Optimal design of the roof structure of the 2,000-seat tributary of the rowing channel.

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ABSTRACT

The article proposes that the roof of the rowing canal's 2000-seat grandstand be designed using the best alternative among the commonly utilized trusses. The usage of parallel-belt, single-angle trusses has been proved to be effective in the design of such trusses. The grandstand is meant to be 24x80 meters in size.

Keywords: Roof-Covering,Truss,Interval,Base,Knot,Bar,Eccentricity,Bending Moment,Share Force,Axial Force,Angular, Tribune, Paddle.

Introduction: Roof structures are currently made up of a variety of metal trusses. Metal trusses should also be used for the ceiling of the rowing canal grandstand, which will hold 2000 seats. In this instance, the designed farm should, first and foremost, have low metal consumption and labor costs. These numbers ensure that the design is cost-effective.

The key difficulty in the design of tribune roofs is the proper selection of their structural scheme and cross-sectional shapes in order to design steel usage as efficiently as possible.

If the roof covering is formed from a truss with a parallel strip, single-angle cross-section, tribuna roofing is believed to be a more efficient and simple solution.

Main part: The roof covering of the 2000-seat rowing canal tribune was optimally designed using a farm with a span of 24 meters. The seats are arranged in 14 rows for a total distance of 80 meters. Every 8 meters, a 1 meter passage was left.

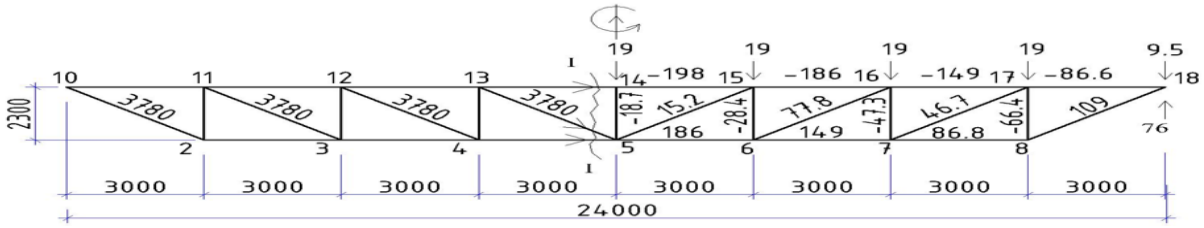


Figure 1. Calculation scheme of a parallel belt farm.

a-geometric dimensions, mmb-stresses, kH

The following must be used to create a single angle farm. Farm truss - 24 m, pitch -6 m material low carbon C235 grade steel (R_y=235 MPa).

Normative and calculated spread loads respectively q^H=0,83 kH/м^2, q=1,054 kH/м^2.

Prongs arranged in 3 m increments are used to transport loads on the farm without roofing.

Solve. We determine the loads that have an impact on the farm. Table 1 shows the normative and design loads for roofing

Table 1

№	Shipping names	Normative load, *кН/м²*	Reliability coefficients	Accounting load, *кН/м²*
1	"Sandwich" panel	0,15 0,18	1,1 1,05	0,165 0,189
2	Progon, binders, farm	0,50	1,4	0,70
3	Snow			
	Total:	q_n=0,83		q_o=1,054

Calculated and accumulated loads influencing the farm's top belt.
P=q·B·d=1.054·6·3=19.0 kH.
Here: d, *B* - the distance between nodes and farms, respectively.

The geometric shape of the farm is created using the above recommendations.
H=2,3м; L=24м
We select each aspect of the farm from a different perspective.

The stresses and selected cuts generated in the farm rods using the LIRA-SAPR program are given in the following tables.

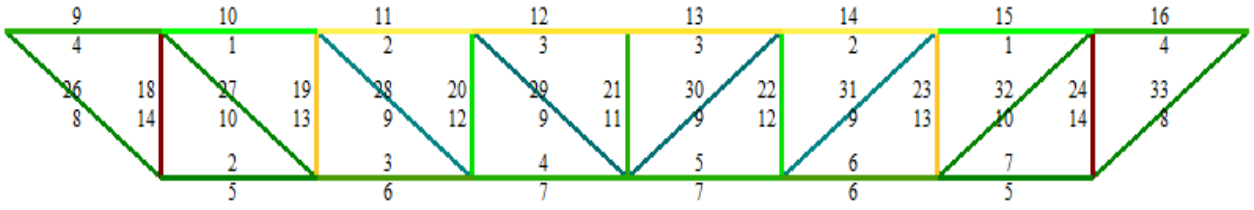
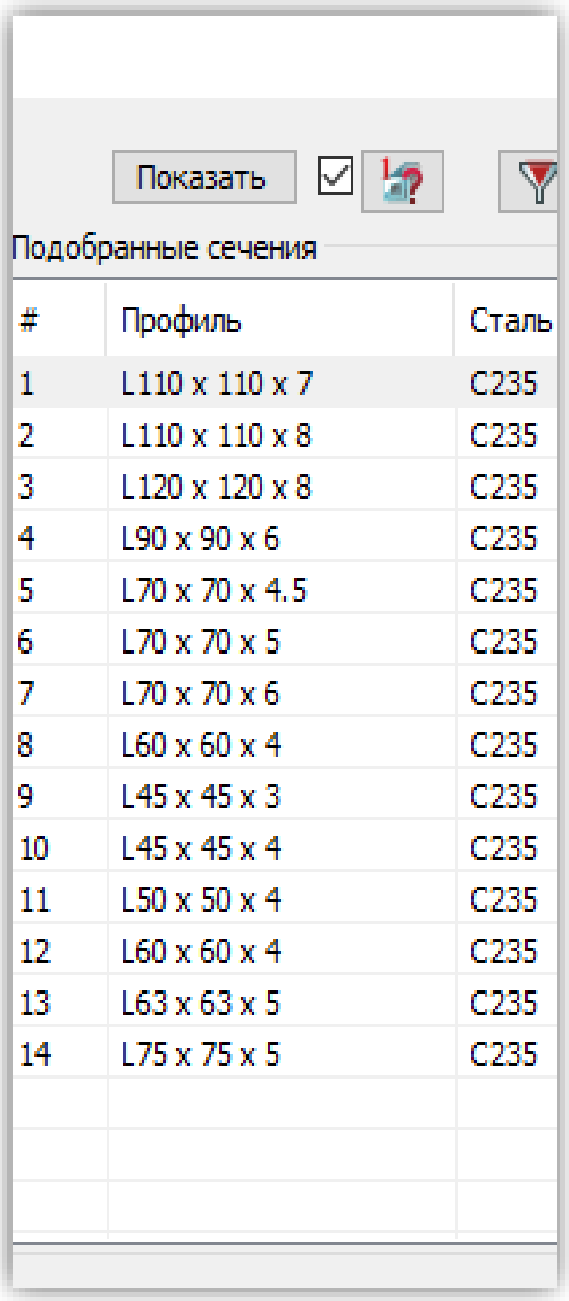


Figure 2. Numbering of farm rods.

Table 2. Table 3.

	Efforts
№ of element	N (t)
2	8.672867
3	14.856489
4	18.571472
5	18.571472
6	14.856489
7	8.672867
9	-8.666481
10	-14.85064
11	-18.56887
12	-19.80794
13	-19.80794
14	-18.5688
15	-14.8506
16	-8.666481
18	-6.627856
19	-4.738003
20	-2.842999
21	-1.894507
22	-2.842999
23	-4.738003
24	-6.627856
26	10.91642
27	7.780612
28	4.675334
29	1.557033
30	1.557033
31	4.675334
32	7.780612
33	10.91642



Conclusion

The best specifications were chosen in the design of the truss for the roof of the 2,000-seat rowing channel. In this scenario, a single-angle truss with a parallel strip is effective for covering the area of 24x80 m. The primary computations were done with the Lira-SAPR-2017 program, and the results are provided in tables.

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