44	0,23	0,30	0,26	0,20	0,23	0,13

Table B.6. 30-meter truss connections inspection under 1.5 t/m per unit length

№		1U	1B	2B	2U	3U	3B	4B	4U	5U	5B	6B	6U	7U	7B	8B	8U	9U	9B	10B	10U	V1U	V1B	V2U	V2B	V3U	V3B	V4U	V4B	V5U	V5B
M	Tnf*cm	4,60	16,80	1,60	11,40	19,30	4,70	15,60	6,60	7,80	4,30	6,00	4,90	4,30	5,20	3,20	5,40	2,10	4,20	4,00	1,20	-14,30	18,30	-6,40	5,90	-1,50	1,10	1,30	-1,70	2,20	-3,50
N	Tnf	33,97	33,06	23,90	23,90	15,80	14,65	10,88	10,88	6,15	4,87	2,88	2,88	0,15	0,07	2,63	2,63	4,85	4,85	5,52	6,79	1,88	1,88	1,91	1,91	1,84	1,84	1,78	1,78	1,51	1,51
F	Tnf	-29,61	48,63	48,63	-29,61	-29,61	69,10	69,10	-61,49	-61,49	75,40	75,40	-61,49	-61,49	73,73	73,73	-73,89	-73,89	0,00	0,00	-73,89	-75,65	33,97	-75,65	15,80	-71,16	6,15	-71,16	2,63	0,00	6,79
R_y	Tnf/cm2	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	2,55	3,45	2,55	3,45	2,55	3,45	2,55
E	Tnf/cm2	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100
A	cm^2	26,90	26,90	26,90	26,90	26,90	26,90	26,90	26,90	26,90	26,90	26,90	26,90	26,90	26,90	26,90	26,90	26,90	26,90	26,90	26,90	26,90	18,50	26,90	18,50	26,90	15,36	26,90	15,36	26,90	15,36
D	cm	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	12,00	14,00	12,00	14,00	10,00	14,00	10,00	14,00	10,00
D_b	cm	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	12,00	14,00	12,00	14,00	10,00	14,00	10,00	14,00	10,00
t	cm	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,40	0,50	0,40	0,50	0,40	0,50	0,40	0,50	0,40
α	degree	35,00	29,00	37,00	31,00	43,00	37,00	44,00	38,00	49,00	44,00	49,00	43,00	55,00	49,00	54,00	48,00	59,00	54,00	57,00	52,00	84,00	61,00	84,00	53,00	84,00	46,00	84,00	41,00	84,00	33,00
R_{yd}	Tnf/cm2	3,45	3,45	3,45	3,45	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55
Ad	cm^2	18,50	18,50	18,50	18,50	18,50	18,50	18,50	18,50	15,36	15,36	15,36	15,36	15,36	15,36	15,36	15,36	15,36	15,36	15,36	15,36	12,16	12,16	12,16	12,16	12,16	12,16	12,16	12,16	12,16	12,16
d	cm	12,00	12,00	12,00	12,00	12,00	12,00	12,00	12,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00
db	cm	12,00	12,00	12,00	12,00	12,00	12,00	12,00	12,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00
td	cm	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40
g	cm	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
R_{wf}	Tnf/cm2	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84
b	cm	20,92	24,75	19,94	23,30	17,60	19,94	17,28	19,49	13,25	14,40	13,25	14,66	12,21	13,25	12,36	13,46	11,67	12,36	11,92	12,69	8,04	9,15	8,04	10,02	8,04	11,12	8,04	12,19	8,04	14,69
f	cm	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	3,00	2,00	3,00	2,00	3,00	1,00	3,00	1,00	3,00	1,00
d/D		0,86	0,86	0,86	0,86	0,86	0,86	0,86	0,86	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,57	0,67	0,57	0,67	0,57	0,80	0,57	0,80	0,57	0,80
g/d		0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13
Y_c		1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
Yd	f axial stre	1,20	1,20	1,00	1,00	1,20	1,20	1,00	1,00	1,20	1,20	1,00	1,00	1,00	1,00	1,20	1,20	1,00	1,00	1,20	1,20	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
Y_D		1,00	1,00	1,00	1,00	1,00	1,00	1,00	0,84	0,84	1,00	1,00	0,84	0,84	1,00	1,00	0,70	0,70	1,00	1,00	0,70	0,68	1,00	0,68	1,00	0,73	1,00	0,73	1,00	1,00	1,00
Yt		0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80
k_f	cm	0,50	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40
Chord's web use factor		0,34	0,23	0,26	0,19	0,22	0,16	0,16	0,12	0,31	0,17	0,16	0,15	0,05	0,04	0,13	0,17	0,40	0,27	0,27	0,39	0,14	0,59	0,12	0,38	0,25	0,12	0,33	0,07	0,23	0,03
Truss member use factor		0,49	0,41	0,43	0,37	0,38	0,30	0,32	0,28	0,20	0,14	0,12	0,10	0,01	0,01	0,09	0,09	0,21	0,20	0,19	0,22	0,06	0,17	0,09	0,11	0,11	0,08	0,11	0,07	0,10	0,04
Welding strength use factor		0,57	0,53	0,55	0,42	0,47	0,34	0,34	0,27	0,27	0,18	0,13	0,11	0,02	0,01	0,13	0,12	0,25	0,23	0,28	0,30	0,08	0,20	0,12	0,13	0,14	0,09	0,15	0,06	0,13	0,04

Table B.7. 30-meter truss connections inspection under 1.7 t/m per unit length

№		1U	1B	2B	2U	3U	3B	4B	4U	5U	5B	6B	6U	7U	7B	8B	8U
M	Tnf*cm	5,40	16,50	-0,40	14,00	23,40	1,80	13,80	8,90	10,00	2,80	5,00	6,20	5,90	4,10	2,30	6,60
N	Tnf	38,32	37,25	26,83	26,83	17,98	16,57	12,11	12,11	7,06	5,48	3,13	3,13	0,08	-0,02	3,05	3,05
F	Tnf	-33,41	54,77	54,77	-33,41	-33,41	77,86	77,86	-69,40	-69,40	84,99	84,99	-69,40	-69,40	83,12	83,12	-83,36
R_y	Tnf/cm2	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45
E	Tnf/cm2	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100
A	cm^2	32,16	26,90	26,90	32,16	32,16	26,90	26,90	32,16	32,16	26,90	26,90	32,16	32,16	26,90	26,90	32,16
D	cm	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00
D_b	cm	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00
t	cm	0,60	0,50	0,50	0,60	0,60	0,50	0,50	0,60	0,60	0,50	0,50	0,60	0,60	0,50	0,50	0,60
α	degree	35,00	29,00	37,00	31,00	43,00	37,00	44,00	38,00	49,00	44,00	49,00	43,00	55,00	49,00	54,00	48,00
R_{yd}	Tnf/cm2	3,45	3,45	3,45	3,45	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55
Ad	cm^2	18,50	18,50	18,50	18,50	18,50	18,50	18,50	18,50	15,36	15,36	15,36	15,36	15,36	15,36	15,36	15,36
d	cm	12,00	12,00	12,00	12,00	12,00	12,00	12,00	12,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00
db	cm	12,00	12,00	12,00	12,00	12,00	12,00	12,00	12,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00
td	cm	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40
g	cm	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
R_{wf}	Tnf/cm2	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84
b	cm	20,92	24,75	19,94	23,30	17,60	19,94	17,28	19,49	13,25	14,40	13,25	14,66	12,21	13,25	12,36	13,46
f	cm	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00
d/D		0,86	0,86	0,86	0,86	0,86	0,86	0,86	0,86	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,71
g/d		0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10
Y_c		1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
Yd	f axial stre	1,20	1,20	1,00	1,00	1,20	1,20	1,00	1,00	1,20	1,20	1,00	1,00	1,00	1,00	1,20	1,20
Y_D		1,00	1,00	1,00	1,00	1,00	1,00	1,00	0,87	0,87	1,00	1,00	0,87	0,87	1,00	1,00	0,75
Yt		1,00	0,80	0,80	1,00	1,00	0,80	0,80	1,00	1,00	0,80	0,80	1,00	1,00	0,80	0,80	1,00
k_f	cm	0,50	0,40	0,40	0,50	0,50	0,40	0,40	0,50	0,50	0,40	0,40	0,50	0,50	0,40	0,40	0,50
Chord's web use factor		0,25	0,26	0,29	0,14	0,17	0,18	0,18	0,09	0,24	0,18	0,17	0,12	0,04	0,03	0,14	0,13
Truss member use factor		0,53	0,46	0,48	0,40	0,42	0,34	0,36	0,30	0,22	0,16	0,12	0,11	0,01	0,01	0,10	0,10
Welding strength use factor		0,62	0,59	0,61	0,36	0,41	0,38	0,37	0,23	0,24	0,20	0,14	0,09	0,01	0,01	0,15	0,10

№		9U	9B	10B	10U	V1U	V1B	V2U	V2B	V3U	V3B	V4U	V4B	V5U	V5B
M	Tnf*cm	3,10	3,40	3,40	1,90	-16,60	21,30	-7,20	6,80	-1,70	1,40	1,40	-1,80	2,40	-3,80
N	Tnf	5,41	5,41	6,18	7,68	2,21	2,21	2,35	2,35	2,27	2,27	2,16	2,16	1,79	1,79
F	Tnf	-83,36	0,00	0,00	-83,36	-85,34	38,32	-85,34	17,98	-80,26	7,06	-80,26	3,05	0,00	7,68
R_y	Tnf/cm2	3,45	3,45	3,45	3,45	3,45	3,45	3,45	2,55	3,45	2,55	3,45	2,55	3,45	2,55
E	Tnf/cm2	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100
A	cm^2	32,16	26,90	26,90	32,16	32,16	18,50	32,16	18,50	32,16	15,36	32,16	15,36	32,16	15,36
D	cm	14,00	14,00	14,00	14,00	14,00	12,00	14,00	12,00	14,00	10,00	14,00	10,00	14,00	10,00
D_b	cm	14,00	14,00	14,00	14,00	14,00	12,00	14,00	12,00	14,00	10,00	14,00	10,00	14,00	10,00
t	cm	0,60	0,50	0,50	0,60	0,60	0,40	0,60	0,40	0,60	0,40	0,60	0,40	0,60	0,40
α	degree	59,00	54,00	57,00	52,00	84,00	61,00	84,00	53,00	84,00	46,00	84,00	41,00	84,00	33,00
R_{yd}	Tnf/cm2	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55
Ad	cm^2	15,36	15,36	15,36	15,36	12,16	12,16	12,16	12,16	12,16	12,16	12,16	12,16	12,16	12,16
d	cm	10,00	10,00	10,00	10,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00
db	cm	10,00	10,00	10,00	10,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00
td	cm	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40
g	cm	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
R_{wf}	Tnf/cm2	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84
b	cm	11,67	12,36	11,92	12,69	8,04	9,15	8,04	10,02	8,04	11,12	8,04	12,19	8,04	14,69
f	cm	2,00	2,00	2,00	2,00	3,00	2,00	3,00	2,00	3,00	1,00	3,00	1,00	3,00	1,00
d/D		0,71	0,71	0,71	0,71	0,57	0,67	0,57	0,67	0,57	0,80	0,57	0,80	0,57	0,80
g/d		0,10	0,10	0,10	0,10	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13
Y_c		1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
Yd	f axial stre	1,00	1,00	1,20	1,20	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
Y_D		0,75	1,00	1,00	0,75	0,73	1,00	0,73	1,00	0,78	1,00	0,78	1,00	1,00	1,00
Yt		1,00	0,80	0,80	1,00	1,00	0,80	1,00	0,80	1,00	0,80	1,00	0,80	1,00	0,80
k_f	cm	0,50	0,40	0,40	0,50	0,50	0,40	0,50	0,40	0,50	0,40	0,50	0,40	0,50	0,40
Chord's web use factor		0,30	0,29	0,29	0,29	0,10	0,69	0,11	0,46	0,21	0,15	0,26	0,09	0,18	0,04
Truss member use factor		0,22	0,22	0,22	0,24	0,07	0,19	0,11	0,14	0,13	0,10	0,13	0,08	0,11	0,05
Welding strength use factor		0,22	0,26	0,31	0,26	0,07	0,24	0,12	0,16	0,13	0,11	0,14	0,08	0,12	0,04

Table B.8. 30-meter truss connections inspection under 2.1 t/m per unit length

№		1U	1B	2B	2U	3U	3B	4B	4U	5U	5B	6B	6U	7U	7B	8B	8U	9U	9B	10B	10U	V1U	V1B	V2U	V2B	V3U	V3B	V4U	V4B	V5U	V5B
M	Tnf*cm	7,40	18,30	-0,30	14,10	27,10	0,20	16,90	8,00	11,00	2,80	5,90	6,40	6,10	4,80	2,40	7,20	2,90	4,10	3,90	1,80	-21,10	26,90	-9,40	8,90	-2,30	2,00	1,70	-2,20	3,00	-4,70
N	Tnf	46,98	45,66	32,96	32,96	21,95	20,23	14,93	14,93	8,58	6,68	3,90	3,90	0,17	0,05	3,66	3,66	6,71	6,71	7,55	9,32	2,72	2,72	2,86	2,86	2,74	2,74	2,61	2,61	2,11	2,11
F	Tnf	-42,22	69,28	69,28	-42,22	-42,22	98,47	98,47	-87,70	-87,70	107,46	107,46	-87,70	-87,70	105,10	105,10	-105,35	-105,35	0,00	0,00	-105,35	-107,85	48,42	-107,85	22,63	-101,44	8,84	-101,44	3,77	0,00	9,60
R_y	Tnf/cm2	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	2,55	3,45	2,55	3,45	2,55	3,45	2,55
E	Tnf/cm2	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100
A	cm^2	37,24	32,16	32,16	37,24	37,24	32,16	32,16	37,24	37,24	32,16	32,16	37,24	37,24	32,16	32,16	37,24	37,24	32,16	32,16	37,24	37,24	18,50	37,24	18,50	37,24	15,36	37,24	15,36	37,24	15,36
D	cm	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	12,00	14,00	12,00	14,00	10,00	14,00	10,00	14,00	10,00
D_b	cm	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	12,00	14,00	12,00	14,00	10,00	14,00	10,00	14,00	10,00
t	cm	0,70	0,60	0,60	0,70	0,70	0,60	0,60	0,70	0,70	0,60	0,60	0,70	0,70	0,60	0,60	0,70	0,70	0,60	0,60	0,70	0,70	0,40	0,70	0,40	0,70	0,40	0,70	0,40	0,70	0,40
α	degree	35,00	29,00	37,00	31,00	43,00	37,00	44,00	38,00	49,00	44,00	49,00	43,00	55,00	49,00	54,00	48,00	59,00	54,00	57,00	52,00	84,00	61,00	84,00	53,00	84,00	46,00	84,00	41,00	84,00	33,00
R_{yd}	Tnf/cm2	3,45	3,45	3,45	3,45	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55
Ad	cm^2	18,50	18,50	18,50	18,50	18,50	18,50	18,50	18,50	15,36	15,36	15,36	15,36	15,36	15,36	15,36	15,36	15,36	15,36	15,36	15,36	12,16	12,16	12,16	12,16	12,16	12,16	12,16	12,16	12,16	12,16
d	cm	12,00	12,00	12,00	12,00	12,00	12,00	12,00	12,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00
db	cm	12,00	12,00	12,00	12,00	12,00	12,00	12,00	12,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00
td	cm	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40
g	cm	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
R_{wf}	Tnf/cm2	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84
b	cm	20,92	24,75	19,94	23,30	17,60	19,94	17,28	19,49	13,25	14,40	13,25	14,66	12,21	13,25	12,36	13,46	11,67	12,36	11,92	12,69	8,04	9,15	8,04	10,02	8,04	11,12	8,04	12,19	8,04	14,69
f	cm	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	3,00	2,00	3,00	2,00	3,00	1,00	3,00	1,00	3,00	1,00
d/D		0,86	0,86	0,86	0,86	0,86	0,86	0,86	0,86	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,57	0,67	0,57	0,67	0,57	0,80	0,57	0,80	0,57	0,80
g/d		0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13
Y_c		1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
Yd	f axial stre	1,20	1,20	1,00	1,00	1,20	1,20	1,00	1,00	1,20	1,20	1,00	1,00	1,00	1,00	1,20	1,20	1,00	1,00	1,20	1,20	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
Y_D		1,00	1,00	1,00	1,00	1,00	1,00	1,00	0,82	0,82	1,00	1,00	0,82	0,82	1,00	1,00	0,68	0,68	1,00	1,00	0,68	0,66	1,00	0,66	1,00	0,71	1,00	0,71	1,00	1,00	1,00
Yt		1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	0,80	1,00	0,80	1,00	0,80	1,00	0,80	1,00	0,80
k_f	cm	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,40	0,50	0,40	0,50	0,40	0,50	0,40	0,50	0,40
Chord's web use factor		0,27	0,22	0,24	0,15	0,18	0,15	0,15	0,10	0,23	0,15	0,14	0,11	0,03	0,02	0,11	0,12	0,29	0,25	0,25	0,28	0,14	0,86	0,10	0,57	0,20	0,19	0,25	0,11	0,16	0,04
Truss member use factor		0,62	0,53	0,57	0,48	0,49	0,39	0,42	0,35	0,26	0,18	0,15	0,13	0,02	0,01	0,12	0,11	0,26	0,26	0,25	0,28	0,08	0,24	0,13	0,17	0,15	0,12	0,15	0,10	0,13	0,06
Welding strength use factor		0,73	0,55	0,58	0,43	0,49	0,35	0,35	0,27	0,28	0,18	0,13	0,11	0,02	0,01	0,13	0,12	0,26	0,24	0,29	0,31	0,08	0,29	0,14	0,20	0,16	0,13	0,16	0,10	0,14	0,05

Table B.9. 30-meter truss connections inspection under 2.3 t/m per unit length

№		1U	1B	2B	2U	3U	3B	4B	4U	5U	5B	6B	6U	7U	7B	8B	8U	9U	9B	10B	10U	V1U	V1B	V2U	V2B	V3U	V3B	V4U	V4B	V5U	V5B
M	Tnf*cm	8,80	17,80	-0,01	12,70	28,00	-1,50	18,00	6,30	10,90	2,50	6,00	5,80	5,80	4,80	2,20	7,10	2,50	4,30	3,90	1,50	-23,50	29,70	-10,50	10,00	-2,60	2,40	1,80	-2,30	3,30	-5,00
N	Tnf	53,23	51,74	37,39	37,39	24,81	22,87	16,97	16,97	9,66	7,53	4,47	4,47	0,25	0,12	4,09	4,09	7,65	7,65	8,54	10,48	3,07	3,07	3,22	3,22	3,06	3,06	2,91	2,91	2,31	2,31
F	Tnf	-46,42	76,21	76,21	-46,42	-46,42	108,30	108,30	-96,42	-96,42	118,18	118,18	-96,42	-96,42	115,57	115,57	-115,82	-115,82	0,00	0,00	-115,82	-118,57	53,23	-118,57	24,81	-111,51	9,66	-111,51	4,09	0,00	10,48
R_y	Tnf/cm2	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	2,55	3,45	2,55	3,45	2,55	3,45	2,55
E	Tnf/cm2	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100
A	cm^2	42,24	37,24	37,24	42,24	42,24	37,24	37,24	42,24	42,24	37,24	37,24	42,24	42,24	37,24	37,24	42,24	42,24	37,24	37,24	42,24	42,24	18,50	42,24	18,50	42,24	15,36	42,24	15,36	42,24	15,36
D	cm	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	12,00	14,00	12,00	14,00	10,00	14,00	10,00	14,00	10,00
D_b	cm	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	12,00	14,00	12,00	14,00	10,00	14,00	10,00	14,00	10,00
t	cm	0,80	0,70	0,70	0,80	0,80	0,70	0,70	0,80	0,80	0,70	0,70	0,80	0,80	0,70	0,70	0,80	0,80	0,70	0,70	0,80	0,80	0,40	0,80	0,40	0,80	0,40	0,80	0,40	0,80	0,40
α	degree	35,00	29,00	37,00	31,00	43,00	37,00	44,00	38,00	49,00	44,00	49,00	43,00	55,00	49,00	54,00	48,00	59,00	54,00	57,00	52,00	84,00	61,00	84,00	53,00	84,00	46,00	84,00	41,00	84,00	33,00
R_{yd}	Tnf/cm2	3,45	3,45	3,45	3,45	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55
Ad	cm^2	18,50	18,50	18,50	18,50	18,50	18,50	18,50	18,50	15,36	15,36	15,36	15,36	15,36	15,36	15,36	15,36	15,36	15,36	15,36	15,36	12,16	12,16	12,16	12,16	12,16	12,16	12,16	12,16	12,16	12,16
d	cm	12,00	12,00	12,00	12,00	12,00	12,00	12,00	12,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00
db	cm	12,00	12,00	12,00	12,00	12,00	12,00	12,00	12,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00
td	cm	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40
g	cm	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
R_{wf}	Tnf/cm2	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84
b	cm	20,92	24,75	19,94	23,30	17,60	19,94	17,28	19,49	13,25	14,40	13,25	14,66	12,21	13,25	12,36	13,46	11,67	12,36	11,92	12,69	8,04	9,15	8,04	10,02	8,04	11,12	8,04	12,19	8,04	14,69
f	cm	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	3,00	2,00	3,00	2,00	3,00	1,00	3,00	1,00	3,00	1,00
d/D		0,86	0,86	0,86	0,86	0,86	0,86	0,86	0,86	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,57	0,67	0,57	0,67	0,57	0,80	0,57	0,80	0,57	0,80
g/d		0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13
Y_c		1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
Yd	f axial stre	1,20	1,20	1,00	1,00	1,20	1,20	1,00	1,00	1,20	1,20	1,00	1,00	1,00	1,00	1,20	1,20	1,00	1,00	1,20	1,20	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
Y_D		1,00	1,00	1,00	1,00	1,00	1,00	1,00	0,84	0,84	1,00	1,00	0,84	0,84	1,00	1,00	0,71	0,71	1,00	1,00	0,71	0,69	1,00	0,69	1,00	0,73	1,00	0,73	1,00	1,00	1,00
Yt		1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	0,80	1,00	0,80	1,00	0,80	1,00	0,80	1,00	0,80
k_f	cm	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,40	0,50	0,40	0,50	0,40	0,50	0,40	0,50	0,40
Chord's web use factor		0,26	0,21	0,23	0,15	0,17	0,14	0,14	0,10	0,19	0,12	0,12	0,09	0,03	0,02	0,09	0,10	0,24	0,21	0,20	0,23	0,16	0,96	0,08	0,64	0,16	0,21	0,20	0,12	0,14	0,05
Truss member use factor		0,69	0,58	0,62	0,52	0,54	0,43	0,46	0,39	0,28	0,20	0,16	0,14	0,02	0,01	0,13	0,12	0,29	0,29	0,27	0,30	0,09	0,27	0,14	0,19	0,16	0,14	0,17	0,11	0,14	0,06
Welding strength use factor		0,81	0,60	0,63	0,47	0,53	0,39	0,39	0,30	0,30	0,20	0,14	0,12	0,02	0,01	0,14	0,13	0,28	0,27	0,32	0,33	0,09	0,33	0,15	0,22	0,17	0,15	0,18	0,11	0,15	0,06

Table B.10. 36-meter truss connections inspection under 1.3 t/m per unit length

№		1U	1B	2B	2U	3U	3B	4B	4U	5U	5B	6B	6U	7U	7B	8B	8U
M	Tnf*cm	4,70	17,50	1,80	11,80	20,70	4,90	17,00	6,70	8,80	4,40	7,00	5,00	5,70	4,70	4,70	5,20
N	Tnf	35,88	35,09	25,84	25,84	17,73	16,72	12,94	12,94	8,21	7,09	5,07	5,07	2,07	2,00	0,28	0,28
F	Tnf	-31,27	51,85	51,85	-31,27	-31,27	75,34	75,34	-66,26	-66,26	84,56	84,56	-66,26	-66,26	85,74	85,74	-81,65
R_y	Tnf/cm2	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45
E	Tnf/cm2	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100
A	cm^2	26,90	26,90	26,90	26,90	26,90	26,90	26,90	26,90	26,90	26,90	26,90	26,90	26,90	26,90	26,90	26,90
D	cm	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00
D_b	cm	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00
t	cm	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50
α	degree	35,00	29,00	37,00	31,00	43,00	37,00	44,00	38,00	49,00	44,00	49,00	43,00	55,00	49,00	54,00	48,00
R_{yd}	Tnf/cm2	3,45	3,45	3,45	3,45	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55
Ad	cm^2	18,50	18,50	18,50	18,50	18,50	18,50	18,50	18,50	15,36	15,36	15,36	15,36	15,36	15,36	15,36	15,36
d	cm	12,00	12,00	12,00	12,00	12,00	12,00	12,00	12,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00
db	cm	12,00	12,00	12,00	12,00	12,00	12,00	12,00	12,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00
td	cm	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40
g	cm	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
R_{wf}	Tnf/cm2	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84
b	cm	20,92	24,75	19,94	23,30	17,60	19,94	17,28	19,49	13,25	14,40	13,25	14,66	12,21	13,25	12,36	13,46
f	cm	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00
d/D		0,86	0,86	0,86	0,86	0,86	0,86	0,86	0,86	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,71
g/d		0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10
Y_c		1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
Yd	f axial stre	1,20	1,20	1,00	1,00	1,20	1,20	1,00	1,00	1,20	1,20	1,00	1,00	1,20	1,20	1,20	1,20
Y_D		1,00	1,00	1,00	1,00	1,00	1,00	1,00	0,79	0,79	1,00	1,00	0,79	0,79	1,00	1,00	0,62
Yt		0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80
k_f	cm	0,50	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40
Chord's web use factor		0,36	0,25	0,28	0,21	0,25	0,18	0,19	0,15	0,44	0,24	0,26	0,26	0,16	0,10	0,04	0,06
Truss member use factor		0,51	0,43	0,47	0,40	0,43	0,34	0,38	0,33	0,26	0,21	0,20	0,18	0,08	0,07	0,02	0,02
Welding strength use factor		0,61	0,56	0,59	0,46	0,53	0,39	0,40	0,32	0,35	0,26	0,22	0,18	0,11	0,09	0,02	0,02

№		9U	9B	10B	10U	11U	11B	12B	12U	V1U	V1B	V2U	V2B	V3U	V3B	V4U	V4B	V5U	V5B	V6U	V6B
M	Tnf*cm	2,50	5,60	1,90	5,70	1,00	4,40	3,30	1,30	-15,50	19,70	-7,40	6,90	-2,40	2,10	0,20	-0,70	1,90	-2,40	2,40	-3,60
N	Tnf	2,42	2,42	3,12	4,37	6,05	6,05	6,56	7,61	1,63	1,63	1,67	1,67	1,61	1,61	1,55	1,55	1,49	1,49	1,21	1,21
F	Tnf	-81,65	81,93	81,93	-81,65	-81,65	74,92	74,92	-86,35	-86,35	35,88	-84,73	17,73	-84,69	8,21	-84,69	2,07	-79,01	4,37	-79,01	7,61
R_y	Tnf/cm2	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	2,55	3,45	2,55	3,45	2,55	3,45	2,55	3,45	2,55
E	Tnf/cm2	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100
A	cm^2	26,90	26,90	26,90	26,90	26,90	26,90	26,90	26,90	26,90	18,50	26,90	18,50	26,90	15,36	26,90	15,36	26,90	15,36	26,90	15,36
D	cm	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	12,00	14,00	12,00	14,00	10,00	14,00	10,00	14,00	10,00	14,00	10,00
D_b	cm	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	12,00	14,00	12,00	14,00	10,00	14,00	10,00	14,00	10,00	14,00	10,00
t	cm	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,40	0,50	0,40	0,50	0,40	0,50	0,40	0,50	0,40	0,50	0,40
α	degree	59,00	54,00	57,00	52,00	63,00	57,00	60,00	55,00	84,00	61,00	84,00	53,00	84,00	46,00	84,00	41,00	84,00	33,00	84,00	30,00
R_{yd}	Tnf/cm2	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55
Ad	cm^2	15,36	15,36	15,36	15,36	15,36	15,36	15,36	15,36	12,16	12,16	12,16	12,16	12,16	12,16	12,16	12,16	12,16	12,16	12,16	12,16
d	cm	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00
db	cm	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00
td	cm	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40
g	cm	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
R_{wf}	Tnf/cm2	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84
b	cm	11,67	12,36	11,92	12,69	11,22	11,92	11,55	12,21	8,04	9,15	8,04	10,02	8,04	11,12	8,04	12,19	8,04	14,69	8,04	16,00
f	cm	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	3,00	2,00	3,00	2,00	3,00	1,00	3,00	1,00	3,00	1,00	3,00	1,00
d/D		0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,57	0,67	0,57	0,67	0,57	0,80	0,57	0,80	0,57	0,80	0,57	0,80
g/d		0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13
Y_c		1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
Yd	f axial stre	1,00	1,00	1,20	1,20	1,00	1,00	1,20	1,20	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
Y_D		0,62	1,00	1,00	0,62	0,62	1,00	1,00	0,57	0,57	1,00	0,59	1,00	0,59	1,00	0,59	1,00	0,65	1,00	0,65	1,00
Yt		0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80
k_f	cm	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40
Chord's web use factor		0,25	0,16	0,15	0,33	0,59	0,35	0,33	0,57	0,09	0,59	0,06	0,37	0,23	0,12	0,32	0,07	0,34	0,04	0,30	0,02
Truss member use factor		0,11	0,11	0,11	0,15	0,26	0,26	0,24	0,25	0,04	0,16	0,07	0,10	0,09	0,07	0,10	0,06	0,10	0,04	0,08	0,03
Welding strength use factor		0,13	0,12	0,16	0,20	0,33	0,31	0,35	0,36	0,05	0,19	0,10	0,12	0,12	0,08	0,13	0,06	0,13	0,04	0,11	0,02

Table B.11. 36-meter truss connections inspection under 1.7 t/m per unit length

№		1U	1B	2B	2U	3U	3B	4B	4U	5U	5B	6B	6U	7U	7B	8B	8U	9U	9B	10B	10U	11U	11B	12B	12U	V1U	V1B	V2U	V2B	V3U	V3B	V4U	V4B	V5U	V5B	V6U	V6B
M	Tnf*cm	6,90	17,20	-0,20	13,20	26,40	-0,03	16,80	7,20	11,30	2,40	6,40	5,70	7,50	3,30	3,80	6,20	3,30	5,20	0,70	7,00	1,20	4,20	2,80	1,70	-20,70	26,20	-9,80	9,40	-3,30	3,20	0,04	-0,60	2,40	-2,90	3,00	-4,40
N	Tnf	46,39	45,31	33,30	33,30	23,05	21,62	16,58	16,58	10,69	9,11	6,46	6,46	2,74	2,64	0,43	0,43	3,09	3,09	3,95	5,67	7,82	7,82	8,40	9,76	2,22	2,22	2,37	2,37	2,27	2,27	2,17	2,17	2,05	2,05	1,57	1,57
F	Tnf	-40,45	66,98	66,98	-40,45	-40,45	97,36	97,36	-85,72	-85,72	109,29	109,29	-85,72	-85,72	110,82	110,82	-105,58	-105,58	105,91	105,91	-105,58	-105,58	96,88	96,88	-111,63	-111,63	46,39	-109,54	23,05	-109,49	10,69	-109,49	2,74	-102,13	5,67	-102,13	9,76
R_y	Tnf/cm2	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	2,55	3,45	2,55	3,45	2,55	3,45	2,55	3,45	2,55
E	Tnf/cm2	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100
A	cm^2	37,24	32,16	32,16	37,24	37,24	32,16	32,16	37,24	37,24	32,16	32,16	37,24	37,24	32,16	32,16	37,24	37,24	32,16	32,16	37,24	37,24	32,16	32,16	37,24	37,24	18,50	37,24	18,50	37,24	15,36	37,24	15,36	37,24	15,36	37,24	15,36
D	cm	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	12,00	14,00	12,00	14,00	10,00	14,00	10,00	14,00	10,00	14,00	10,00
D_b	cm	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	12,00	14,00	12,00	14,00	10,00	14,00	10,00	14,00	10,00	14,00	10,00
t	cm	0,70	0,60	0,60	0,70	0,70	0,60	0,60	0,70	0,70	0,60	0,60	0,70	0,70	0,60	0,60	0,70	0,70	0,60	0,60	0,70	0,70	0,60	0,60	0,70	0,70	0,40	0,70	0,40	0,70	0,40	0,70	0,40	0,70	0,40	0,70	0,40
α	degree	35,00	29,00	37,00	31,00	43,00	37,00	44,00	38,00	49,00	44,00	49,00	43,00	55,00	49,00	54,00	48,00	59,00	54,00	57,00	52,00	63,00	57,00	60,00	55,00	84,00	61,00	84,00	53,00	84,00	46,00	84,00	41,00	84,00	33,00	84,00	30,00
R_{yd}	Tnf/cm2	3,45	3,45	3,45	3,45	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55
Ad	cm^2	18,50	18,50	18,50	18,50	18,50	18,50	18,50	18,50	15,36	15,36	15,36	15,36	15,36	15,36	15,36	15,36	15,36	15,36	15,36	15,36	15,36	15,36	15,36	15,36	12,16	12,16	12,16	12,16	12,16	12,16	12,16	12,16	12,16	12,16	12,16	12,16
d	cm	12,00	12,00	12,00	12,00	12,00	12,00	12,00	12,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00
db	cm	12,00	12,00	12,00	12,00	12,00	12,00	12,00	12,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00
td	cm	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40
g	cm	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
R_{wf}	Tnf/cm2	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84
b	cm	20,92	24,75	19,94	23,30	17,60	19,94	17,28	19,49	13,25	14,40	13,25	14,66	12,21	13,25	12,36	13,46	11,67	12,36	11,92	12,69	11,22	11,92	11,55	12,21	8,04	9,15	8,04	10,02	8,04	11,12	8,04	12,19	8,04	14,69	8,04	16,00
f	cm	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	3,00	2,00	3,00	2,00	3,00	1,00	3,00	1,00	3,00	1,00	3,00	1,00
d/D		0,86	0,86	0,86	0,86	0,86	0,86	0,86	0,86	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,57	0,67	0,57	0,67	0,57	0,80	0,57	0,80	0,57	0,80	0,57	0,80
g/d		0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13
Y_c		1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
Yd	f axial stre	1,20	1,20	1,00	1,00	1,20	1,20	1,00	1,00	1,20	1,20	1,00	1,00	1,20	1,20	1,20	1,20	1,00	1,00	1,20	1,20	1,00	1,00	1,20	1,20	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
Y_D		1,00	1,00	1,00	1,00	1,00	1,00	1,00	0,83	0,83	1,00	1,00	0,83	0,83	1,00	1,00	0,68	0,68	1,00	1,00	0,68	0,68	1,00	1,00	0,63	0,63	1,00	0,65	1,00	0,65	1,00	0,65	1,00	0,71	1,00	0,71	1,00
Yt		1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	0,80	1,00	0,80	1,00	0,80	1,00	0,80	1,00	0,80	1,00	0,80
k_f	cm	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,40	0,50	0,40	0,50	0,40	0,50	0,40	0,50	0,40	0,50	0,40
Chord's web use factor		0,26	0,21	0,24	0,15	0,18	0,16	0,16	0,11	0,27	0,20	0,22	0,16	0,10	0,08	0,03	0,04	0,15	0,13	0,12	0,20	0,35	0,31	0,28	0,34	-0,16	0,79	0,05	0,52	0,15	0,17	0,20	0,10	0,21	0,05	0,18	0,02
Truss member use factor		0,62	0,53	0,57	0,48	0,51	0,42	0,46	0,39	0,32	0,25	0,24	0,21	0,10	0,08	0,02	0,02	0,13	0,13	0,13	0,18	0,32	0,31	0,29	0,30	0,05	0,21	0,10	0,15	0,12	0,11	0,12	0,08	0,12	0,06	0,10	0,04
Welding strength use factor		0,72	0,55	0,58	0,43	0,51	0,38	0,39	0,30	0,34	0,25	0,21	0,17	0,11	0,09	0,02	0,02	0,12	0,12	0,15	0,20	0,32	0,30	0,34	0,34	0,06	0,26	0,11	0,17	0,12	0,11	0,13	0,08	0,13	0,05	0,11	0,03

Table B.12. 36-meter truss connections inspection under 1.9 t/m per unit length

№		1U	1B	2B	2U	3U	3B	4B	4U	5U	5B	6B	6U	7U	7B	8B	8U	9U	9B	10B	10U
M	Tnf*cm	8,30	17,10	0,10	12,10	27,90	-1,90	18,40	5,60	11,50	2,00	6,70	5,20	7,40	3,30	3,90	6,10	2,90	5,60	0,40	7,20
N	Tnf	52,22	51,01	37,52	37,52	25,88	24,29	18,72	18,72	11,98	10,23	7,32	7,32	3,04	2,93	0,44	0,44	3,53	3,53	4,43	6,33
F	Tnf	-45,54	75,44	75,44	-45,54	-45,54	109,64	109,64	-96,49	-96,49	123,06	123,06	-96,49	-96,49	124,77	124,77	-118,85	-118,85	119,24	119,24	-118,85
R_y	Tnf/cm2	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45	3,45
E	Tnf/cm2	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100
A	cm^2	42,24	37,24	37,24	42,24	42,24	37,24	37,24	42,24	42,24	37,24	37,24	42,24	42,24	37,24	37,24	42,24	42,24	37,24	37,24	42,24
D	cm	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00
D_b	cm	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00	14,00
t	cm	0,80	0,70	0,70	0,80	0,80	0,70	0,70	0,80	0,80	0,70	0,70	0,80	0,80	0,70	0,70	0,80	0,80	0,70	0,70	0,80
α	degree	35,00	29,00	37,00	31,00	43,00	37,00	44,00	38,00	49,00	44,00	49,00	43,00	55,00	49,00	54,00	48,00	59,00	54,00	57,00	52,00
R_{yd}	Tnf/cm2	3,45	3,45	3,45	3,45	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55
Ad	cm^2	18,50	18,50	18,50	18,50	18,50	18,50	18,50	18,50	15,36	15,36	15,36	15,36	15,36	15,36	15,36	15,36	15,36	15,36	15,36	15,36
d	cm	12,00	12,00	12,00	12,00	12,00	12,00	12,00	12,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00
db	cm	12,00	12,00	12,00	12,00	12,00	12,00	12,00	12,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00
td	cm	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40
g	cm	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
R_{wf}	Tnf/cm2	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84
b	cm	20,92	24,75	19,94	23,30	17,60	19,94	17,28	19,49	13,25	14,40	13,25	14,66	12,21	13,25	12,36	13,46	11,67	12,36	11,92	12,69
f	cm	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00
d/D		0,86	0,86	0,86	0,86	0,86	0,86	0,86	0,86	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,71
g/d		0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10
Y_c		1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
Yd	f axial stre	1,20	1,20	1,00	1,00	1,20	1,20	1,00	1,00	1,20	1,20	1,00	1,00	1,20	1,20	1,20	1,20	1,00	1,00	1,20	1,20
Y_D		1,00	1,00	1,00	1,00	1,00	1,00	1,00	0,84	0,84	1,00	1,00	0,84	0,84	1,00	1,00	0,68	0,68	1,00	1,00	0,68
Yt		1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
k_f	cm	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50
Chord's web use factor		0,26	0,21	0,23	0,15	0,18	0,15	0,16	0,11	0,23	0,17	0,18	0,13	0,08	0,06	0,02	0,03	0,12	0,11	0,10	0,16
Truss member use factor		0,68	0,58	0,62	0,53	0,56	0,45	0,50	0,42	0,35	0,27	0,26	0,23	0,10	0,09	0,02	0,02	0,14	0,14	0,14	0,19
Welding strength use factor		0,79	0,59	0,63	0,47	0,55	0,41	0,42	0,32	0,37	0,27	0,23	0,19	0,12	0,09	0,02	0,02	0,13	0,13	0,16	0,21

№		11U	11B	12B	12U	V1U	V1B	V2U	V2B	V3U	V3B	V4U	V4B	V5U	V5B	V6U	V6B
M	Tnf*cm	0,70	4,50	2,70	1,50	-23,50	29,60	-11,30	10,90	-3,90	3,80	-0,03	-0,50	2,70	-3,10	3,30	-4,90
N	Tnf	8,85	8,85	9,45	10,91	2,49	2,49	2,65	2,65	2,52	2,52	2,40	2,40	2,27	2,27	1,69	1,69
F	Tnf	-118,85	109,10	109,10	-125,67	-125,67	52,22	-123,30	25,88	-123,25	11,98	-123,25	3,04	-114,96	6,33	-114,96	10,91
R_y	Tnf/cm2	3,45	3,45	3,45	3,45	3,45	3,45	3,45	2,55	3,45	2,55	3,45	2,55	3,45	2,55	3,45	2,55
E	Tnf/cm2	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100
A	cm^2	42,24	37,24	37,24	42,24	42,24	18,50	42,24	18,50	42,24	15,36	42,24	15,36	42,24	15,36	42,24	15,36
D	cm	14,00	14,00	14,00	14,00	14,00	12,00	14,00	12,00	14,00	10,00	14,00	10,00	14,00	10,00	14,00	10,00
D_b	cm	14,00	14,00	14,00	14,00	14,00	12,00	14,00	12,00	14,00	10,00	14,00	10,00	14,00	10,00	14,00	10,00
t	cm	0,80	0,70	0,70	0,80	0,80	0,40	0,80	0,40	0,80	0,40	0,80	0,40	0,80	0,40	0,80	0,40
α	degree	63,00	57,00	60,00	55,00	84,00	61,00	84,00	53,00	84,00	46,00	84,00	41,00	84,00	33,00	84,00	30,00
R_{yd}	Tnf/cm2	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55	2,55
Ad	cm^2	15,36	15,36	15,36	15,36	12,16	12,16	12,16	12,16	12,16	12,16	12,16	12,16	12,16	12,16	12,16	12,16
d	cm	10,00	10,00	10,00	10,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00
db	cm	10,00	10,00	10,00	10,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00	8,00
td	cm	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40	0,40
g	cm	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
R_{wf}	Tnf/cm2	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84
b	cm	11,22	11,92	11,55	12,21	8,04	9,15	8,04	10,02	8,04	11,12	8,04	12,19	8,04	14,69	8,04	16,00
f	cm	2,00	2,00	2,00	2,00	3,00	2,00	3,00	2,00	3,00	1,00	3,00	1,00	3,00	1,00	3,00	1,00
d/D		0,71	0,71	0,71	0,71	0,57	0,67	0,57	0,67	0,57	0,80	0,57	0,80	0,57	0,80	0,57	0,80
g/d		0,10	0,10	0,10	0,10	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13
Y_c		1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
Yd	f axial stre	1,00	1,00	1,20	1,20	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
Y_D		0,68	1,00	1,00	0,64	0,64	1,00	0,65	1,00	0,65	1,00	0,65	1,00	0,71	1,00	0,71	1,00
Yt		1,00	1,00	1,00	1,00	1,00	0,80	1,00	0,80	1,00	0,80	1,00	0,80	1,00	0,80	1,00	0,80
k_f	cm	0,50	0,50	0,50	0,50	0,50	0,40	0,50	0,40	0,50	0,40	0,50	0,40	0,50	0,40	0,50	0,40
Chord's web use factor		0,30	0,26	0,23	0,29	0,16	0,89	0,04	0,59	0,13	0,19	0,17	0,11	0,18	0,06	0,15	0,02
Truss member use factor		0,35	0,34	0,31	0,33	0,06	0,24	0,11	0,17	0,13	0,12	0,13	0,09	0,13	0,07	0,10	0,04
Welding strength use factor		0,35	0,33	0,37	0,37	0,06	0,29	0,11	0,19	0,13	0,13	0,14	0,09	0,14	0,06	0,11	0,03

Table B.13. 36-meter truss connections inspection under 2.1 t/m per unit length

№		1U	1B	2B	2U	3U	3B	4B	4U	5U	5B	6B	6U	7U	7B	8B	8U	9U	9B
M	Tnf*cm	9,7	18,7	1,9	10,5	28,9	-1,4	22,6	3,1	11,1	3,1	8,3	4,4	6,9	4,4	5,0	5,7	2,0	6,9
N	Tnf	56,9	55,6	41,0	41,0	28,0	26,4	20,6	20,6	12,9	11,1	8,1	8,1	3,2	3,1	0,4	0,4	4,0	4,0
F	Tnf	-51,1	84,8	84,8	-51,1	-51,1	123,2	123,2	-108,3	-108,3	138,2	138,2	-108,3	-108,3	140,1	140,1	-133,4	-133,4	133,9
R_y	Tnf/cm2	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5
E	Tnf/cm2	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100
A	cm^2	42,2	42,2	42,2	42,2	42,2	42,2	42,2	42,2	42,2	42,2	42,2	42,2	42,2	42,2	42,2	42,2	42,2	42,2
D	cm	14,0	14,0	14,0	14,0	14,0	14,0	14,0	14,0	14,0	14,0	14,0	14,0	14,0	14,0	14,0	14,0	14,0	14,0
D_b	cm	14,0	14,0	14,0	14,0	14,0	14,0	14,0	14,0	14,0	14,0	14,0	14,0	14,0	14,0	14,0	14,0	14,0	14,0
t	cm	0,8	0,8	0,8	0,8	0,8	0,8	0,8	0,8	0,8	0,8	0,8	0,8	0,8	0,8	0,8	0,8	0,8	0,8
α	degree	35,0	29,0	37,0	31,0	43,0	37,0	44,0	38,0	49,0	44,0	49,0	43,0	55,0	49,0	54,0	48,0	59,0	54,0
R_{yd}	Tnf/cm2	3,5	3,5	3,5	3,5	2,6	2,6	2,6	2,6	2,6	2,6	2,6	2,6	2,6	2,6	2,6	2,6	2,6	2,6
Ad	cm^2	18,5	18,5	18,5	18,5	18,5	18,5	18,5	18,5	15,4	15,4	15,4	15,4	15,4	15,4	15,4	15,4	15,4	15,4
d	cm	12,0	12,0	12,0	12,0	12,0	12,0	12,0	12,0	10,0	10,0	10,0	10,0	10,0	10,0	10,0	10,0	10,0	10,0
db	cm	12,0	12,0	12,0	12,0	12,0	12,0	12,0	12,0	10,0	10,0	10,0	10,0	10,0	10,0	10,0	10,0	10,0	10,0
td	cm	0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,4
g	cm	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0
R_{wf}	Tnf/cm2	1,8	1,8	1,8	1,8	1,8	1,8	1,8	1,8	1,8	1,8	1,8	1,8	1,8	1,8	1,8	1,8	1,8	1,8
b	cm	20,9	24,8	19,9	23,3	17,6	19,9	17,3	19,5	13,3	14,4	13,3	14,7	12,2	13,3	12,4	13,5	11,7	12,4
f	cm	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00
d/D		0,86	0,86	0,86	0,86	0,86	0,86	0,86	0,86	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,71
g/d		0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10
Y_c		1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
Yd	f axial stre	1,20	1,20	1,00	1,00	1,20	1,20	1,00	1,00	1,20	1,20	1,00	1,00	1,20	1,20	1,20	1,20	1,00	1,00
Y_D		1,00	1,00	1,00	1,00	1,00	1,00	1,00	0,76	0,76	1,00	1,00	0,76	0,76	1,00	1,00	0,58	0,58	1,00
Yt		1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
k_f	cm	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,50
Chord's web use factor		0,28	0,20	0,22	0,16	0,20	0,14	0,15	0,12	0,27	0,14	0,16	0,16	0,09	0,05	0,02	0,03	0,16	0,10
Truss member use factor		0,74	0,61	0,66	0,57	0,60	0,48	0,54	0,46	0,37	0,29	0,28	0,25	0,11	0,09	0,02	0,02	0,15	0,15
Welding strength use factor		0,87	0,63	0,68	0,52	0,60	0,43	0,46	0,35	0,39	0,29	0,25	0,21	0,12	0,10	0,02	0,02	0,15	0,14

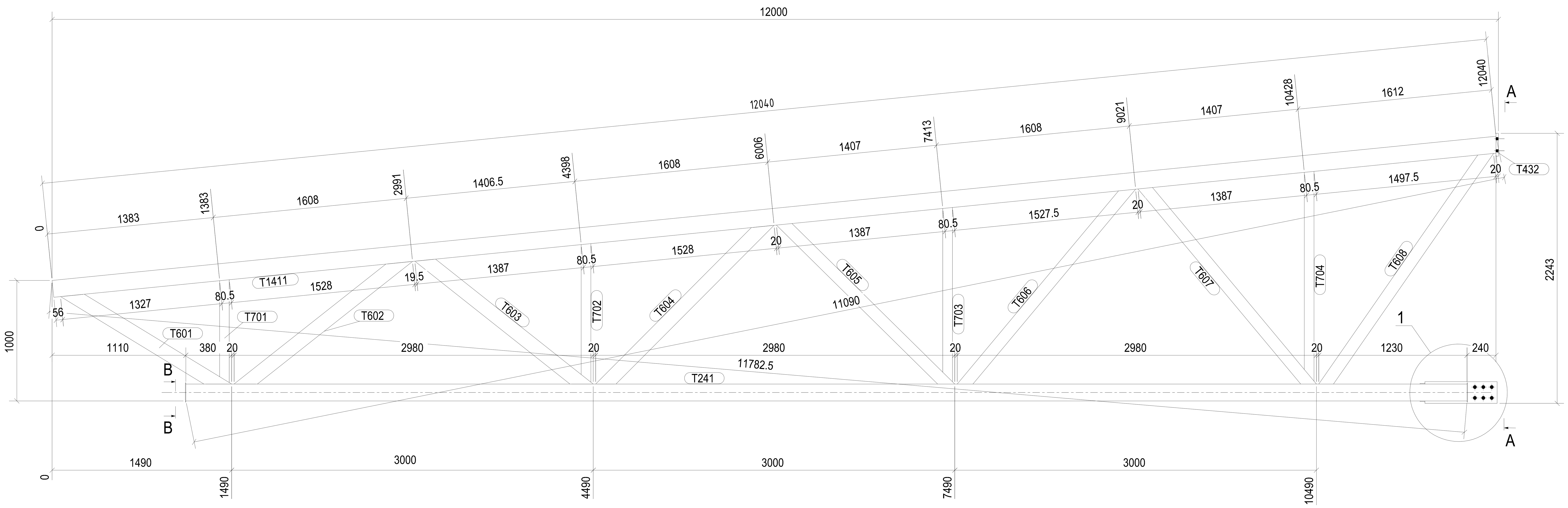
№		10B	10U	11U	11B	12B	12U	V1U	V1B	V2U	V2B	V3U	V3B	V4U	V4B	V5U	V5B	V6U	V6B
M	Tnf*cm	0,8	7,3	-0,2	5,6	3,3	1,0	-26,4	33,0	-12,9	12,3	-4,4	4,3	-0,1	-0,5	3,1	-3,5	3,7	-5,5
N	Tnf	4,8	6,8	9,7	9,7	10,3	11,8	2,6	2,6	2,7	2,7	2,6	2,6	2,5	2,5	2,3	2,3	1,7	1,7
F	Tnf	133,9	-133,4	-133,4	122,5	122,5	-141,1	-141,1	58,6	-138,4	28,9	-138,4	13,3	-138,4	3,3	-129,1	7,0	-129,1	12,2
R_y	Tnf/cm2	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	2,6	3,5	2,6	3,5	2,6	3,5	2,6	3,5	2,6
E	Tnf/cm2	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100
A	cm^2	42,2	42,2	42,2	42,2	42,2	42,2	42,2	18,5	42,2	18,5	42,2	15,4	42,2	15,4	42,2	15,4	42,2	15,4
D	cm	14,0	14,0	14,0	14,0	14,0	14,0	14,0	12,0	14,0	12,0	14,0	10,0	14,0	10,0	14,0	10,0	14,0	10,0
D_b	cm	14,0	14,0	14,0	14,0	14,0	14,0	14,0	12,0	14,0	12,0	14,0	10,0	14,0	10,0	14,0	10,0	14,0	10,0
t	cm	0,8	0,8	0,8	0,8	0,8	0,8	0,8	0,4	0,8	0,4	0,8	0,4	0,8	0,4	0,8	0,4	0,8	0,4
α	degree	57,0	52,0	63,0	57,0	60,0	55,0	84,0	61,0	84,0	53,0	84,0	46,0	84,0	41,0	84,0	33,0	84,0	30,0
R_{yd}	Tnf/cm2	2,6	2,6	2,6	2,6	2,6	2,6	2,6	2,6	2,6	2,6	2,6	2,6	2,6	2,6	2,6	2,6	2,6	2,6
Ad	cm^2	15,4	15,4	15,4	15,4	15,4	15,4	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2
d	cm	10,0	10,0	10,0	10,0	10,0	10,0	8,0	8,0	8,0	8,0	8,0	8,0	8,0	8,0	8,0	8,0	8,0	8,0
db	cm	10,0	10,0	10,0	10,0	10,0	10,0	8,0	8,0	8,0	8,0	8,0	8,0	8,0	8,0	8,0	8,0	8,0	8,0
td	cm	0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,4
g	cm	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0
R_{wf}	Tnf/cm2	1,8	1,8	1,8	1,8	1,8	1,8	1,8	1,8	1,8	1,8	1,8	1,8	1,8	1,8	1,8	1,8	1,8	1,8
b	cm	11,9	12,7	11,2	11,9	11,5	12,2	8,0	9,1	8,0	10,0	8,0	11,1	8,0	12,2	8,0	14,7	8,0	16,0
f	cm	2,00	2,00	2,00	2,00	2,00	2,00	3,00	2,00	3,00	2,00	3,00	1,00	3,00	1,00	3,00	1,00	3,00	1,00
d/D		0,71	0,71	0,71	0,71	0,71	0,71	0,57	0,67	0,57	0,67	0,57	0,80	0,57	0,80	0,57	0,80	0,57	0,80
g/d		0,10	0,10	0,10	0,10	0,10	0,10	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13	0,13
Y_c		1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
Yd	f axial stre	1,20	1,20	1,00	1,00	1,20	1,20	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
Y_D		1,00	0,58	0,58	1,00	1,00	0,53	0,53	1,00	0,55	1,00	0,55	1,00	0,55	1,00	0,61	1,00	0,61	1,00
Yt		1,00	1,00	1,00	1,00	1,00	1,00	1,00	0,80	1,00	0,80	1,00	0,80	1,00	0,80	1,00	0,80	1,00	0,80
k_f	cm	0,50	0,50	0,50	0,50	0,50	0,50	0,50	0,40	0,50	0,40	0,50	0,40	0,50	0,40	0,50	0,40	0,50	0,40
Chord's web use factor		0,08	0,21	0,38	0,22	0,20	0,37	0,15	0,98	0,02	0,63	0,15	0,20	0,21	0,12	0,22	0,06	0,18	0,02
Truss member use factor		0,15	0,21	0,38	0,37	0,33	0,35	0,05	0,26	0,10	0,17	0,13	0,12	0,13	0,10	0,14	0,07	0,11	0,04
Welding strength use factor		0,17	0,23	0,38	0,35	0,39	0,40	0,06	0,31	0,11	0,20	0,13	0,13	0,14	0,09	0,15	0,06	0,11	0,03

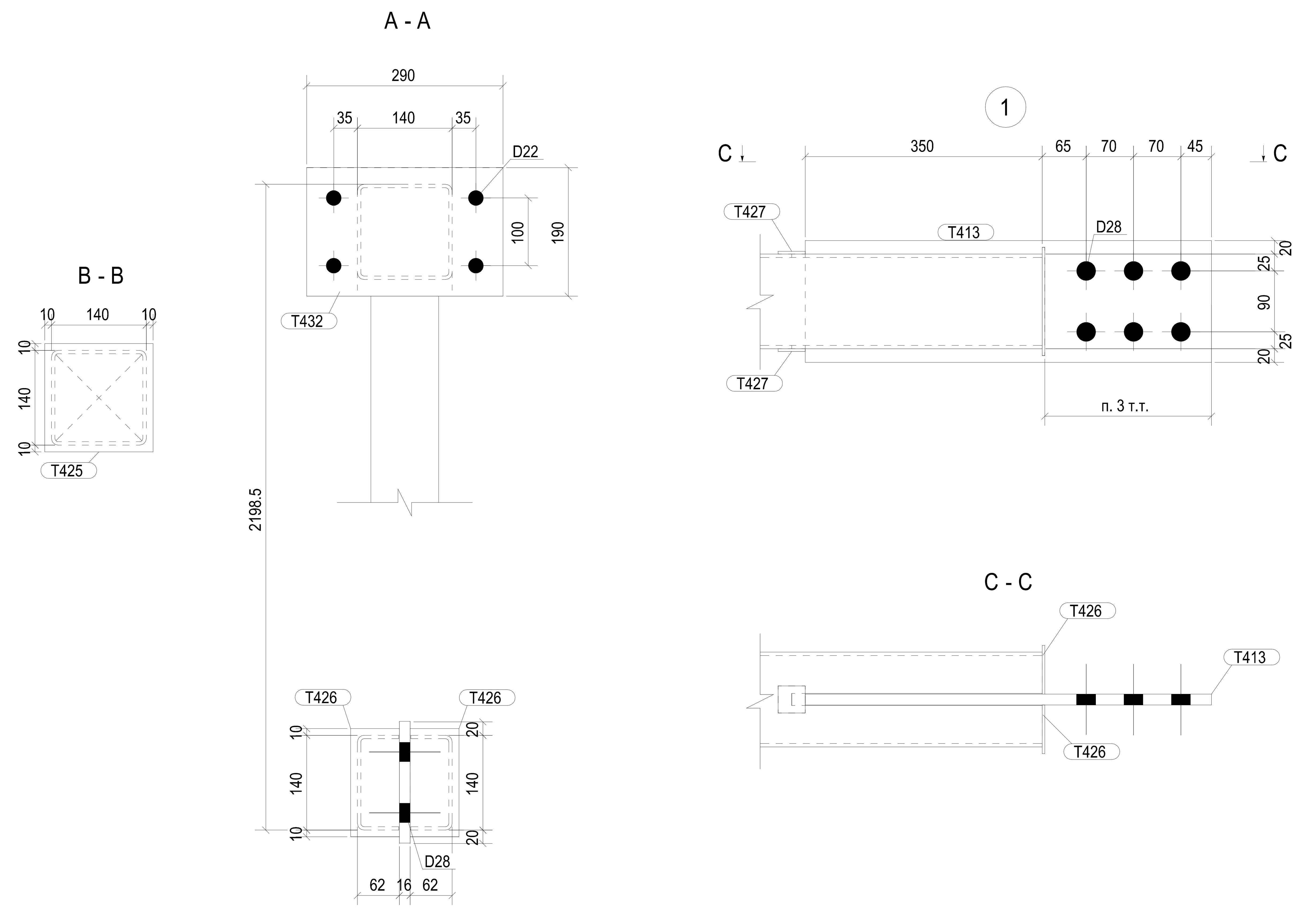
APPENDIX C

Table C.1. Bottom chord friction connections calculations

	Axial stress N	t	**75,4**	**85**	**85,7**	**85,9**	**89,7**	**101,5**	**104,3**	**109,2**	**110,8**	**118,2**	**123,7**	**124,8**	**136**
Gussets	Thickness	mm	16	16	16	25	25	25	25	25	25	25	25	25	25
	Heigh	mm	180	180	180	180	180	180	220	220	220	220	220	220	220
	Sections	mm^2	2880	2880	2880	4500	4500	4500	5500	5500	5500	5500	5500	5500	5500
	Design resistance	N/mm^2	300	300	300	300	300	300	300	300	300	300	300	300	300
Flanges	Thickness	mm	16	16	16	16	16	16	18	18	20	20	20	20	22
	Heigh	mm	180	180	180	220	220	220	220	220	220	220	220	220	220
	The number in one direction	units	2	2	2	2	2	2	2	2	2	2	2	2	2
	Design resistance	N/mm^2	300	300	300	300	300	300	300	300	300	300	300	300	300
Bolts	Bolts diameter	mm	24	24	24	24	24	24	24	24	24	24	24	24	24
	Backlash	mm	3	3	3	3	3	3	3	3	3	3	3	3	3
	Hole diameter	mm	27	27	27	27	27	27	27	27	27	27	27	27	27
	Number of bolts in horizontal direction	units	3	3	3	3	3	3	3	3	3	3	3	3	3
	Number of bolts in vertical direction	units	2	2	2	3	3	3	3	3	3	3	3	3	3
	Bolts amount	units	6	6	6	9	9	9	9	9	9	9	9	9	9
	Rbun - bolts characteristic resistance	N/mm^2	1078	1078	1078	1078	1078	1078	1078	1078	1078	1078	1078	1078	1078
	Rbh - bolts design resistance	N/mm^2	755	755	755	755	755	755	755	755	755	755	755	755	755
	Abn - bolts sectional area	cm^2	3,53	3,53	3,53	3,53	3,53	3,53	3,53	3,53	3,53	3,53	3,53	3,53	3,53
		mm^2	353	353	353	353	353	353	353	353	353	353	353	353	353
	H- frictional coefficient		0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35
	Yh- coefficient		1,17	1,17	1,17	1,17	1,17	1,17	1,17	1,17	1,17	1,17	1,17	1,17	1,17
	Qbh-force rated on one bolt friction area	N	79726,7094	79726,7094	79726,7094	79726,7094	79726,7094	79726,7094	79726,7094	79726,7094	79726,7094	79726,7094	79726,7094	79726,7094	79726,7094
		t	8,12709385	8,12709385	8,12709385	8,12709385	8,12709385	8,12709385	8,12709385	8,12709385	8,12709385	8,12709385	8,12709385	8,12709385	8,12709385
	k-friction surface amount	units	2	2	2	2	2	2	2	2	2	2	2	2	2
	Yc- coefficient of the work conditions		1	1	1	1	1	1	1	1	1	1	1	1	1
	Yb-coefficient of the friction surface work conditions		0,9	0,9	0,9	0,9	0,9	0,9	0,9	0,9	0,9	0,9	0,9	0,9	1
	N/(Qbh*k*Yb*Yc)	units	5,154227287	5,810468427	5,858319344	5,871991034	6,131753152	6,938382887	7,129786552	7,464742968	7,574116491	8,079969036	8,455940523	8,53113482	8,367074535
	Bolts use-factor	%	85,90378812	96,84114045	97,63865573	65,24434482	68,13059058	77,09314318	79,21985058	82,94158853	84,1568499	89,77743374	93,9548947	94,79038689	92,96749483
	Bolts conditional check n>N/(Qbh*k*Yb*Yc)		OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
Gussets and flanges check															
	Reduced gusset area	mm^2	2826	2826	2826	4419	4419	4419	5419	5419	5419	5419	5419	5419	5419
	Flange area	mm^2	2880	2880	2880	3520	3520	3520	3960	3960	4400	4400	4400	4400	4840
	Reduced flange area	mm^2	2826	2826	2826	3439	3439	3439	3879	3879	4319	4319	4319	4319	4759
	An (A) gusset	mm^2	2880	2880	2880	4500	4500	4500	5500	5500	5500	5500	5500	5500	5500
	An (A) flange	mm^2	2880	2880	2880	3520	3520	3520	3960	3960	4400	4400	4400	4400	4840
	N/An*Ry for the gusset		0,864044738	0,974055739	0,982077374	0,629996333	0,657865787	0,744407774	0,625862586	0,655265527	0,664866487	0,709270927	0,742274227	0,748874887	0,816081608
	N/An*Ry for the flange		0,864044738	0,974055739	0,982077374	0,805393039	0,841021602	0,951657666	0,869253592	0,910091009	0,831083108	0,886588659	0,927842784	0,936093609	0,927365464
	Gusset conditional check 1>N/An*Ry		OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
	Flange conditional check 1>N/An*Ry		OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
Welding check															
	b_f		0,7	0,7	0,7	0,7	0,7	0,7	0,7	0,7	0,7	0,7	0,7	0,7	0,7
	b_z		1	1	1	1	1	1	1	1	1	1	1	1	1
	R_{wf}	Н/мм2	215	215	215	215	215	215	215	215	215	215	215	215	215
	R_{wz}	Н/мм2	207	207	207	207	207	207	207	207	207	207	207	207	207
	Welding leg K_f	мм	5	5	5	6	6	6	6	6	7	7	7	7	7
	γ_c		0,8	0,8	0,8	0,8	0,8	0,8	0,8	0,8	0,8	0,8	0,8	0,8	0,8
	Welding length L_f	мм	1400	1400	1400	1600	1600	1600	1600	1600	1400	1400	1600	1600	1600
	Axial stress N	Н	739674	833850	840717	842679	879957	995715	1023183	1071252	1086948	1159542	1213497	1224288	1334160
	Weld metal use factor		0,877638823	0,989380636	0,997528477	0,729061981	0,76131385	0,86146439	0,885228924	0,92681686	0,921204827	0,982729338	0,899899887	0,907902231	0,989380636
	Conditional check $N/(b_f K_f R_{wf} \gamma_c)<1$		OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

APPENDIX D





Details list of 1

Index	Name	Number	Cross-section profile	Material	Length,mm	Mass unit, kg	Mass total, kg
T241	Bottom chord	1	O (MSH)140X140X5.0	C345	10630	222.2	222.2
T413	Gusset	1	- (BL)600x180x16.0	C255	600	13.8	13.8
T425	Pipe closer	1	- (BL)160x160x4.0	C255	160	0.8	0.8
T426	Pipe closer	2	- (BL)160x72x4.0	C255	160	0.4	0.7
T427	Pipe closer	2	- (BL)40x40x4.0	C255	40	0.1	0.1
T432	Flange	1	- (BL)190x290x20.0	C255	190	8.8	8.8
T601	Diagonal	1	O (MSH)120X120X4.0	C345	1591	20.4	20.4
T602	Diagonal	1	O (MSH)120X120X4.0	C345	1793	23.4	23.4
T603	Diagonal	1	O (MSH)120X120X4.0	C345	1794	23.9	23.9
T604	Diagonal	1	O (MSH)120X120X4.0	C345	1979	26.6	26.6
T605	Diagonal	1	O (MSH)100X100X4.0	C255	1981	22.4	22.4
T606	Diagonal	1	O (MSH)100X100X4.0	C255	2191	24.9	24.9
T607	Diagonal	1	O (MSH)100X100X4.0	C255	2192	25.1	25.1
T608	Diagonal	1	O (MSH)100X100X4.0	C255	2400	27.6	27.6
T701	Vertical	1	O (MSH)80X80X4.0	C255	854	7.7	7.7
T702	Vertical	1	O (MSH)80X80X4.0	C255	1150	10.4	10.4
T703	Vertical	1	O (MSH)80X80X4.0	C255	1446	13.1	13.1
T704	Vertical	1	O (MSH)80X80X4.0	C255	1742	15.8	15.8
T1411	Upper chord	1	O (MSH)140X140X5.0	C345	12040	252.1	252.1
						Total weight (kg):	739.9

Total dimensions (HxTxL): 2243 x 290 x 12000

Instead of index | Signature and date | Index

Rev.	Num.l.	Sheet	Doc №	Signature	Date
Designed		Baranovskii			20.04.2015
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Approved		Kleschev			20.04.2015

Standard truss designs album, 2015

T10121

Letter | Mass | Scale

Sheet | Sheets

Steel S345, S245 GOST 27772-88

RUUKKI

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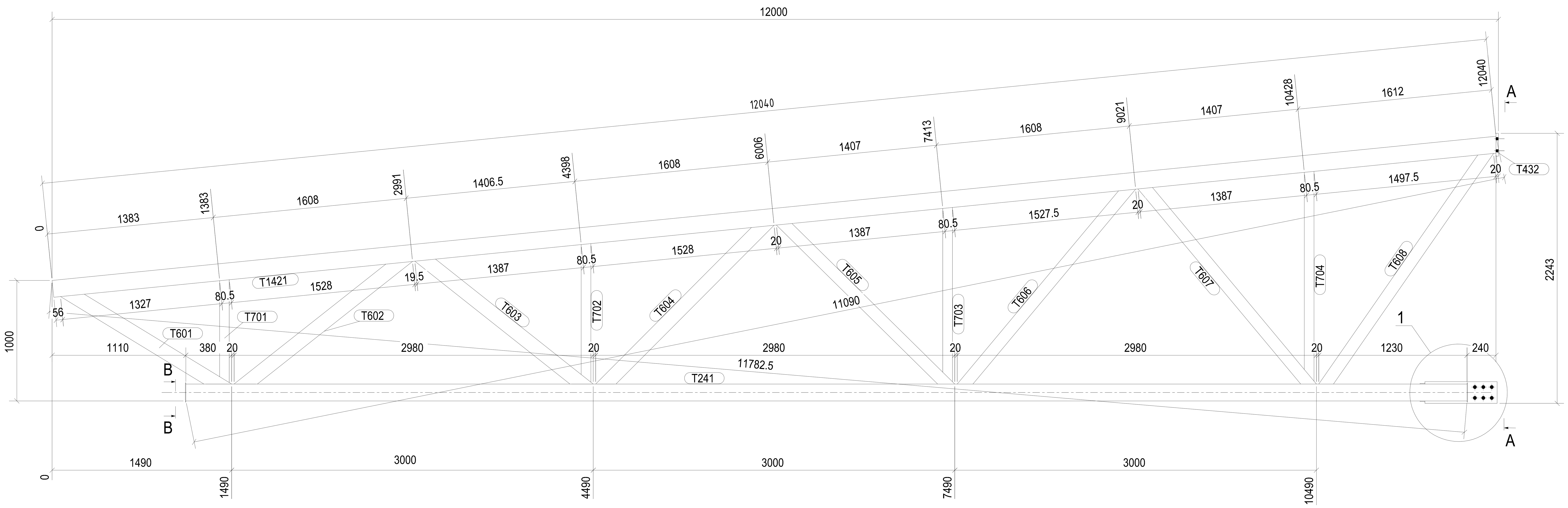

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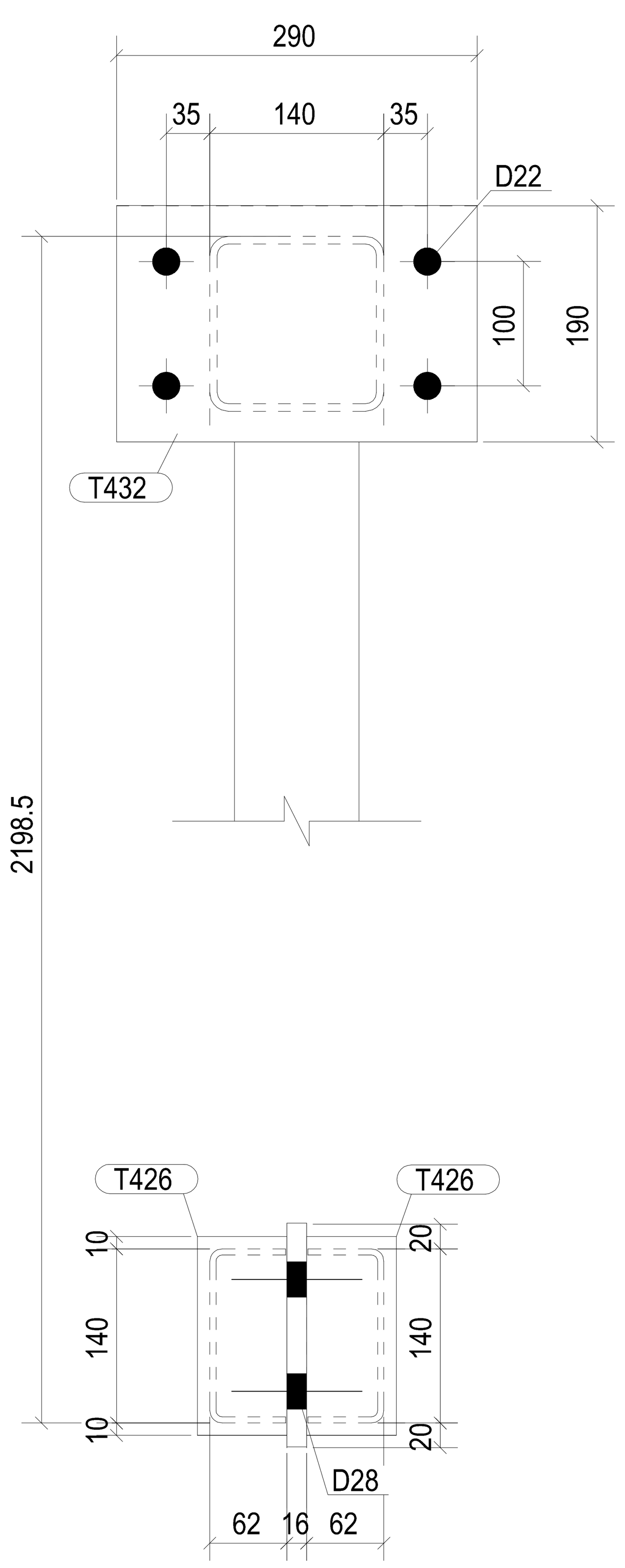

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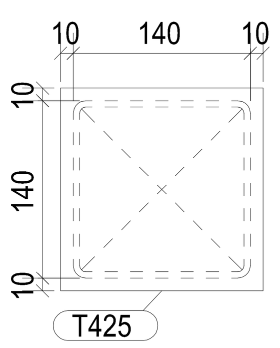

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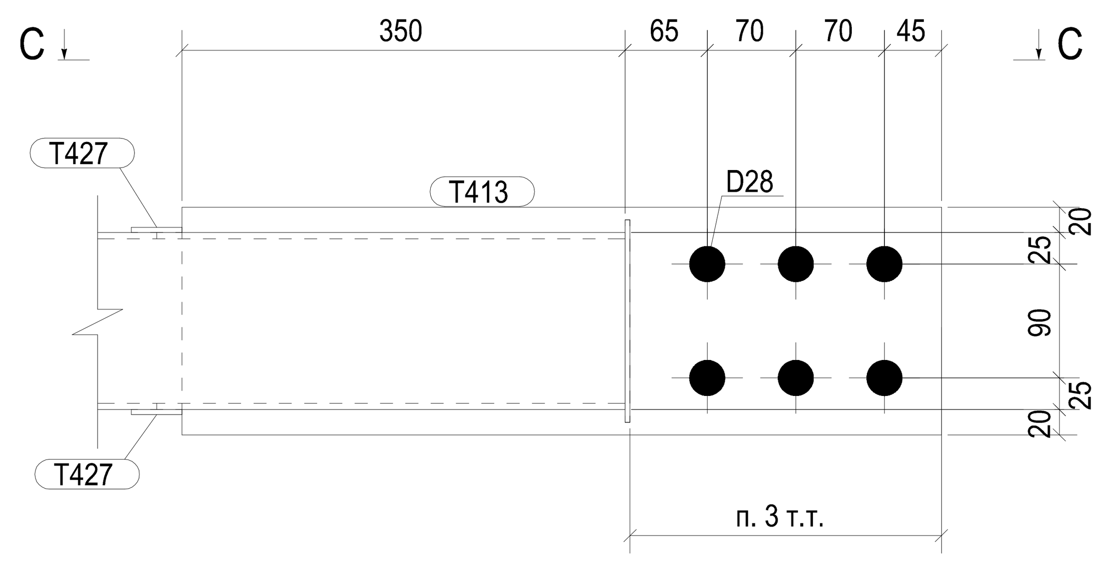

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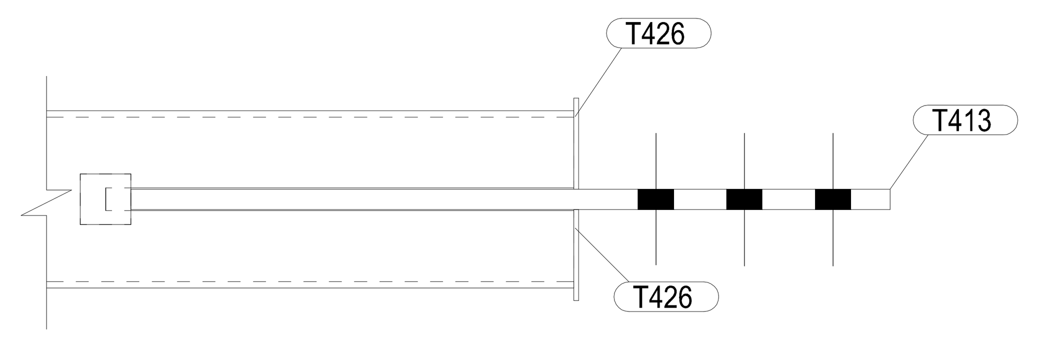

Details list of 2

Index	Name	Number	Cross-section profile	Material	Length,mm	Mass unit, kg	Mass total, kg
T241	Bottom chord	1	O (MSH)140X140X5.0	C345	10630	222.2	222.2
T413	Gusset	1	- (BL)600x180x16.0	C255	600	13.8	13.8
T425	Pipe closer	1	- (BL)160x160x4.0	C255	160	0.8	0.8
T426	Pipe closer	2	- (BL)160x72x4.0	C255	160	0.4	0.7
T427	Pipe closer	2	- (BL)40x40x4.0	C255	40	0.1	0.1
T432	Flange	1	- (BL)190x290x20.0	C255	190	8.8	8.8
T601	Diagonal	1	O (MSH)120X120X4.0	C345	1591	20.4	20.4
T602	Diagonal	1	O (MSH)120X120X4.0	C345	1793	23.4	23.4
T603	Diagonal	1	O (MSH)120X120X4.0	C345	1794	23.9	23.9
T604	Diagonal	1	O (MSH)120X120X4.0	C345	1979	26.6	26.6
T605	Diagonal	1	O (MSH)100X100X4.0	C255	1981	22.4	22.4
T606	Diagonal	1	O (MSH)100X100X4.0	C255	2191	24.9	24.9
T607	Diagonal	1	O (MSH)100X100X4.0	C255	2192	25.1	25.1
T608	Diagonal	1	O (MSH)100X100X4.0	C255	2400	27.6	27.6
T701	Vertical	1	O (MSH)80X80X4.0	C255	854	7.7	7.7
T702	Vertical	1	O (MSH)80X80X4.0	C255	1150	10.4	10.4
T703	Vertical	1	O (MSH)80X80X4.0	C255	1446	13.1	13.1
T704	Vertical	1	O (MSH)80X80X4.0	C255	1742	15.8	15.8
T1421	Upper chord	1	O (MSH)140X140X6.0	C345	12040	295.4	295.4
					Total weight (kg):		783.2

Total dimensions (HxTxL): 2243 x 290 x 12000

Instead of index | Signature ana date | Index

Rev.	Num.l.	Sheet	Doc №	Signature	Date
Designed		Baranovskii			20.04.2015
Checked		Zasulskii			20.04.2015
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Approved		Kleschev			20.04.2015

Standard truss designs album, 2015

T10122

Letter | Mass | Scale

Sheet | Sheets

Steel S345, S245 GOST 27772-88

RUUKKI

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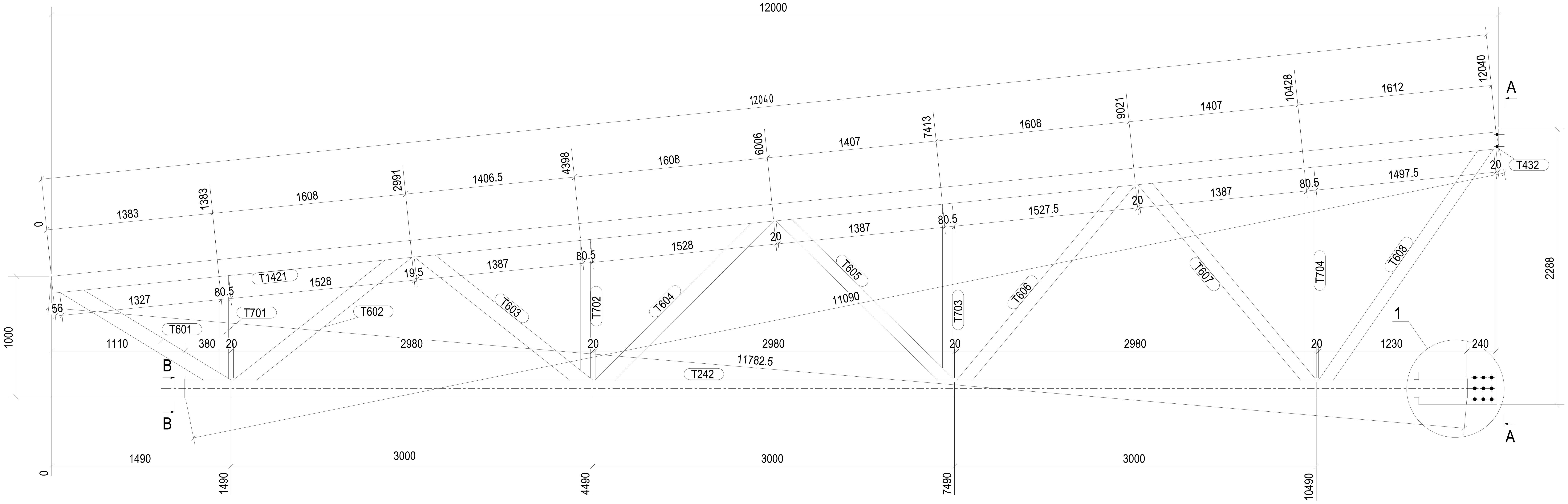

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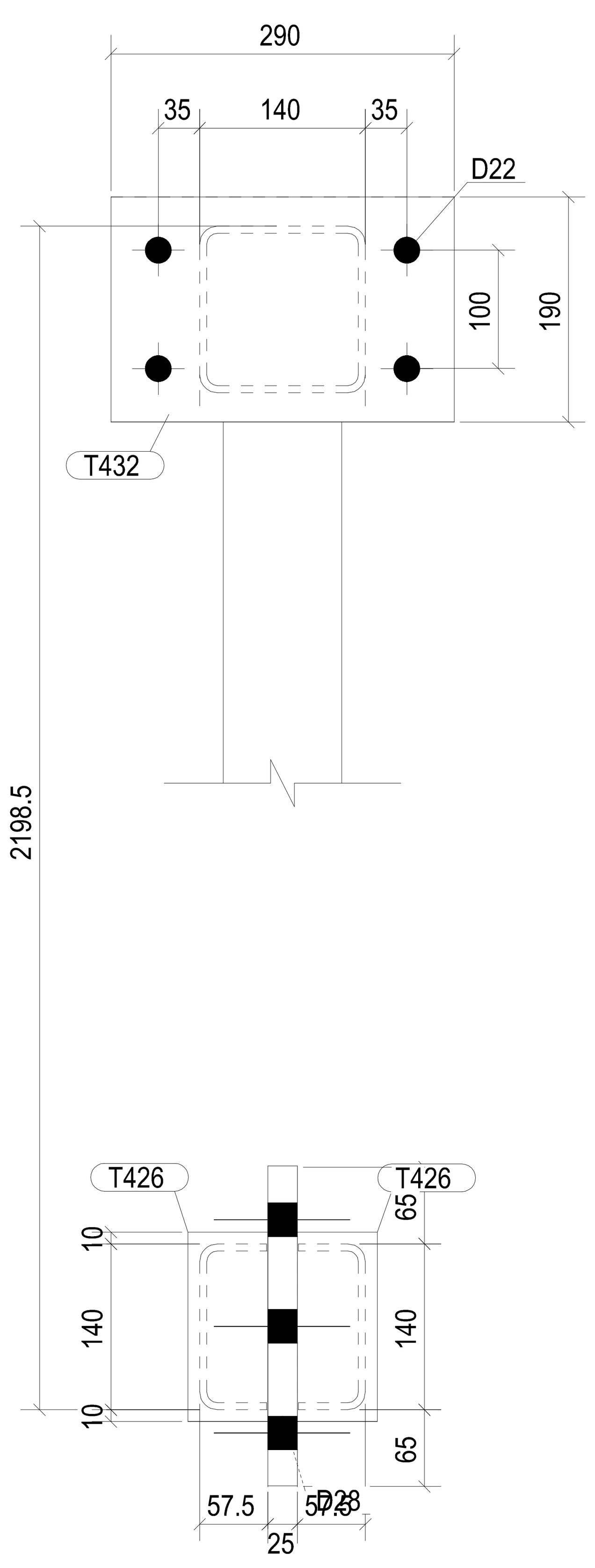

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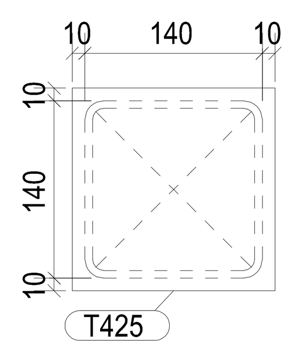

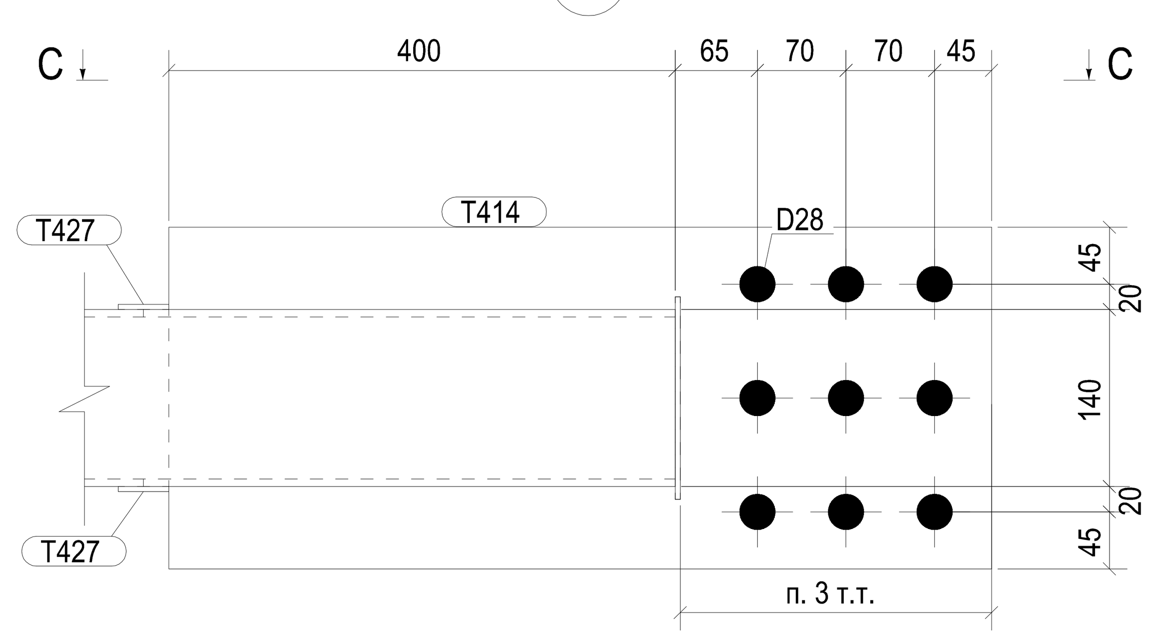

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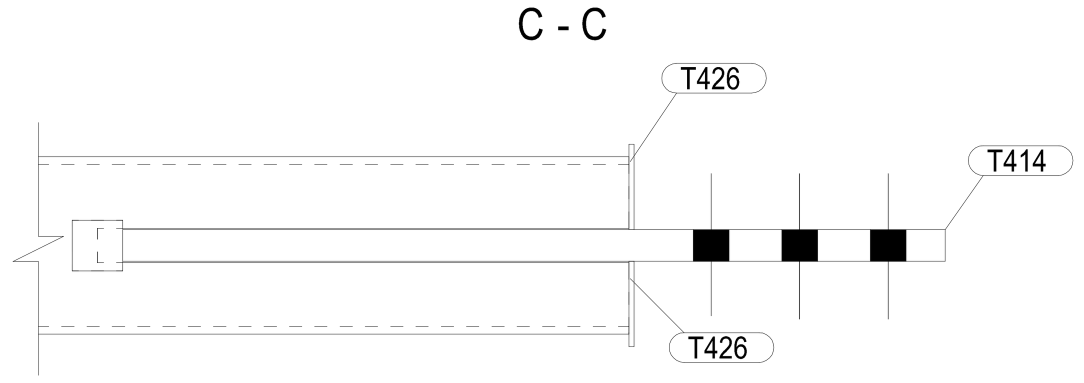

Details list of 3

Index	Name	Number	Cross-section profile	Material	Length,mm	Mass unit, kg	Mass total, kg
T242	Bottom chord	1	O (MSH)140X140X6.0	C345	10630	259.9	259.9
T414	Gusset	1	- (BL)650x270x25.0	C255	650	35.0	35.0
T425	Pipe closer	1	- (BL)160x160x4.0	C255	160	0.8	0.8
T426	Pipe closer	2	- (BL)160x68x4.0	C255	160	0.3	0.7
T427	Pipe closer	2	- (BL)40x40x4.0	C255	40	0.1	0.1
T432	Flange	1	- (BL)190x290x20.0	C255	190	8.8	8.8
T601	Diagonal	1	O (MSH)120X120X4.0	C345	1591	20.4	20.4
T602	Diagonal	1	O (MSH)120X120X4.0	C345	1793	23.4	23.4
T603	Diagonal	1	O (MSH)120X120X4.0	C345	1794	23.9	23.9
T604	Diagonal	1	O (MSH)120X120X4.0	C345	1979	26.6	26.6
T605	Diagonal	1	O (MSH)100X100X4.0	C255	1981	22.4	22.4
T606	Diagonal	1	O (MSH)100X100X4.0	C255	2191	24.9	24.9
T607	Diagonal	1	O (MSH)100X100X4.0	C255	2192	25.1	25.1
T608	Diagonal	1	O (MSH)100X100X4.0	C255	2400	27.6	27.6
T701	Vertical	1	O (MSH)80X80X4.0	C255	854	7.7	7.7
T702	Vertical	1	O (MSH)80X80X4.0	C255	1150	10.4	10.4
T703	Vertical	1	O (MSH)80X80X4.0	C255	1446	13.1	13.1
T704	Vertical	1	O (MSH)80X80X4.0	C255	1742	15.8	15.8
T1421	Upper chord	1	O (MSH)140X140X6.0	C345	12040	295.4	295.4
					Total weight (kg):		842.0

Total dimensions (HxTxL): 2288 x 290 x 12000

Instead of index | Signature ana date | Index

Rev.	Num.l.	Sheet	Doc №	Signature	Date
Designed		Baranovskii			20.04.2015
Checked		Zasulskii			20.04.2015
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Approved		Kleschev			20.04.2015

Standard truss designs album, 2015

T10123

Letter | Mass | Scale

Sheet | Sheets

Steel S345, S245 GOST 27772-88

RUUKKI

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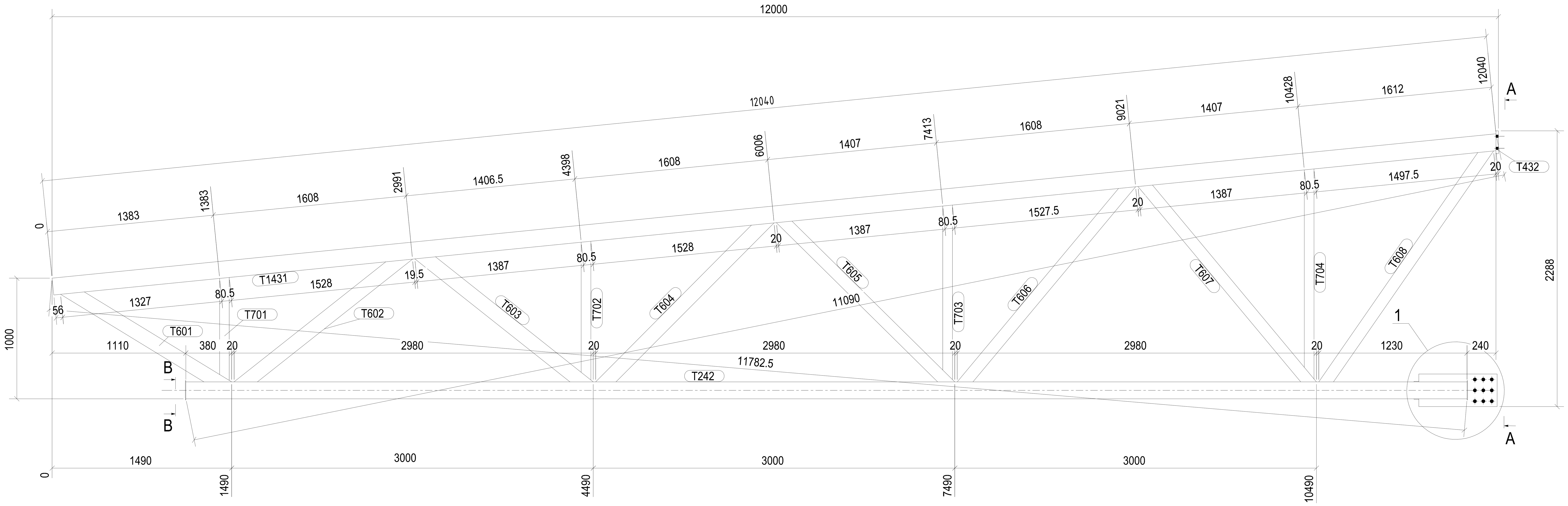

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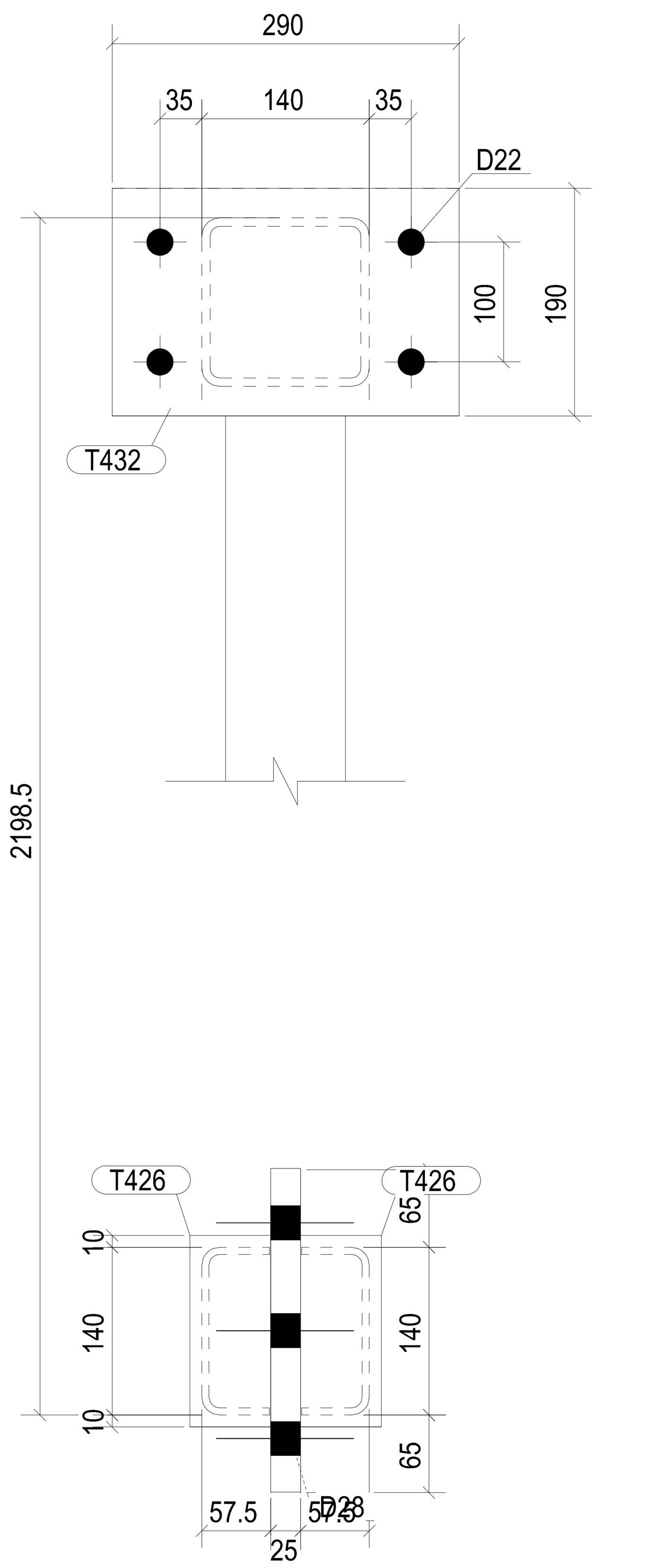

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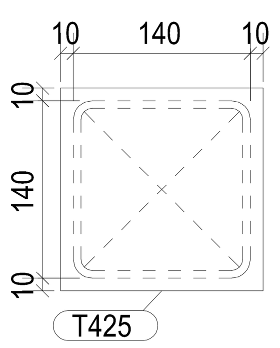

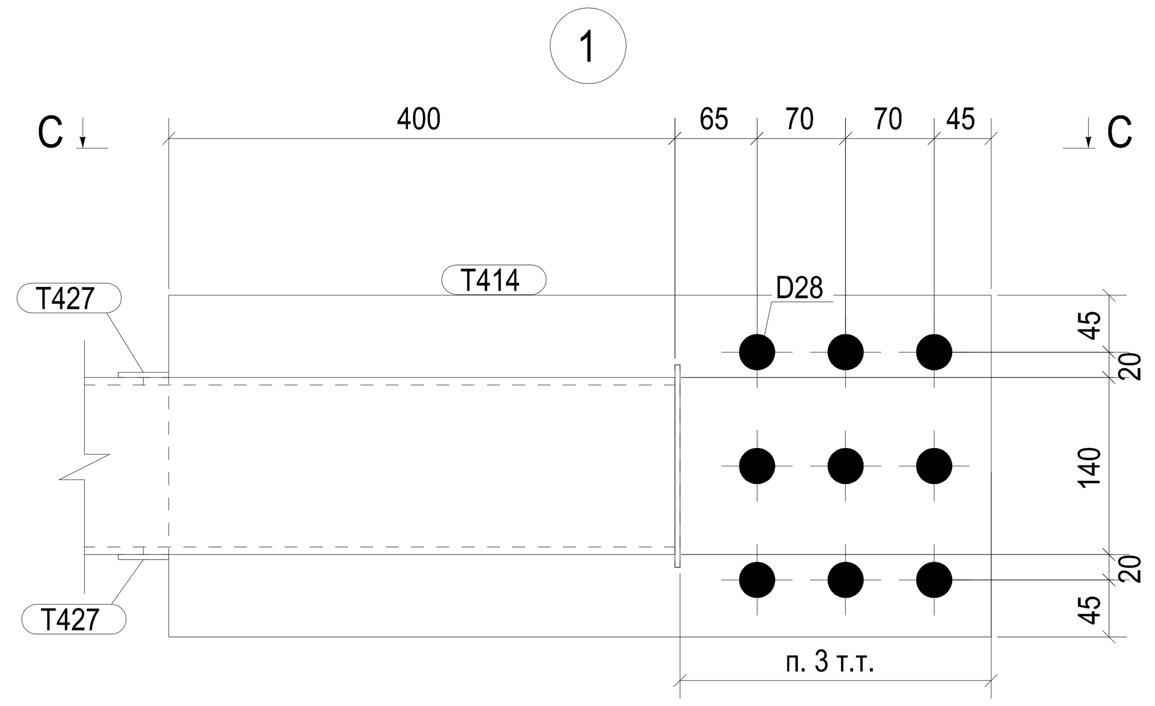

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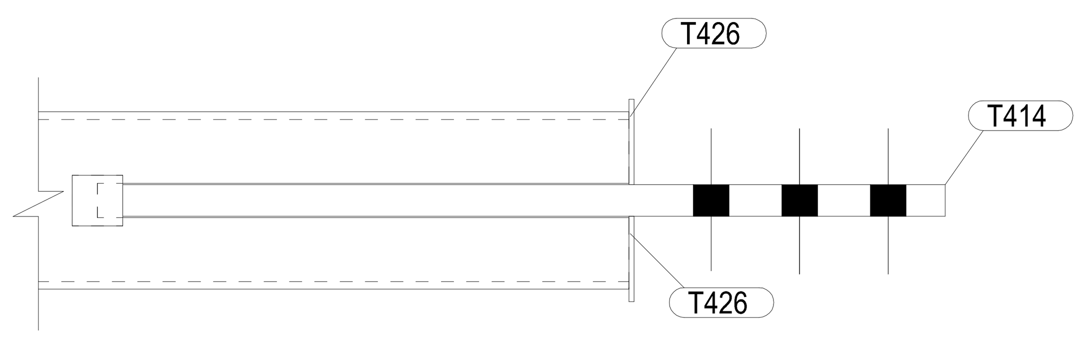

Details list of 4

Index	Name	Number	Cross-section profile	Material	Length,mm	Mass unit, kg	Mass total, kg
T242	Bottom chord	1	O (MSH)140X140X6.0	C345	10630	259.9	259.9
T414	Gusset	1	- (BL)650x270x25.0	C255	650	35.0	35.0
T425	Pipe closer	1	- (BL)160x160x4.0	C255	160	0.8	0.8
T426	Pipe closer	2	- (BL)160x68x4.0	C255	160	0.3	0.7
T427	Pipe closer	2	- (BL)40x40x4.0	C255	40	0.1	0.1
T432	Flange	1	- (BL)190x290x20.0	C255	190	8.8	8.8
T601	Diagonal	1	O (MSH)120X120X4.0	C345	1591	20.4	20.4
T602	Diagonal	1	O (MSH)120X120X4.0	C345	1793	23.4	23.4
T603	Diagonal	1	O (MSH)120X120X4.0	C345	1794	23.9	23.9
T604	Diagonal	1	O (MSH)120X120X4.0	C345	1979	26.6	26.6
T605	Diagonal	1	O (MSH)100X100X4.0	C255	1981	22.4	22.4
T606	Diagonal	1	O (MSH)100X100X4.0	C255	2191	24.9	24.9
T607	Diagonal	1	O (MSH)100X100X4.0	C255	2192	25.1	25.1
T608	Diagonal	1	O (MSH)100X100X4.0	C255	2400	27.6	27.6
T701	Vertical	1	O (MSH)80X80X4.0	C255	854	7.7	7.7
T702	Vertical	1	O (MSH)80X80X4.0	C255	1150	10.4	10.4
T703	Vertical	1	O (MSH)80X80X4.0	C255	1446	13.1	13.1
T704	Vertical	1	O (MSH)80X80X4.0	C255	1742	15.8	15.8
T1431	Upper chord	1	O (MSH)140X140X7.0	C345	12040	342.6	342.6
					Total weight (kg):		889.2

Total dimensions (HxTxL): 2288 x 290 x 12000

Instead of index

Signature ana date

Index

Rev.	Num.I.	Sheet	Doc №	Signature	Date
Designed		Baranovskii			20.04.2015
Checked		Zasulskii			20.04.2015
Control		Zasulskii			20.04.2015
Approved		Kleschev			20.04.2015

Standard truss designs album, 2015

T10124

Steel S345, S245 GOST 27772-88

Letter	Mass	Scale

Sheet | Sheets

OOO "RUUKKI RUS" 2015

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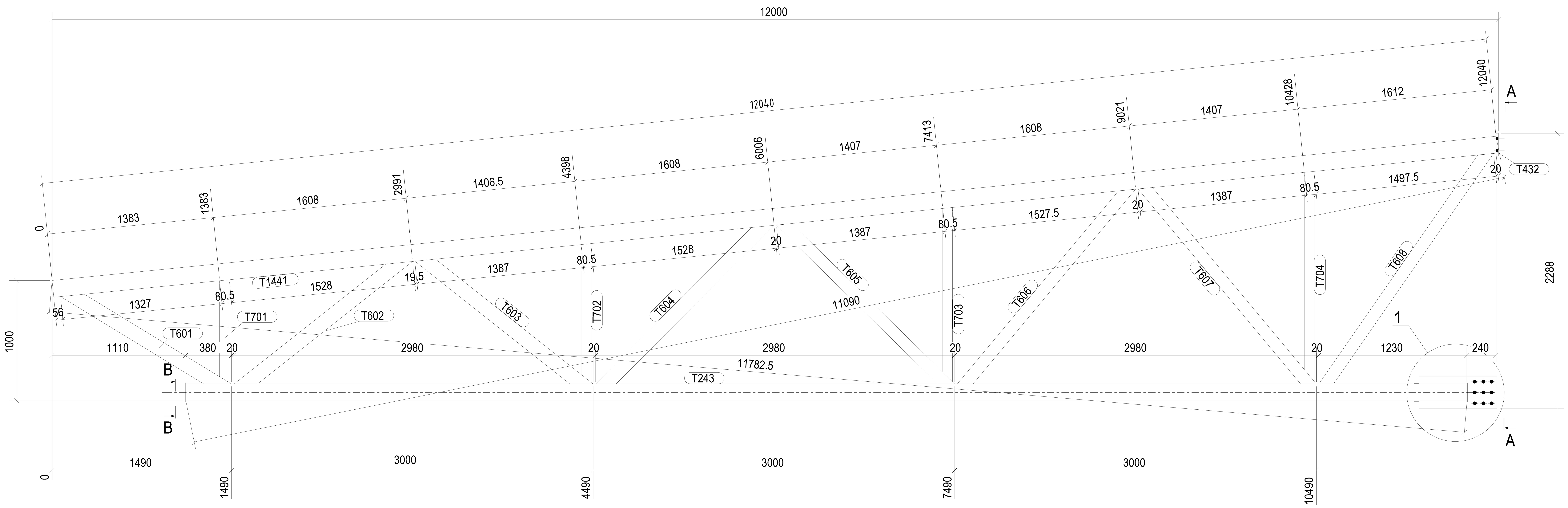

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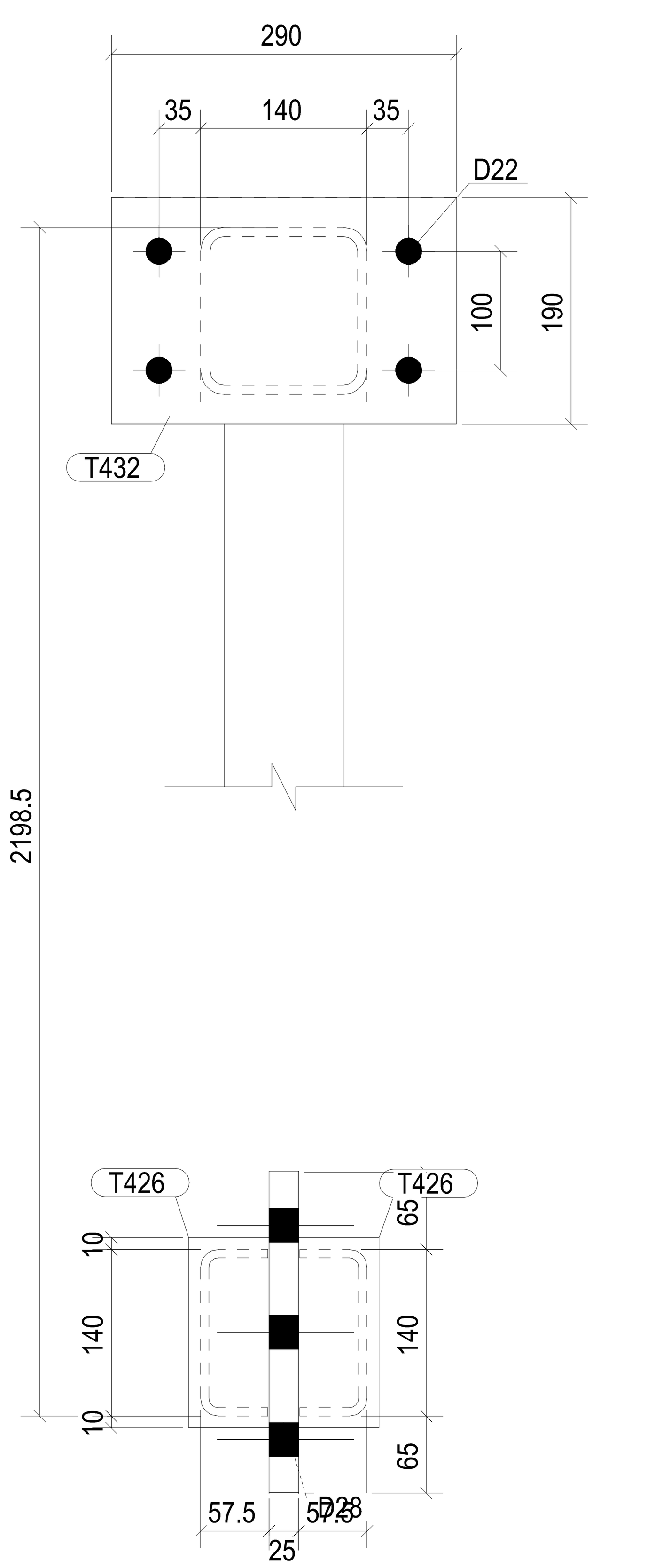

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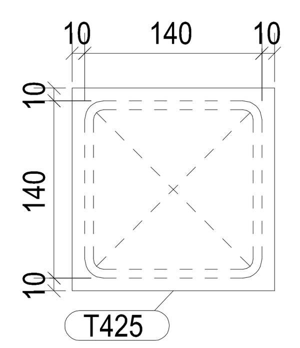

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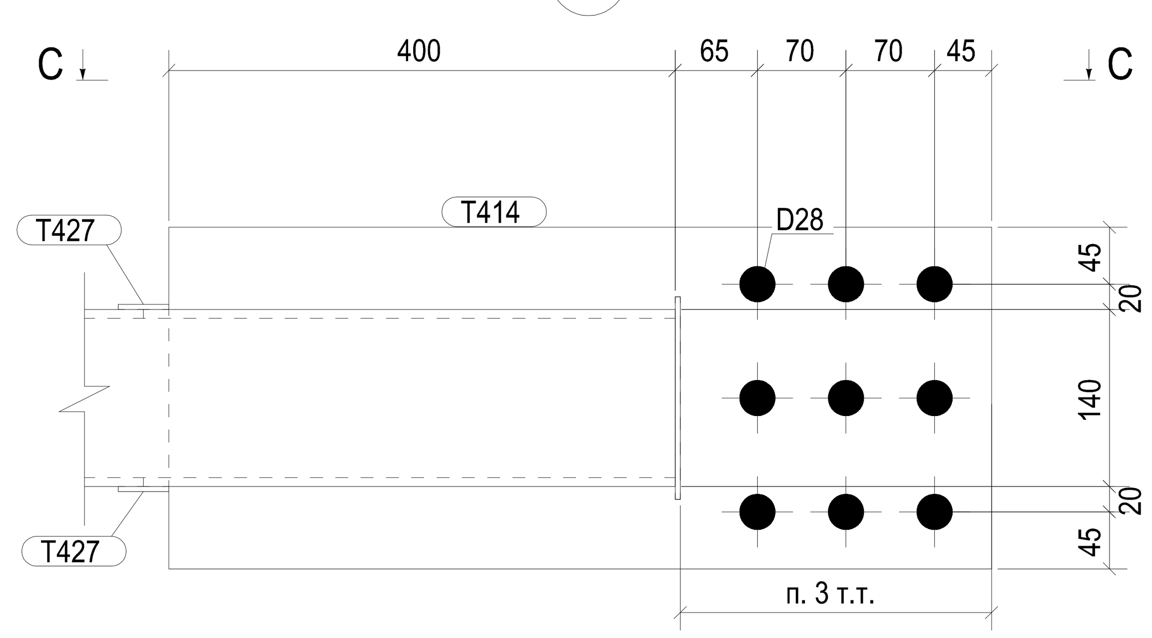

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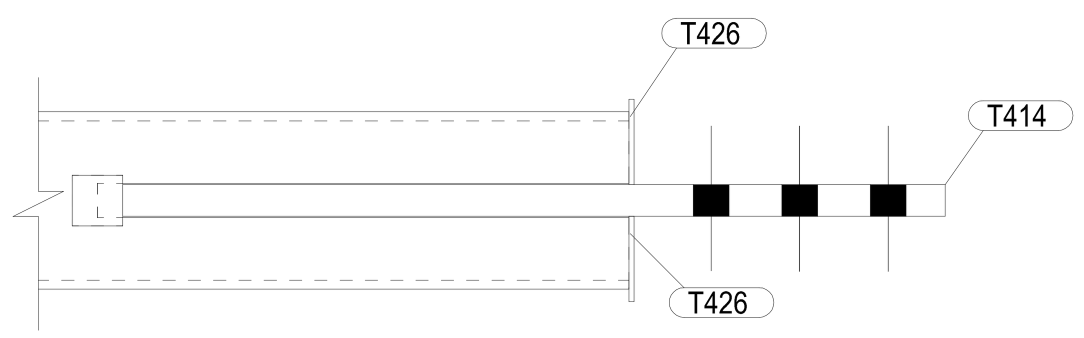

Details list of 5

Index	Name	Number	Cross-section profile	Material	Length,mm	Mass unit, kg	Mass total, kg
T243	Bottom chord	1	O (MSH)140X140X7.0	C345	10630	301.4	301.4
T414	Gusset	1	- (BL)650x270x25.0	C255	650	35.0	35.0
T425	Pipe closer	1	- (BL)160x160x4.0	C255	160	0.8	0.8
T426	Pipe closer	2	- (BL)160x68x4.0	C255	160	0.3	0.7
T427	Pipe closer	2	- (BL)40x40x4.0	C255	40	0.1	0.1
T432	Flange	1	- (BL)190x290x20.0	C255	190	8.8	8.8
T601	Diagonal	1	O (MSH)120X120X4.0	C345	1591	20.4	20.4
T602	Diagonal	1	O (MSH)120X120X4.0	C345	1793	23.4	23.4
T603	Diagonal	1	O (MSH)120X120X4.0	C345	1794	23.9	23.9
T604	Diagonal	1	O (MSH)120X120X4.0	C345	1979	26.6	26.6
T605	Diagonal	1	O (MSH)100X100X4.0	C255	1981	22.4	22.4
T606	Diagonal	1	O (MSH)100X100X4.0	C255	2191	24.9	24.9
T607	Diagonal	1	O (MSH)100X100X4.0	C255	2192	25.1	25.1
T608	Diagonal	1	O (MSH)100X100X4.0	C255	2400	27.6	27.6
T701	Vertical	1	O (MSH)80X80X4.0	C255	854	7.7	7.7
T702	Vertical	1	O (MSH)80X80X4.0	C255	1150	10.4	10.4
T703	Vertical	1	O (MSH)80X80X4.0	C255	1446	13.1	13.1
T704	Vertical	1	O (MSH)80X80X4.0	C255	1742	15.8	15.8
T1441	Upper chord	1	O (MSH)140X140X8.0	C345	12040	381.9	381.9
					Total weight (kg):		970.1
Total dimensions (HxTxL):			2288 x 290 x 12000				

Instead of index | Signature ana date | Index

Standard truss designs album, 2015

Rev.	Num.l.	Sheet	Doc №	Signature	Date
Designed		Baranovskii			20.04.2015
Checked		Zasulskii			20.04.2015
Control		Zasulskii			20.04.2015
Approved		Kleschev			20.04.2015

T10125

Letter | Mass | Scale

Sheet | Sheets

Steel S345, S245 GOST 27772-88

RUUKKI

ООО "RUUKKI RUS" 2015

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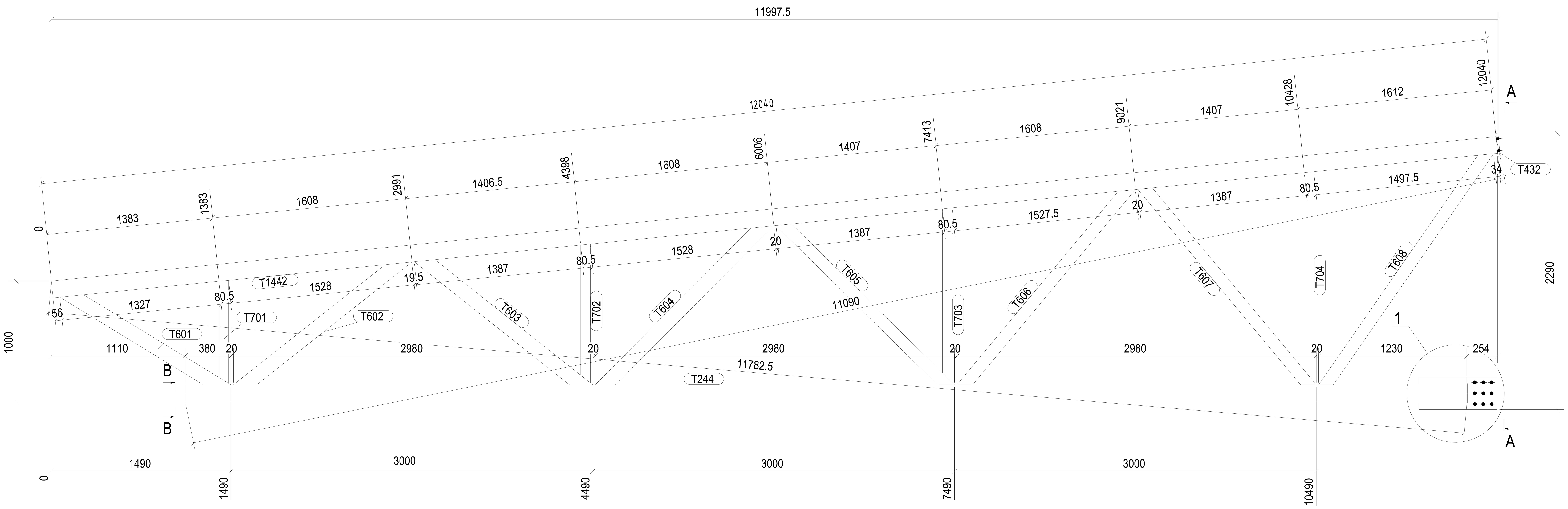

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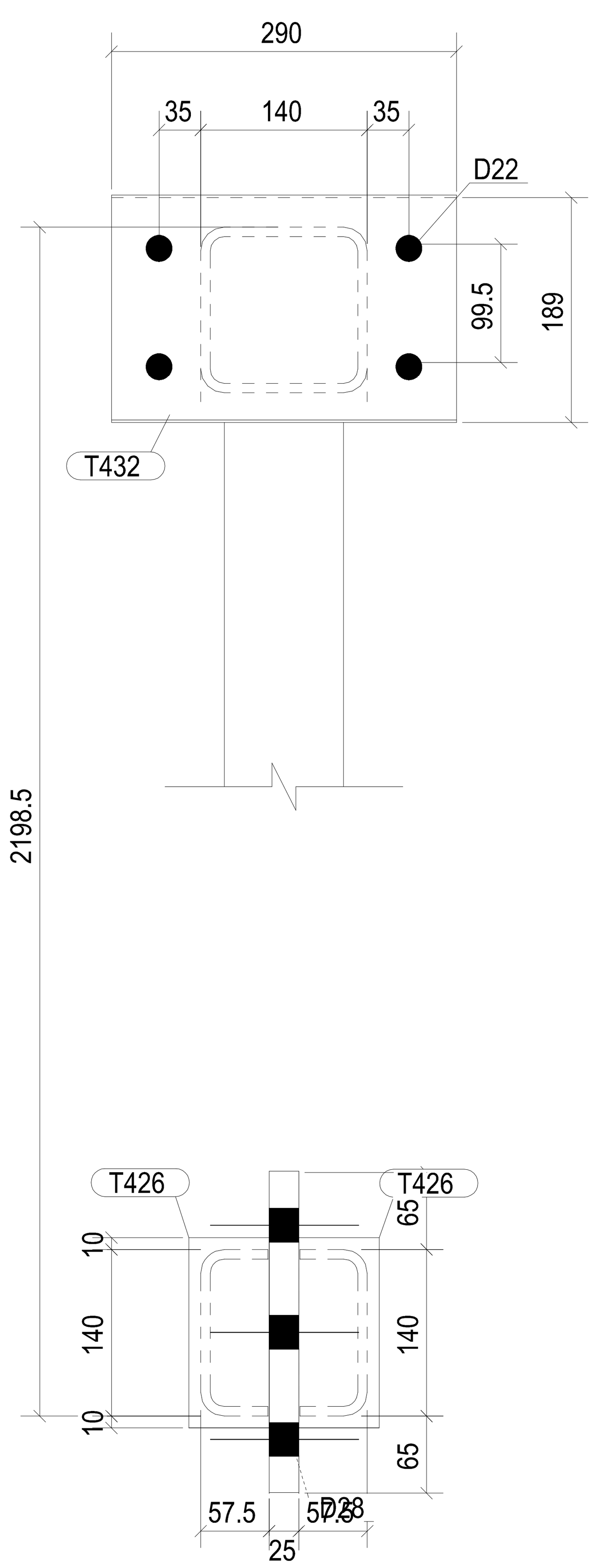

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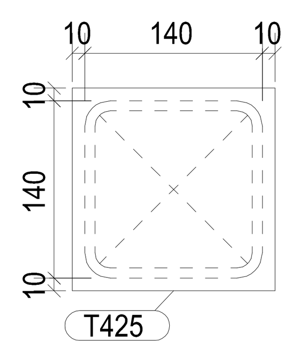

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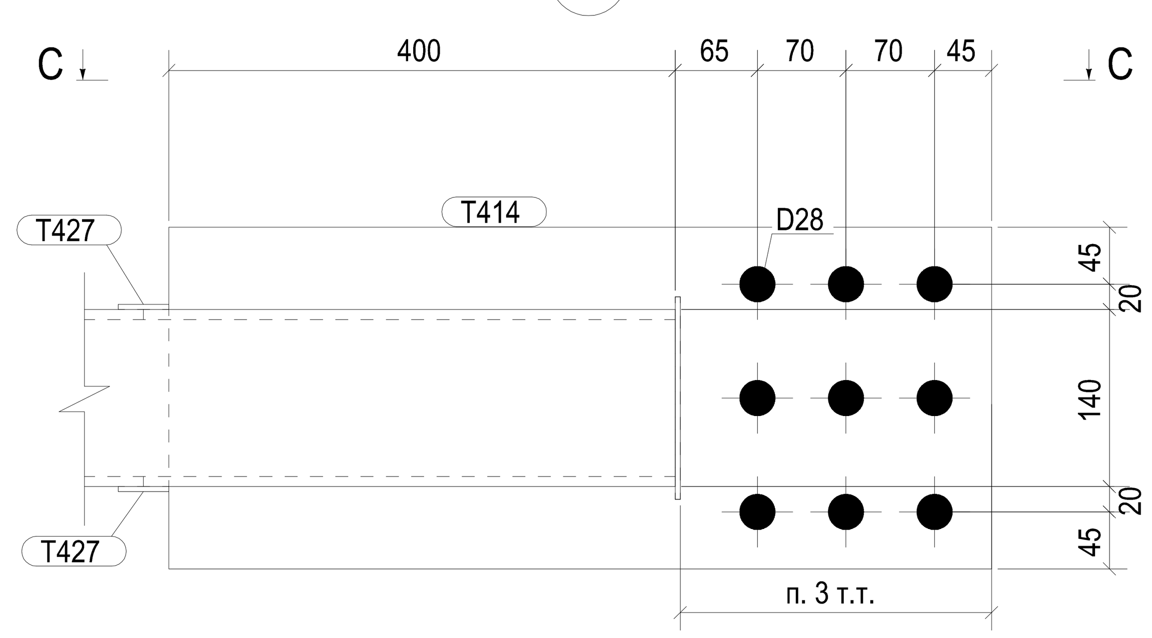

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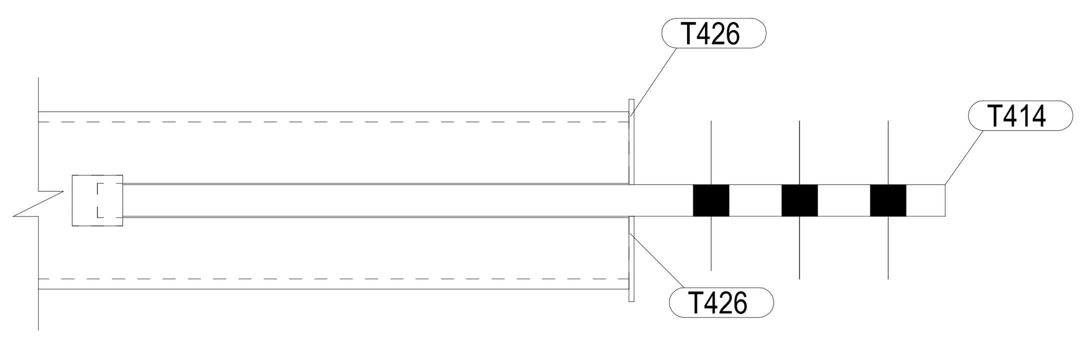

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Index	Name	Number	Cross-section profile	Material	Length,mm	Mass unit, kg	Mass total, kg
T244	Bottom chord	1	O (MSH)140X140X8.0	C345	10630	336.0	336.0
T414	Gusset	1	- (BL)650x270x25.0	C255	650	35.0	35.0
T425	Pipe closer	1	- (BL)160x160x4.0	C255	160	0.8	0.8
T426	Pipe closer	2	- (BL)160x68x4.0	C255	160	0.3	0.7
T427	Pipe closer	2	- (BL)40x40x4.0	C255	40	0.1	0.1
T432	Flange	1	- (BL)190x290x20.0	C255	190	8.8	8.8
T601	Diagonal	1	O (MSH)120X120X4.0	C345	1591	20.4	20.4
T602	Diagonal	1	O (MSH)120X120X4.0	C345	1793	23.4	23.4
T603	Diagonal	1	O (MSH)120X120X4.0	C345	1794	23.9	23.9
T604	Diagonal	1	O (MSH)120X120X4.0	C345	1979	26.6	26.6
T605	Diagonal	1	O (MSH)100X100X4.0	C255	1981	22.4	22.4
T606	Diagonal	1	O (MSH)100X100X4.0	C255	2191	24.9	24.9
T607	Diagonal	1	O (MSH)100X100X4.0	C255	2192	25.1	25.1
T608	Diagonal	1	O (MSH)100X100X4.0	C255	2400	27.6	27.6
T701	Vertical	1	O (MSH)80X80X4.0	C255	854	7.7	7.7
T702	Vertical	1	O (MSH)80X80X4.0	C255	1150	10.4	10.4
T703	Vertical	1	O (MSH)80X80X4.0	C255	1446	13.1	13.1
T704	Vertical	1	O (MSH)80X80X4.0	C255	1742	15.8	15.8
T1442	Upper chord	1	O (MSH)140X140X8.0	C345	12040	382.2	382.2
					Total weight (kg):		1004.9

Total dimensions (HxTxL): 2290 x 290 x 12016

Instead of index | Signature ana date | Index

Rev.	Num.I.	Sheet	Doc №	Signature	Date
Designed		Baranovskii			20.04.2015
Checked		Zasulskii			20.04.2015
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Approved		Kleschev			20.04.2015

Standard truss designs album, 2015

T10126

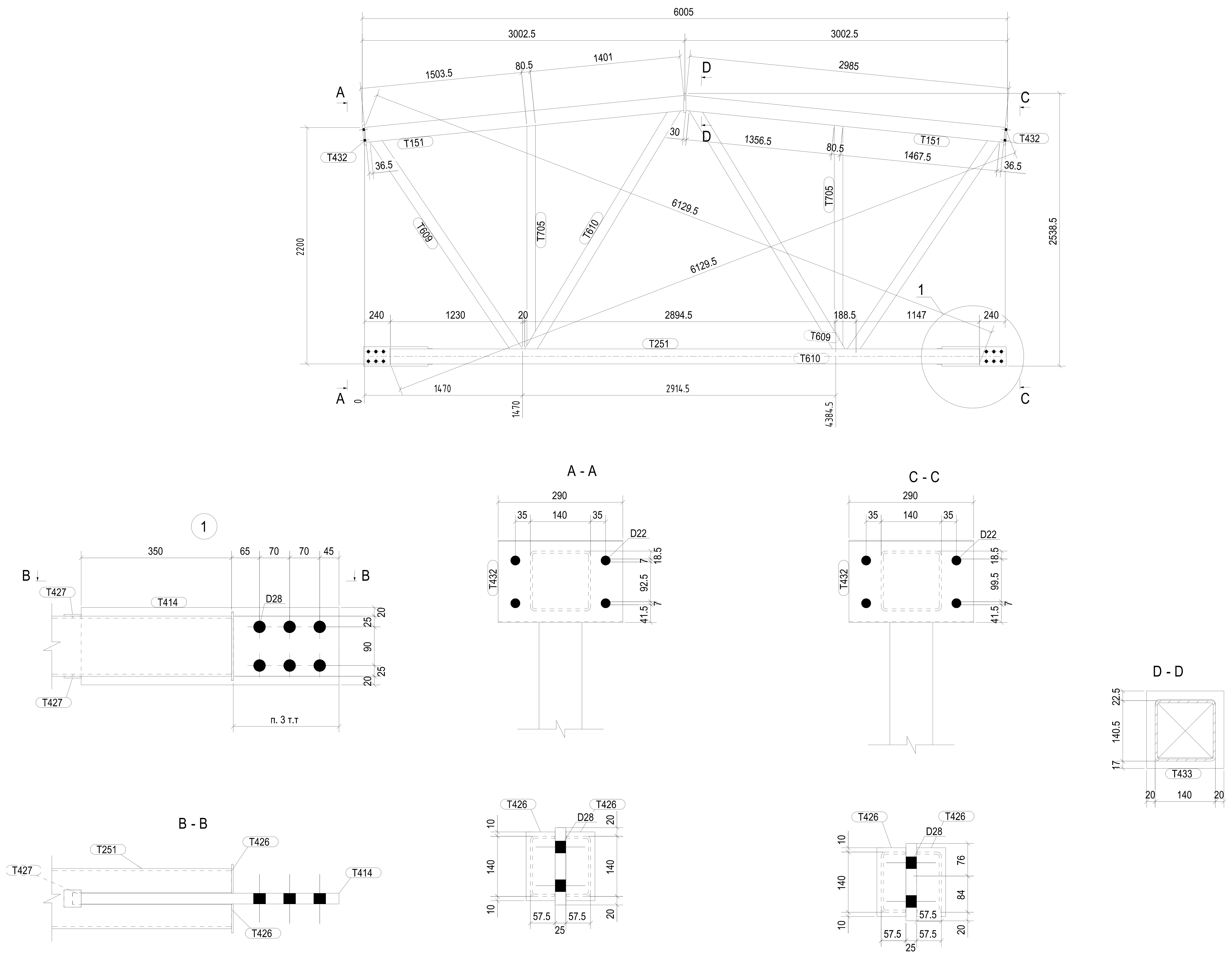
Steel S345, S245 GOST 27772-88

Letter	Mass	Scale

Sheet | Sheets

OOO "RUUKKI RUS" 2015

A1 Paper Size



Instead of index | Signature and date | Index

Details list of 6

Index	Name	Number	Cross-section profile	Material	Length,mm	Mass unit, kg	Mass total, kg
T251	Bottom chord	1	O (MSH)140X140X5.0	C345	5480	113.2	113.2
T151	Upper chord	2	O (MSH)140X140X5.0	C345	2985	62.4	124.8
T414	Gusset	2	- (BL)600x180x25.0	C255	600	21.5	43.0
T426	Pipe closer	4	- (BL)160x68x4.0	C255	160	0.3	1.4
T427	Pipe closer	4	- (BL)40x40x4.0	C255	40	0.1	0.2
T432	Flange	2	- (BL)190x290x20.0	C255	190	8.8	17.6
T433	Пластина	1	- (BL)180x180x20.0	C255	180	5.2	5.2
T609	Diagonal	2	O (MSH)100X100X4.0	C345	2391	27.7	55.4
T610	Diagonal	2	O (MSH)100X100X4.0	C345	2646	30.6	61.3
T705	Vertical	2	O (MSH)80X80X4.0	C255	2047	18.4	36.9
					Total weight (kg):		458.9

Total dimensions (HxTxL): 2539 x 290 x 6005

Rev.	Num.I.	Sheet	Doc №	Signature	Date
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Standard truss designs album, 2015

T10061

Steel S345, S245 GOST 27772-88

Letter	Mass	Scale

Sheet | Sheets

OOO "RUUKKI RUS" 2015

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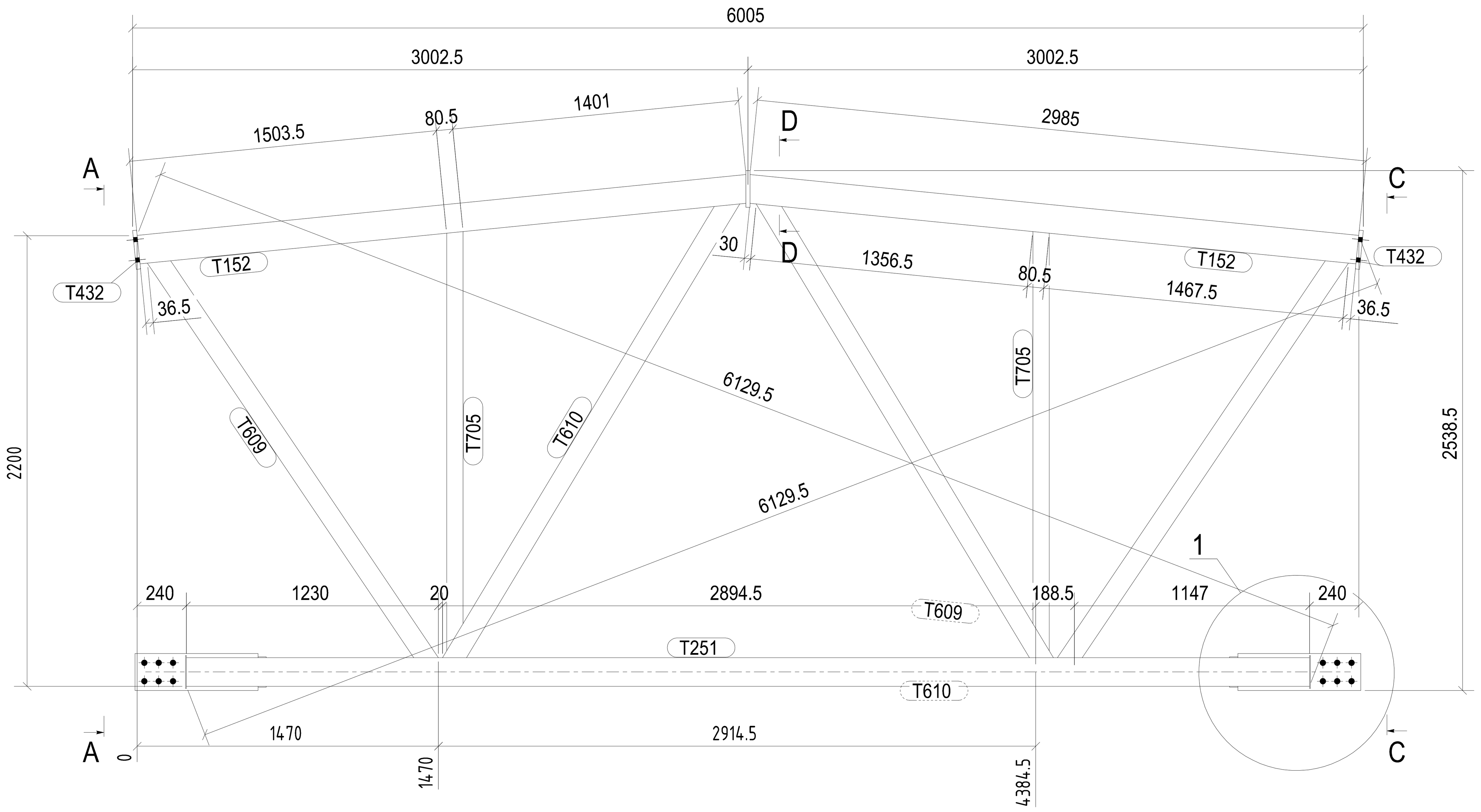

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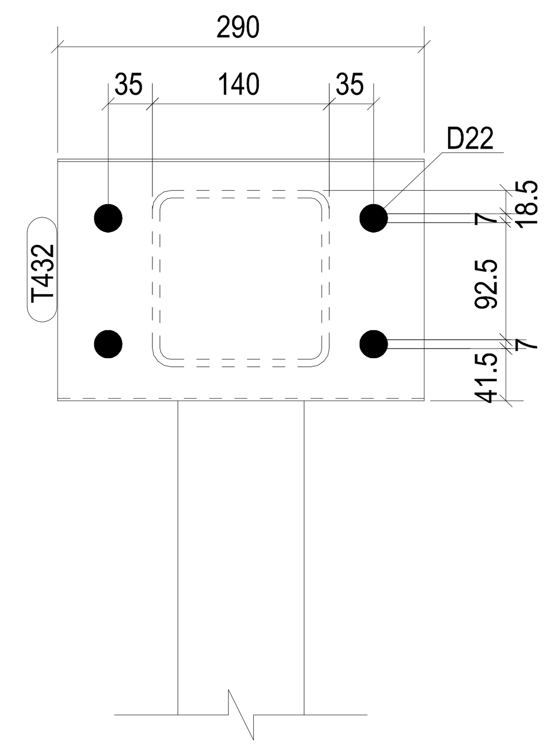

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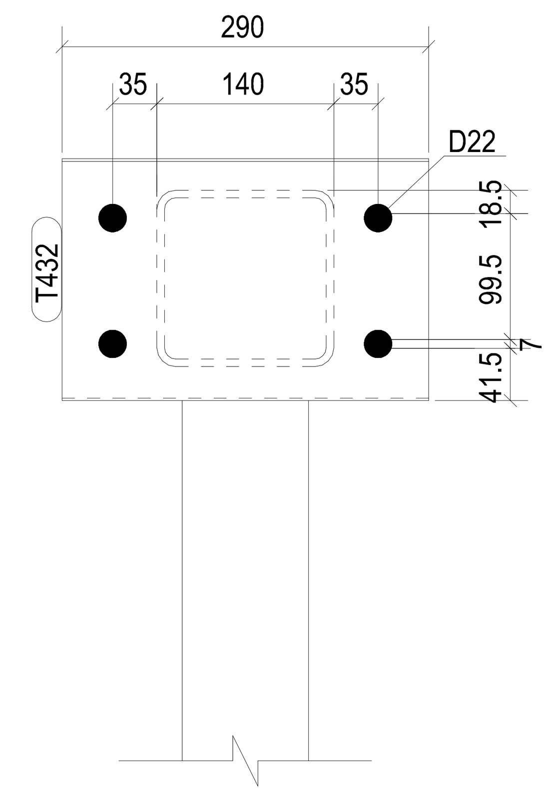

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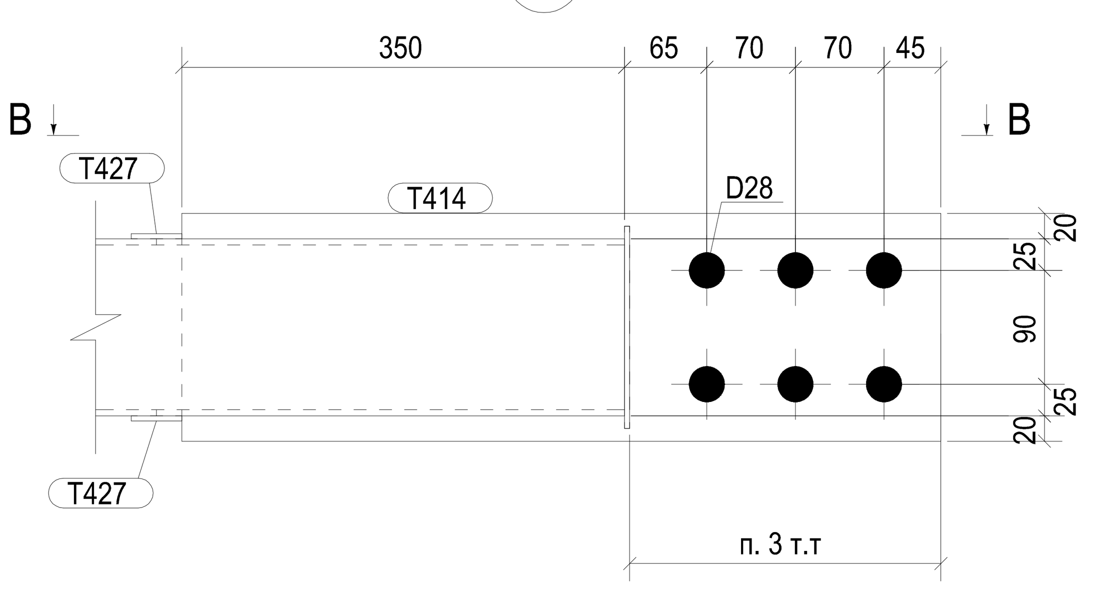

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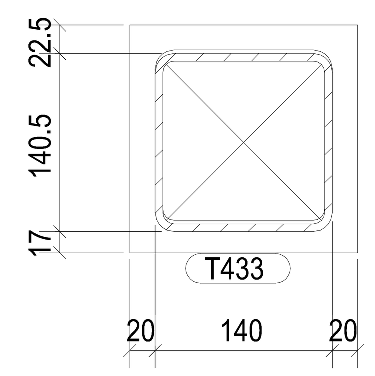

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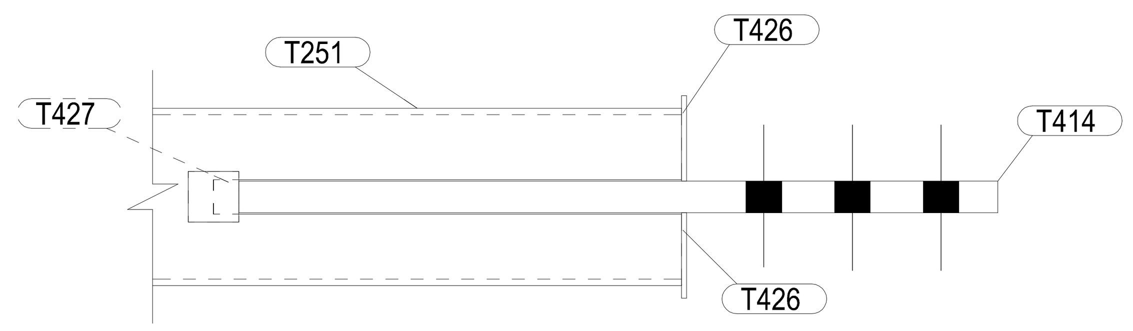

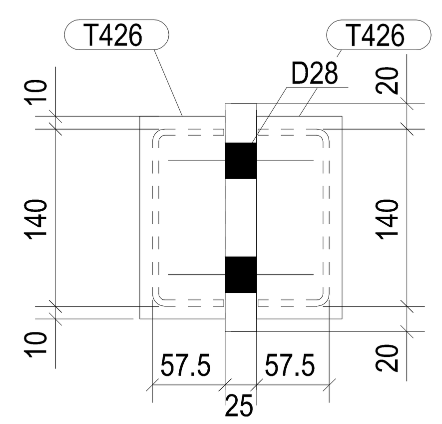

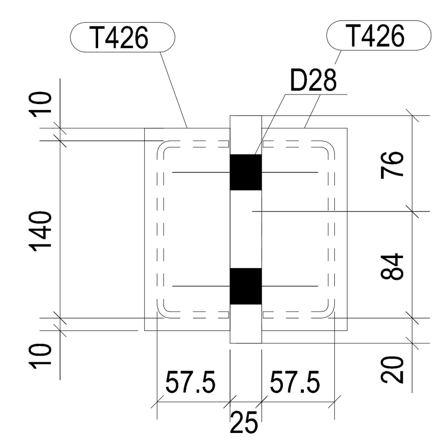

Details list of 8

Index	Name	Number	Cross-section profile	Material	Length,mm	Mass unit, kg	Mass total, kg
T251	Bottom chord	1	O (MSH)140X140X5.0	C345	5480	113.2	113.2
T152	Upper chord	2	O (MSH)140X140X6.0	C345	2985	73.1	146.2
T414	Gusset	2	- (BL)600x180x25.0	C255	600	21.5	43.0
T426	Pipe closer	4	- (BL)160x68x4.0	C255	160	0.3	1.4
T427	Pipe closer	4	- (BL)40x40x4.0	C255	40	0.1	0.2
T432	Flange	2	- (BL)190x290x20.0	C255	190	8.8	17.6
T433	Пластина	1	- (BL)180x180x20.0	C255	180	5.2	5.2
T609	Diagonal	2	O (MSH)100X100X4.0	C345	2391	27.7	55.4
T610	Diagonal	2	O (MSH)100X100X4.0	C345	2646	30.6	61.3
T705	Vertical	2	O (MSH)80X80X4.0	C255	2047	18.4	36.9
					Total weight (kg):		480.3
Total dimensions (HxTxL):			2539 x 290 x 6005				

Instead of index
Signature ana date
Index

Rev.	Num.I.	Sheet	Doc №	Signature	Date
Designed		Baranovskii			20.04.2015
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Approved		Kleschev			20.04.2015

Standard truss designs album, 2015

T10062

Letter | Mass | Scale

Sheet | Sheets

Steel S345, S245 GOST 27772-88

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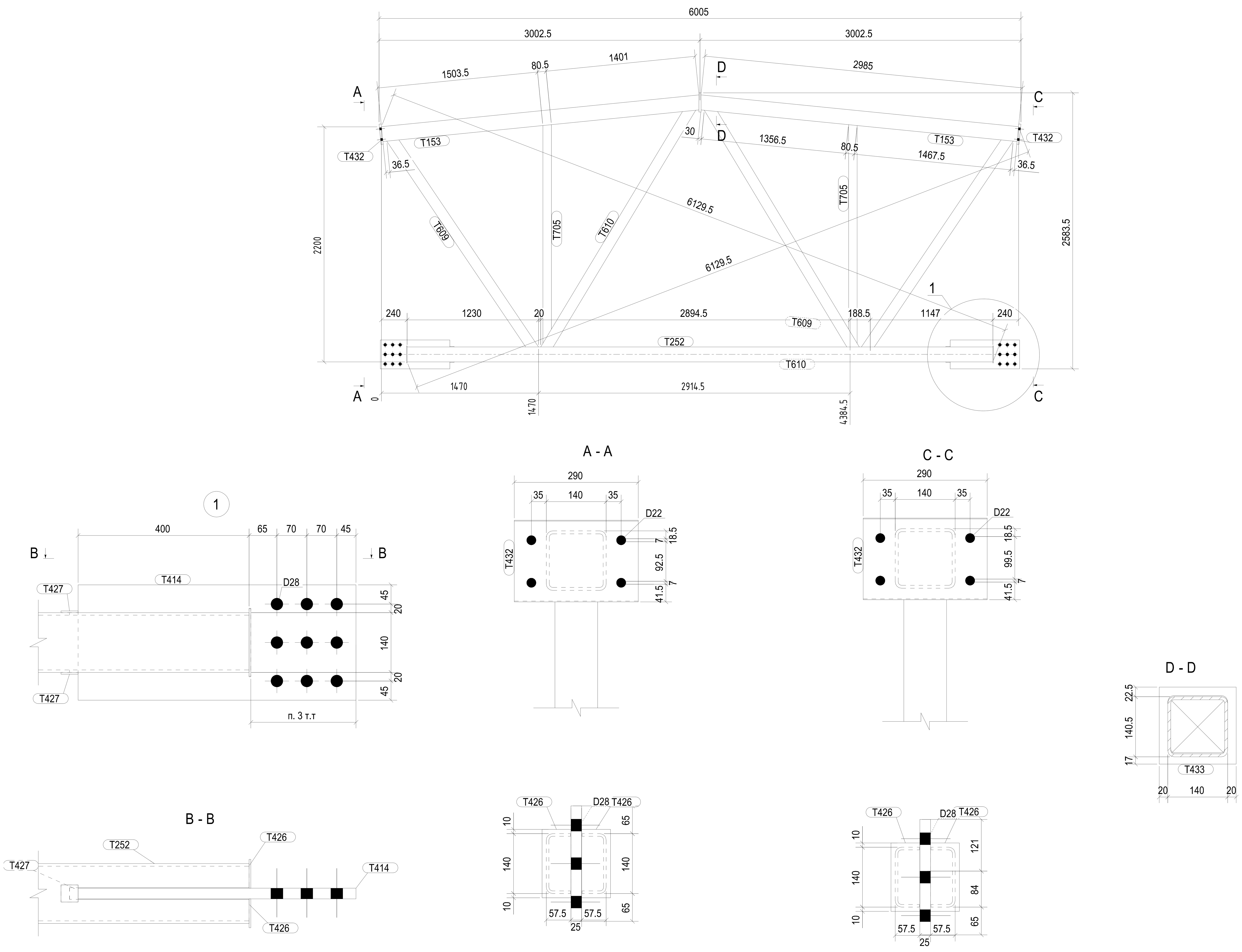

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Index	Name	Number	Cross-section profile	Material	Length,mm	Mass unit, kg	Mass total, kg
T252	Bottom chord	1	O (MSH)140X140X6.0	C345	5480	132.4	132.4
T153	Upper chord	2	O (MSH)140X140X7.0	C345	2985	84.8	169.6
T414	Gusset	2	- (BL)650x270x25.0	C255	650	35.0	69.9
T426	Pipe closer	4	- (BL)160x68x4.0	C255	160	0.3	1.4
T427	Pipe closer	4	- (BL)40x40x4.0	C255	40	0.1	0.2
T432	Flange	2	- (BL)190x290x20.0	C255	190	8.8	17.6
T433	Пластина	1	- (BL)180x180x20.0	C255	180	5.2	5.2
T609	Diagonal	2	O (MSH)100X100X4.0	C345	2391	27.7	55.4
T610	Diagonal	2	O (MSH)100X100X4.0	C345	2646	30.6	61.3
T705	Vertical	2	O (MSH)80X80X4.0	C255	2047	18.4	36.9
					Total weight (kg):		549.7

Total dimensions (HxTxL): 2584 x 290 x 6005

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Standard truss designs album, 2015

T10063

Letter | Mass | Scale

Sheet | Sheets

Steel S345, S245 GOST 27772-88

RUUKKI

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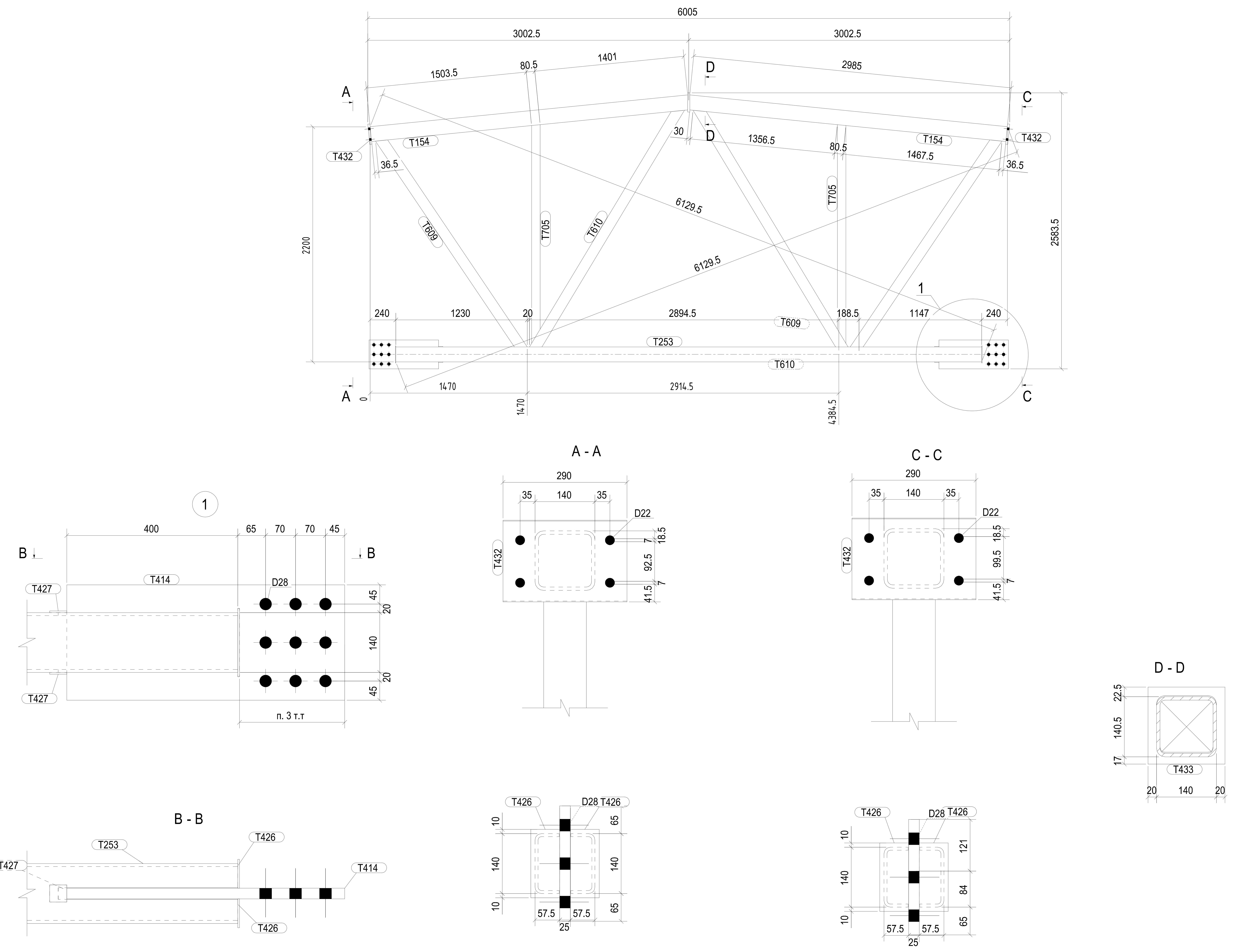

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Index	Name	Number	Cross-section profile	Material	Length,mm	Mass unit, kg	Mass total, kg
T253	Bottom chord	1	O (MSH)140X140X7.0	C345	5480	153.5	153.5
T154	Upper chord	2	O (MSH)140X140X8.0	C345	2985	94.5	189.1
T414	Gusset	2	- (BL)650x270x25.0	C255	650	35.0	69.9
T426	Pipe closer	4	- (BL)160x68x4.0	C255	160	0.3	1.4
T427	Pipe closer	4	- (BL)40x40x4.0	C255	40	0.1	0.2
T432	Flange	2	- (BL)190x290x20.0	C255	190	8.8	17.6
T433	Пластина	1	- (BL)180x180x20.0	C255	180	5.2	5.2
T609	Diagonal	2	O (MSH)100X100X4.0	C345	2391	27.7	55.4
T610	Diagonal	2	O (MSH)100X100X4.0	C345	2646	30.6	61.3
T705	Vertical	2	O (MSH)80X80X4.0	C255	2047	18.4	36.9
					Total weight (kg):		590.3

Total dimensions (HxTxL): 2584 x 290 x 6005

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Standard truss designs album, 2015

T10064

Letter | Mass | Scale

Sheet | Sheets

Steel S345, S245 GOST 27772-88

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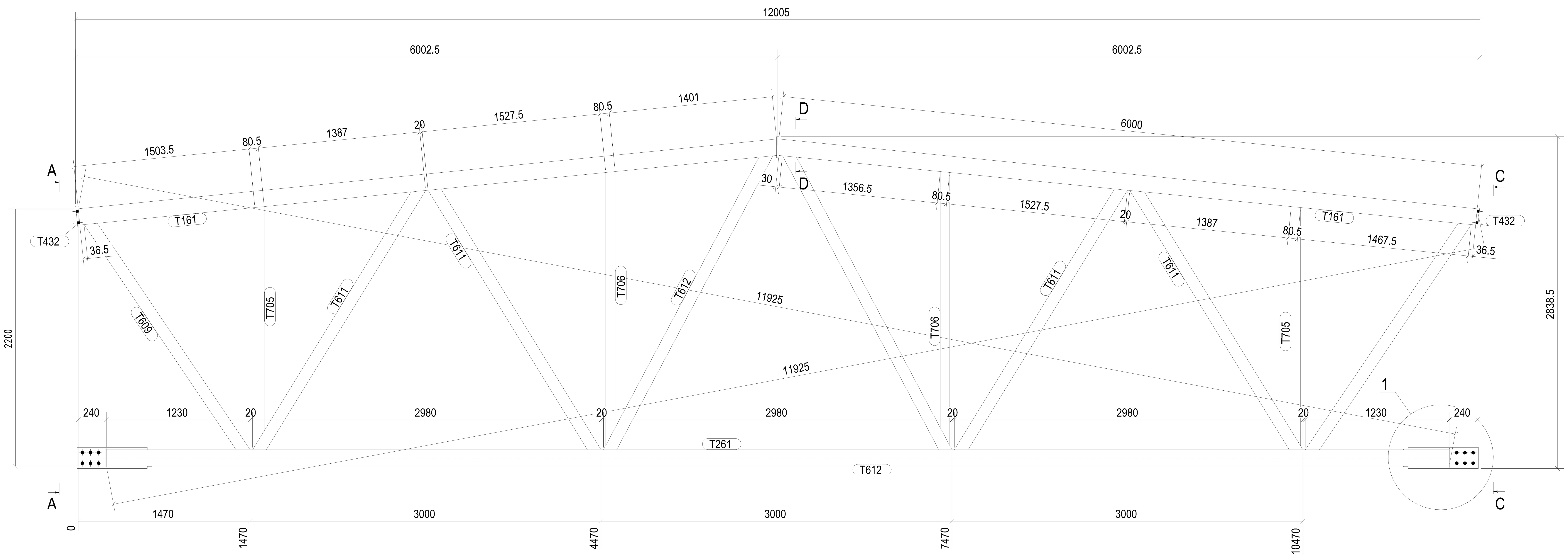

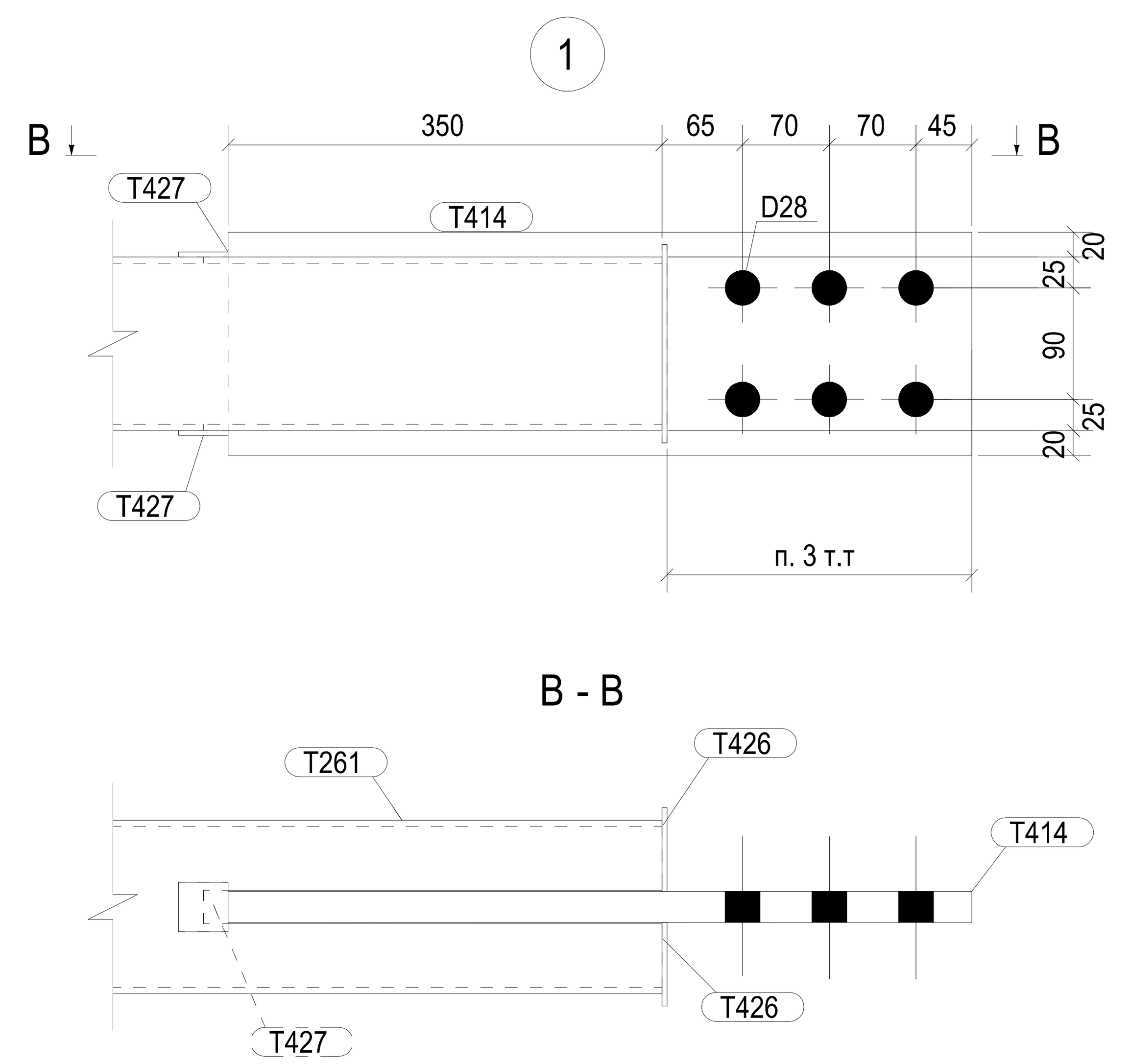

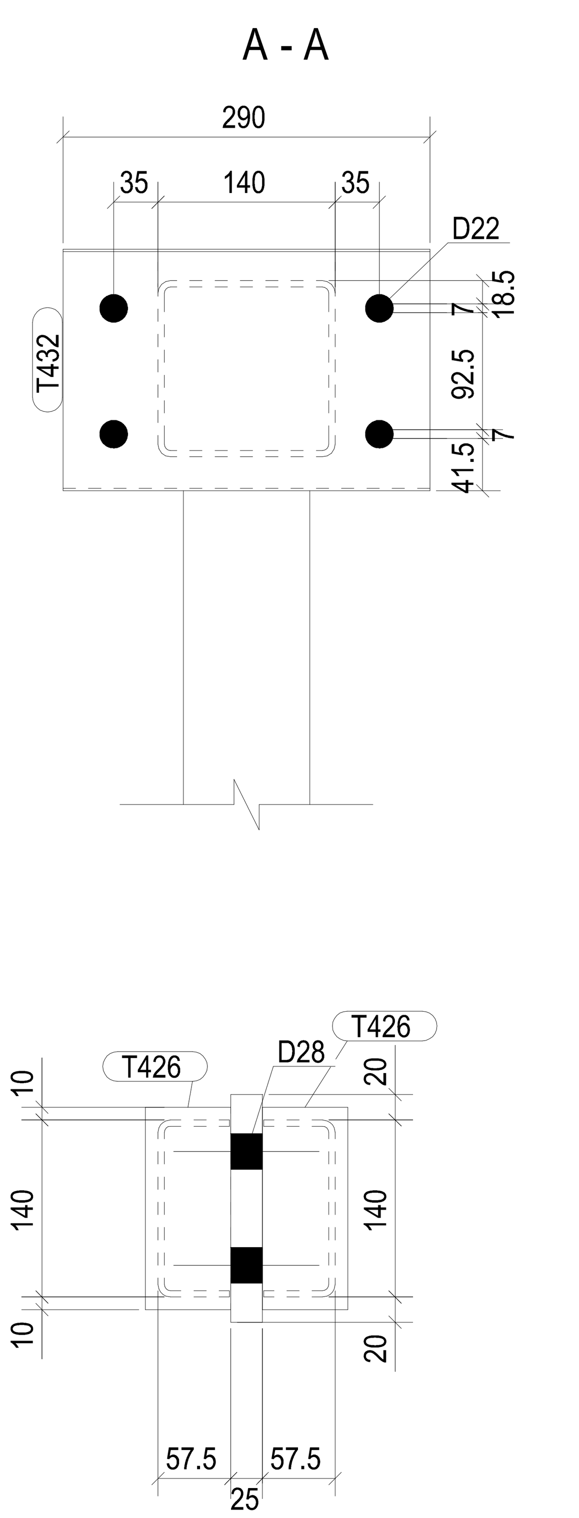

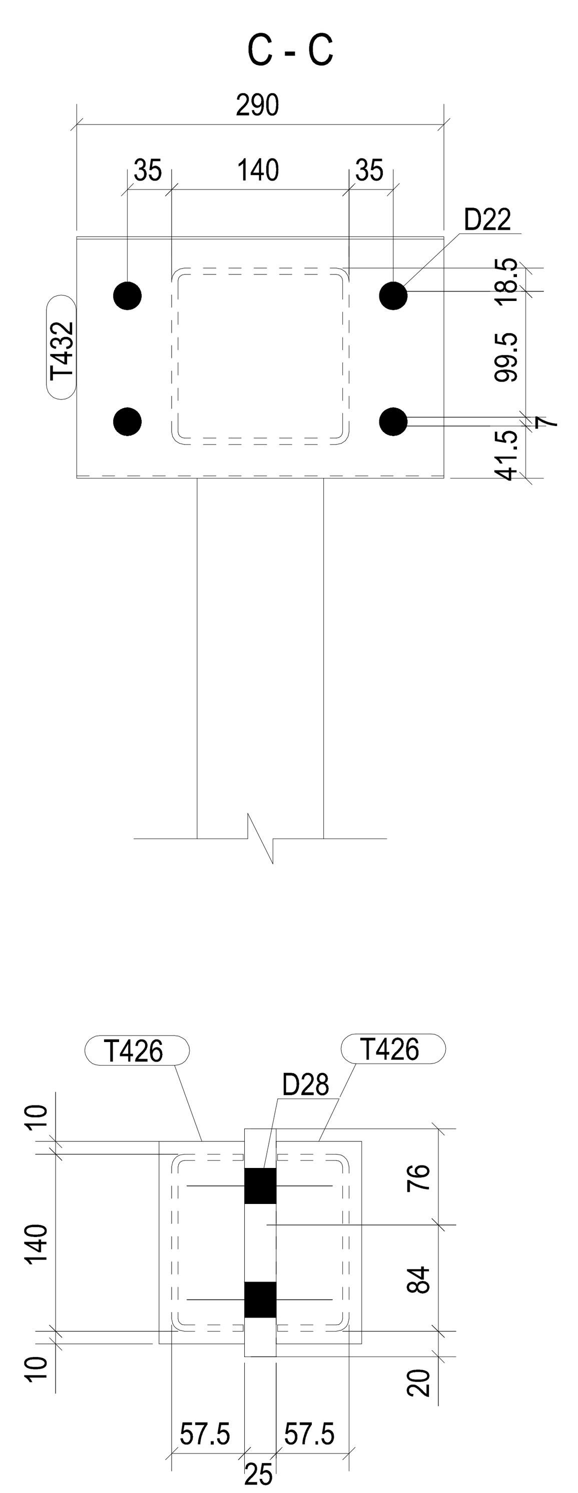

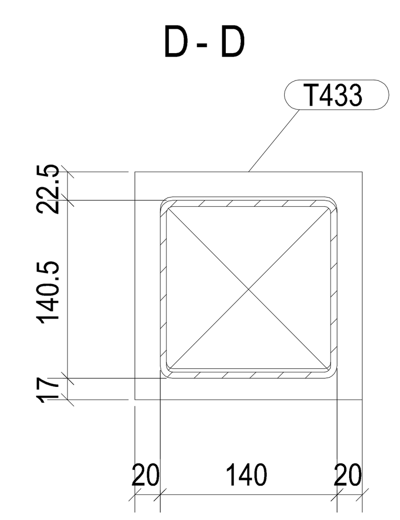

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Index	Name	Number	Cross-section profile	Material	Length,mm	Mass unit, kg	Mass total, kg
T261	Bottom chord	1	O (MSH)140X140X5.0	C345	11480	238.9	238.9
T161	Upper chord	2	O (MSH)140X140X5.0	C345	6000	125.6	251.1
T414	Gusset	2	- (BL)600x180x25.0	C255	600	21.5	43.0
T426	Pipe closer	4	- (BL)160x67x4.0	C255	160	0.3	1.4
T427	Pipe closer	4	- (BL)40x40x4.0	C255	40	0.1	0.2
T432	Flange	2	- (BL)190x290x20.0	C255	190	8.8	17.6
T433	Пластина	1	- (BL)180x180x20.0	C255	180	5.2	5.2
T609	Diagonal	2	O (MSH)100X100X4.0	C345	2391	27.7	55.4
T611	Diagonal	4	O (MSH)100X100X4.0	C345	2667	31.0	123.7
T612	Diagonal	2	O (MSH)100X100X4.0	C345	2902	33.8	67.5
T705	Vertical	2	O (MSH)80X80X4.0	C255	2048	18.5	36.9
T706	Vertical	2	O (MSH)80X80X4.0	C255	2343	21.1	42.2
					Total weight (kg):		883.2

Total dimensions (HxTxL): 2839 x 290 x 12005

Instead of index | Signature ana date | Index

Rev.	Num.l.	Sheet	Doc №	Signature	Date
Designed		Baranovskii			20.04.2015
Checked		Zasulskii			20.04.2015
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Standard truss designs album, 2015

T10121*

Steel S345, S245 GOST 27772-88

Letter	Mass	Scale

Sheet | Sheets

OOO "RUUKKI RUS" 2015

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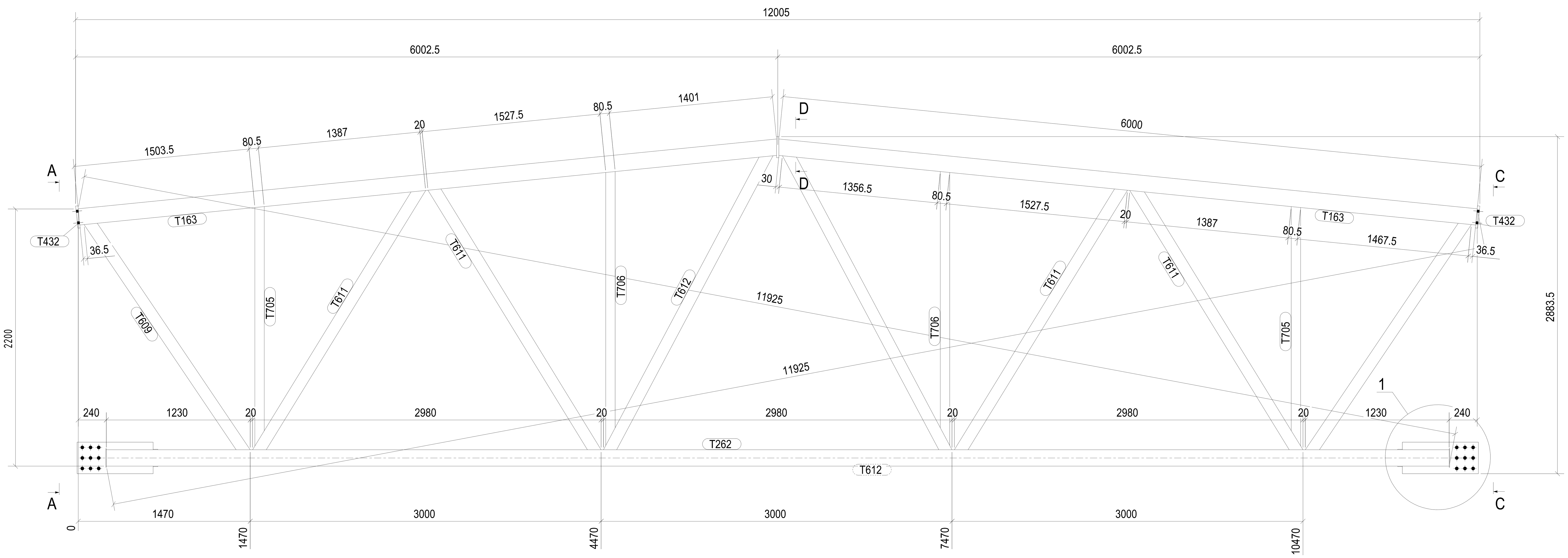

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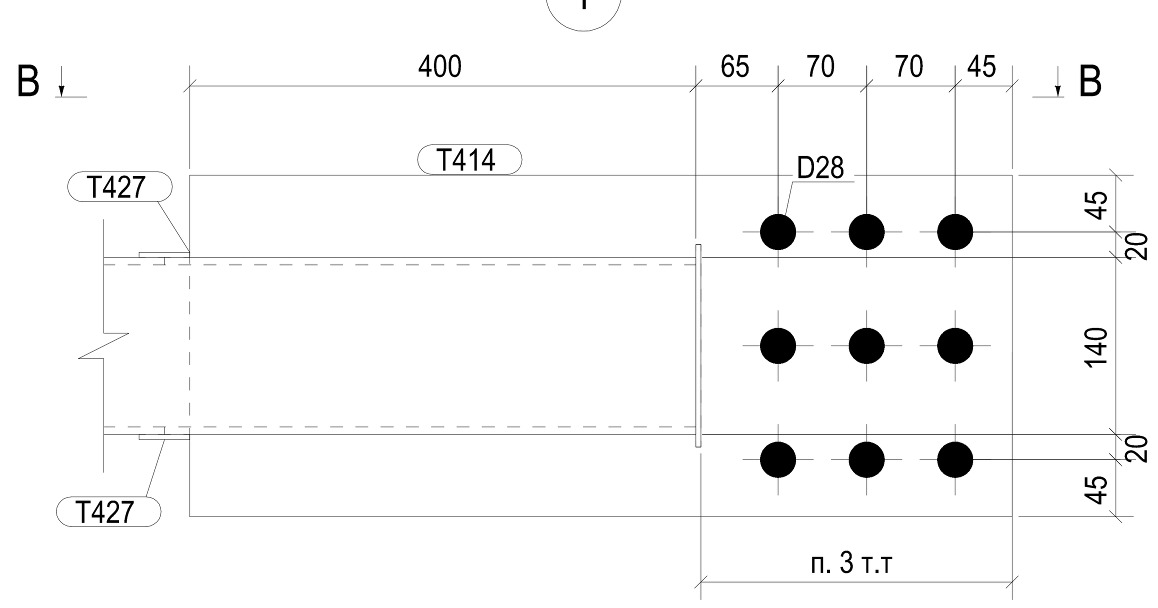

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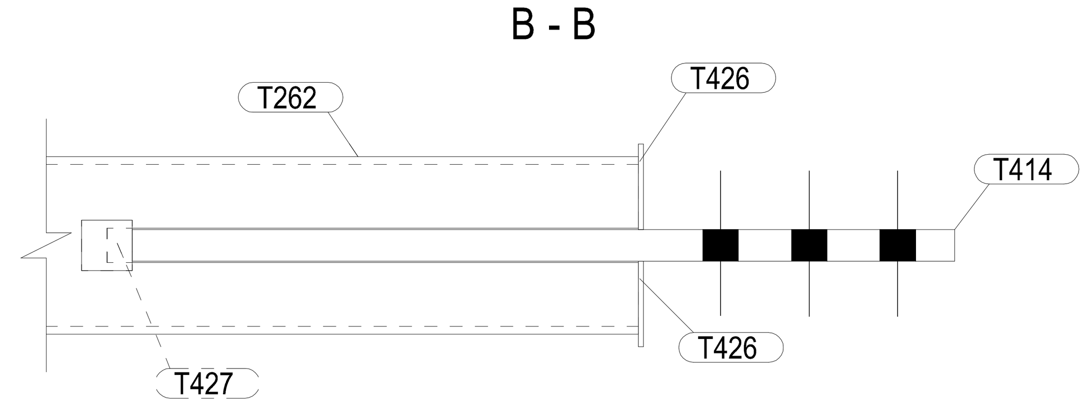

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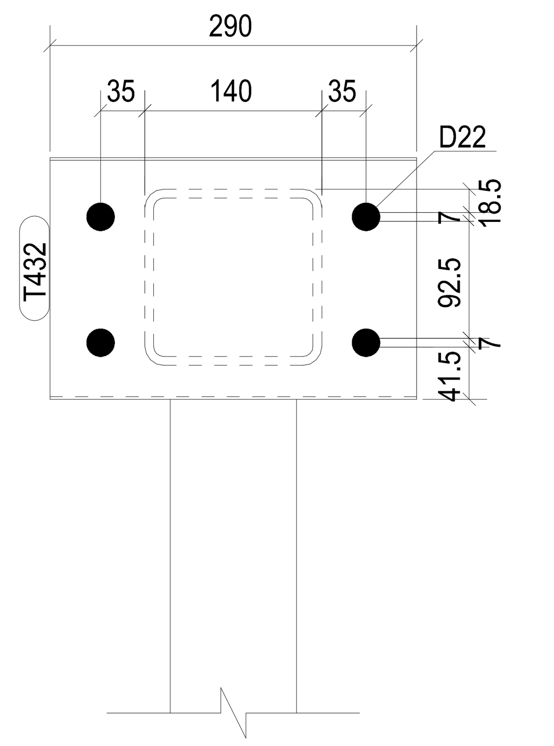

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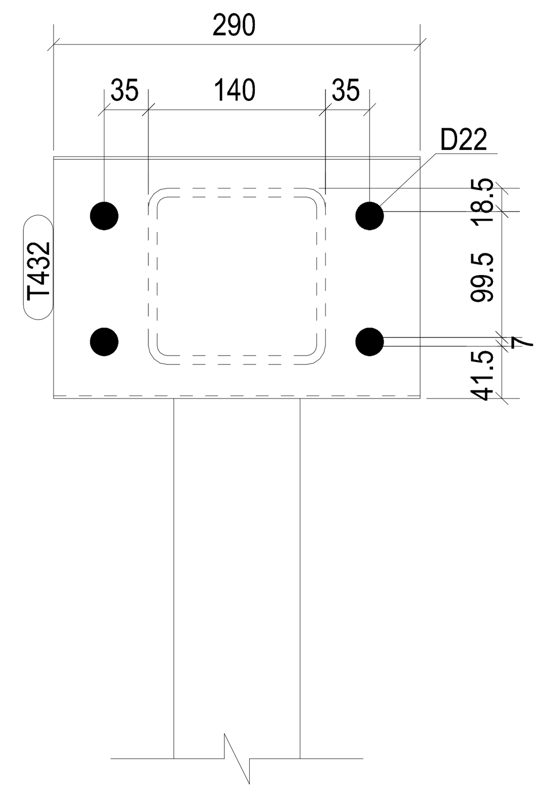

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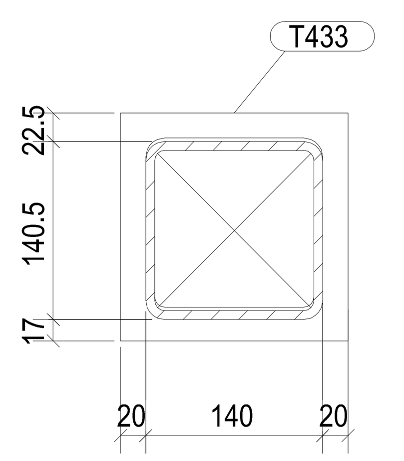

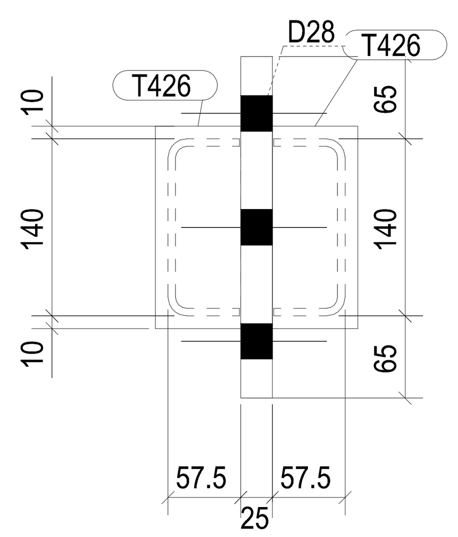

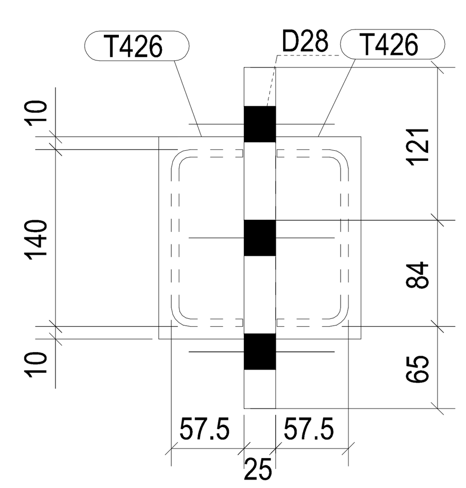

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Index	Name	Number	Cross-section profile	Material	Length,mm	Mass unit, kg	Mass total, kg
T262	Bottom chord	1	O (MSH)140X140X6.0	C345	11480	279.6	279.6
T163	Upper chord	2	O (MSH)140X140X7.0	C345	6000	170.6	341.2
T414	Gusset	2	- (BL)650x270x25.0	C255	650	35.0	69.9
T426	Pipe closer	4	- (BL)160x67x4.0	C255	160	0.3	1.4
T427	Pipe closer	4	- (BL)40x40x4.0	C255	40	0.1	0.2
T432	Flange	2	- (BL)190x290x20.0	C255	190	8.8	17.6
T433	Пластина	1	- (BL)180x180x20.0	C255	180	5.2	5.2
T609	Diagonal	2	O (MSH)100X100X4.0	C345	2391	27.7	55.4
T611	Diagonal	4	O (MSH)100X100X4.0	C345	2667	31.0	123.7
T612	Diagonal	2	O (MSH)100X100X4.0	C345	2902	33.8	67.5
T705	Vertical	2	O (MSH)80X80X4.0	C255	2048	18.5	36.9
T706	Vertical	2	O (MSH)80X80X4.0	C255	2343	21.1	42.2
					Total weight (kg):		1040.9

Total dimensions (HxTxL): 2884 x 290 x 12005

Instead of index | Signature and date | Index

Rev.	Num.l.	Sheet	Doc №	Signature	Date
Designed		Baranovskii			20.04.2015
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Approved		Kleschev			20.04.2015

Standard truss designs album, 2015

T10122*

Steel S345, S245 GOST 27772-88

Letter | Mass | Scale | Sheet | Sheets

RUUKKI
OOO "RUUKKI RUS" 2015

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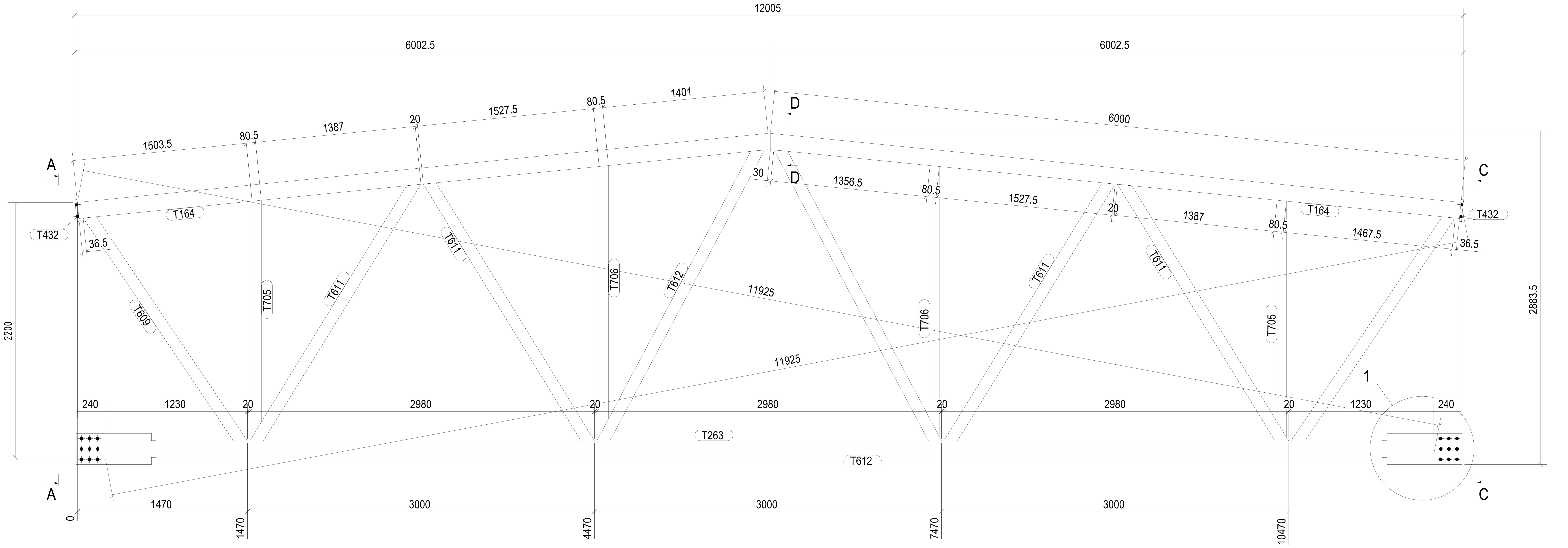

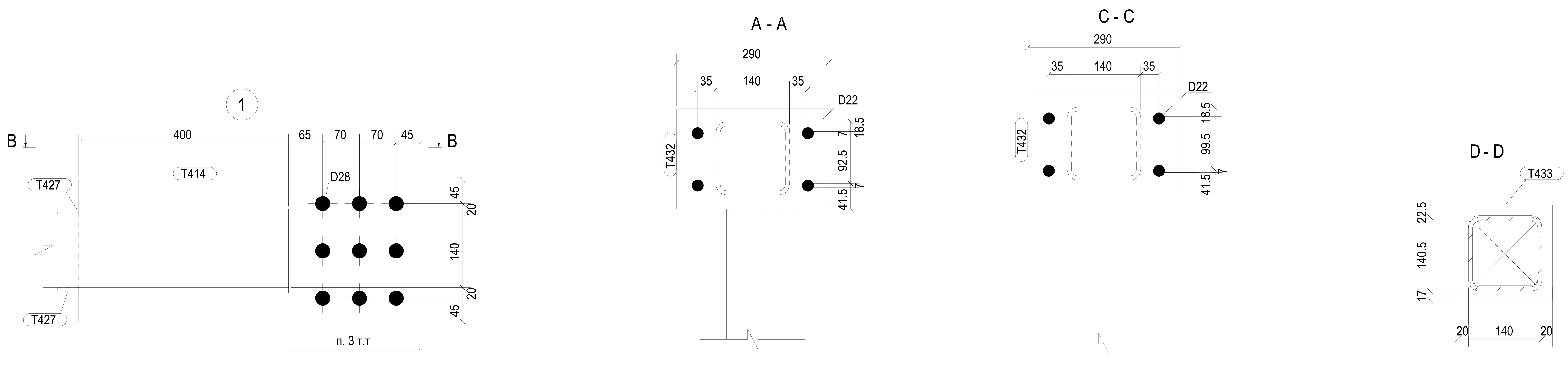

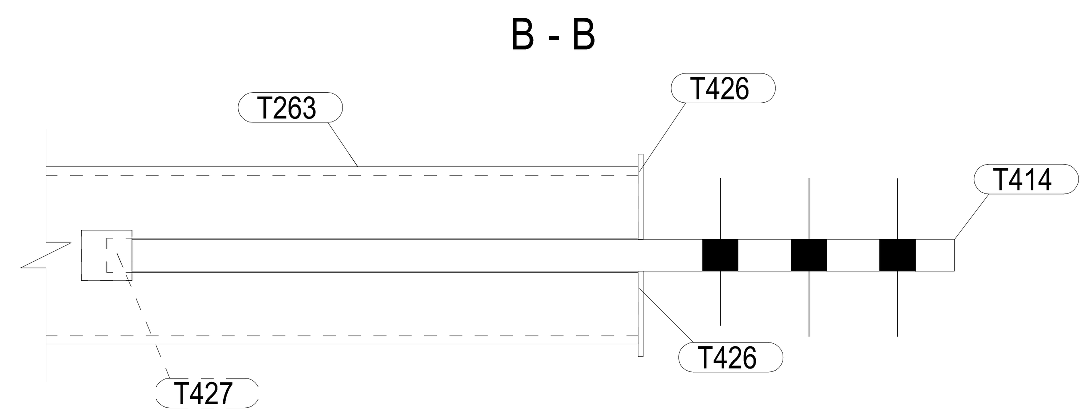

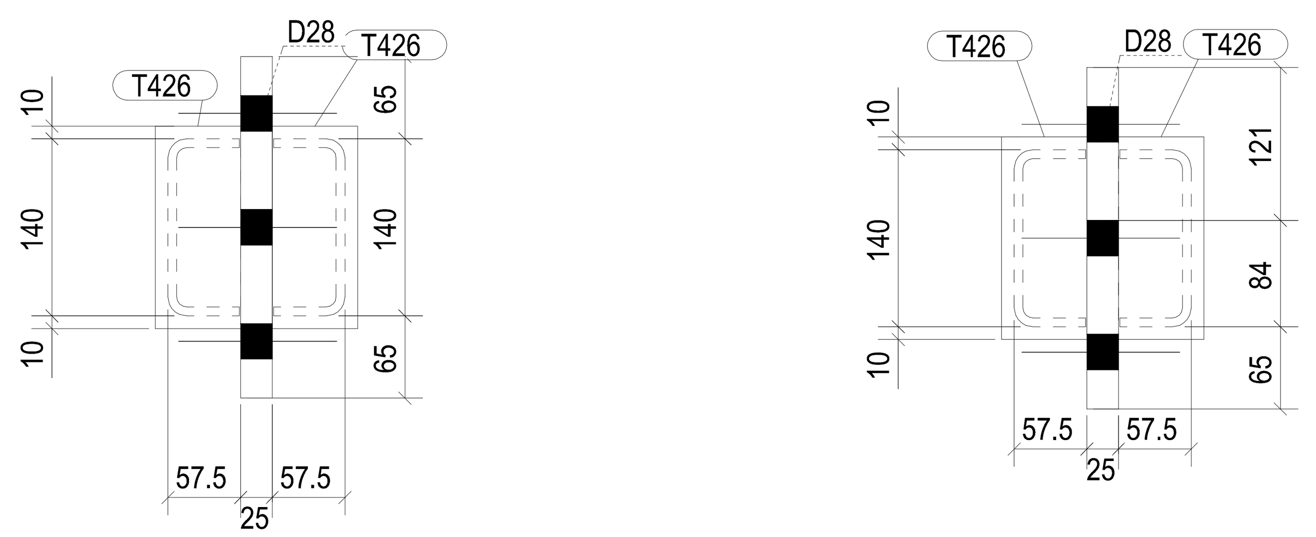

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Index	Name	Number	Cross-section profile	Material	Length,mm	Mass unit, kg	Mass total, kg
T263	Bottom chord	1	O (MSH)140X140X7.0	C345	11480	324.3	324.3
T164	Upper chord	2	O (MSH)140X140X8.0	C345	6000	190.2	380.5
T414	Gusset	2	- (BL)650x270x25.0	C255	650	35.0	69.9
T426	Pipe closer	4	- (BL)160x67x4.0	C255	160	0.3	1.4
T427	Pipe closer	4	- (BL)40x40x4.0	C255	40	0.1	0.2
T432	Flange	2	- (BL)190x290x20.0	C255	190	8.8	17.6
T433	Пластина	1	- (BL)180x180x20.0	C255	180	5.2	5.2
T609	Diagonal	2	O (MSH)100X100X4.0	C345	2391	27.7	55.4
T611	Diagonal	4	O (MSH)100X100X4.0	C345	2667	31.0	123.7
T612	Diagonal	2	O (MSH)100X100X4.0	C345	2902	33.8	67.5
T705	Vertical	2	O (MSH)80X80X4.0	C255	2048	18.5	36.9
T706	Vertical	2	O (MSH)80X80X4.0	C255	2343	21.1	42.2
					Total weight (kg):		1124.8

Total dimensions (HxTxL): 2884 x 290 x 12005

Instead of index | Signature ana date | Index

Rev.	Num.l.	Sheet	Doc №	Signature	Date
Designed		Baranovskii			20.04.2015
Checked		Zasulskii			20.04.2015
Control		Zasulskii			20.04.2015
Approved		Kleschev			20.04.2015

Standard truss designs album, 2015

T10123*

Steel S345, S245 GOST 27772-88

Letter | Mass | Scale

Sheet | Sheets

OOO "RUUKKI RUS" 2015

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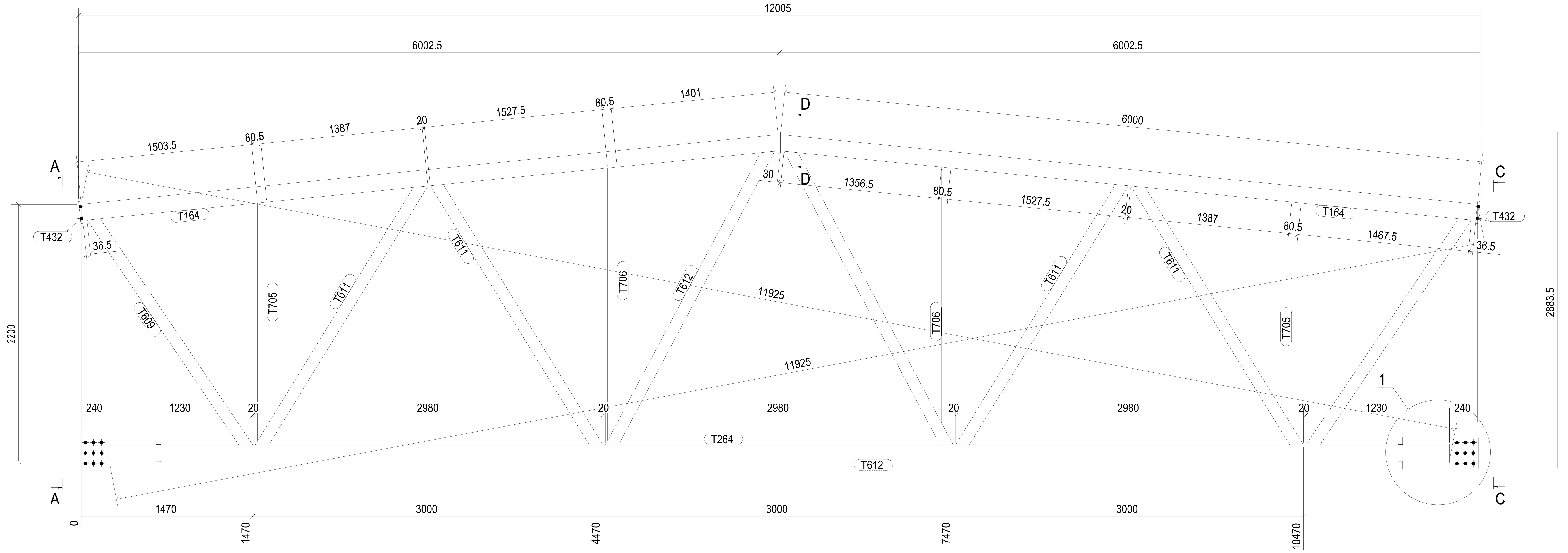

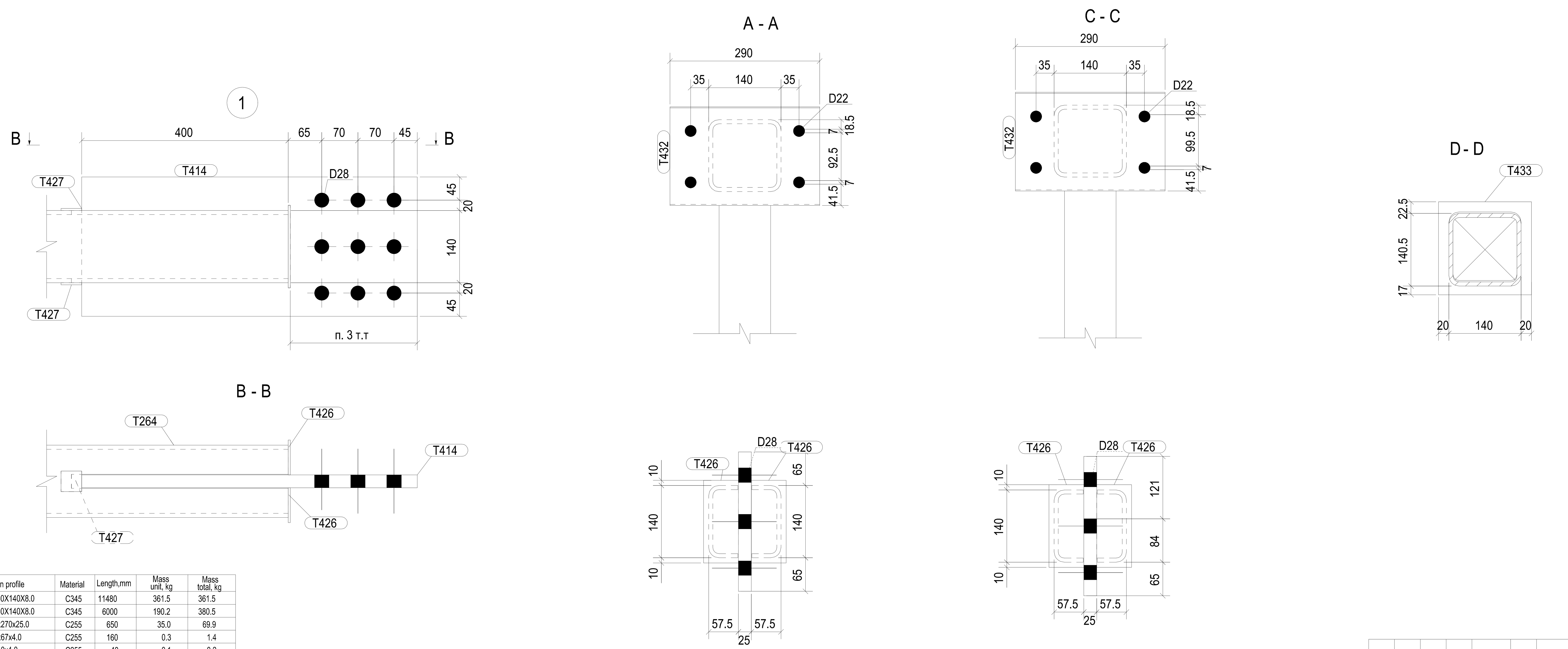

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Index	Name	Number	Cross-section profile	Material	Length,mm	Mass unit, kg	Mass total, kg
T264	Bottom chord	1	O (MSH)140X140X8.0	C345	11480	361.5	361.5
T164	Upper chord	2	O (MSH)140X140X8.0	C345	6000	190.2	380.5
T414	Gusset	2	- (BL)650x270x25.0	C255	650	35.0	69.9
T426	Pipe closer	4	- (BL)160x67x4.0	C255	160	0.3	1.4
T427	Pipe closer	4	- (BL)40x40x4.0	C255	40	0.1	0.2
T432	Flange	2	- (BL)190x290x20.0	C255	190	8.8	17.6
T433	Пластина	1	- (BL)180x180x20.0	C255	180	5.2	5.2
T609	Diagonal	2	O (MSH)100X100X4.0	C345	2391	27.7	55.4
T611	Diagonal	4	O (MSH)100X100X4.0	C345	2667	31.0	123.7
T612	Diagonal	2	O (MSH)100X100X4.0	C345	2902	33.8	67.5
T705	Vertical	2	O (MSH)80X80X4.0	C255	2048	18.5	36.9
T706	Vertical	2	O (MSH)80X80X4.0	C255	2343	21.1	42.2
					Total weight (kg):		1162.0

Total dimensions (HxTxL): 2884 x 290 x 12005

Instead of index

Signature ana date

Index

Rev.	Num.l.	Sheet	Doc №	Signature	Date
Designed		Baranovskii			20.04.2015
Checked		Zasulskii			20.04.2015
Control		Zasulskii			20.04.2015
Approved		Kleschev			20.04.2015

Standard truss designs album, 2015

T10124*

Steel S345, S245 GOST 27772-88

Letter	Mass	Scale

Sheet | Sheets

OOO "RUUKKI RUS" 2015

A1 Paper Size

APPENDIX E

Table E.1. Truss selection table for customers (part 1)

Constant load (kg/m²)		70	Loadings combination	70	Loadings combination	70	Loadings combination	70	Loadings combination	70	Loadings combination	70	70	Loadings combination
Technological load (kg/m²)		0		0		30		0		30		0	30	
Snow area (snow load (kg/m²))		I (80)		II (120)		II (120)		III (180)		III (180)		IV (240)	IV (240)	
Spacing, m	Truss span, m													
6	Load, t*f/m	0,90	1,00	1,14	1,30	1,32	1,40	1,50	1,60	1,70	1,80	1,86	2,04	2,10
	24	Φ24/1												
	30	Φ30/1							Φ30/2		Φ30/3			
	36	Φ36/1				Φ36/2					Φ36/3		Φ36/4	

Table E.1. Truss selection table for customers (part 2)

Constant load (kg/m²)		Loadings combination	70	Loadings combination	70	Loadings combination	70	Loadings combination	70	70	Loadings combination
Technological load (kg/m²)			0		30		0		30	0	
Snow area (snow load (kg/m²))			V (320)		V (320)		VI (400)		VI (400)	VII (480)	
Spacing, m	Truss span, m										
6	Load, t*f/m	2,30	2,34	2,40	2,52	2,70	2,80	2,90	3,00	3,30	3,40
	24	Φ24/1	Φ24/2		Φ24/3		Φ24/4		Φ24/5		-
	30	Φ30/4	-								
	36	-									