Main buildings of converter shops

23. Main Buildings of Converter Shops

Design Institute: TSNIIproektstalkonstructsiya, USSR
Dimensions:
Length: 412 m
Bays: up to 30 m
Column spacing: 12 m and 36 m (in the converter installation zone)
Height to the railhead of the casting bay crane girders: +32 m
Maximum height of the shop: 80 m
Material:
Grade of steel for main structures: C 60/45 and C 46/33
Mass:
Metal structures: 28'000 tons
High-strength steels and steels of higher strength: 12'200 t

The projects have been developed for main buildings of oxygen-converter shops with different capacity converters: 100 - 130 tons (1960 - 1966), 250 tons (1967), 300 - 350 tons (1972 - 1973) and 400 tons (1974 - 1977).
From 1960 on 11 large converter shops have been designed and constructed for 35 converters with a capacity of 53 mio tons of steel per year.
An increase of the converter capacity results in larger overall dimensions of the building, greater crane loads as well as higher loads from the technological, electrical, sanitary-engineering and other types of equipment. Despite a considerable increase of the loads the weight of steel structural members per m2 of the area grows insignificantly, the consumption of steel structural members per ton of steel produced annually remaining practically unchanged or even somewhat decreasing compared to 100 - 130 t capacity converters due to an effective building frame system, to the application of great amount of high-strength steels and budget structures.
The construction of buildings with greater capacity converters (350 - 400 tons) is more effective as it results in an improved main performance of converter shops, raising productivity of labour in steel melting by 20 - 25 o/o compared to 100 - 130 ton capacity converters.
In designing main buildings of converter shops with 350 - 400 ton capacity converters a number of solutions have been used which ensure saving of steel, lowering of construction costs as well as a considerable decrease of labour consumption during fabrication and erection of metal structural members due to development of structures allowing handling and erection by large units weighing up to 70 tons.
Among these solutions are:

- The use for the high zone of the building of a frame-bracing system permitting to achieve higher rigidity of the building, saving of steel for columns and collar-beams of the high zone, lowering of labour consumption for making field joints due to a rational force distribution and the application of high-strength steels in the critical frame members (Fig. 1).
- The use of trusses-crane girders with the lower chord having a box-type cross-section for designing crane structures for heavy bridge cranes (450 - 500 tons) with the column spacing 30 - 36 m (in the converter installation zone).
- The application of connections made by high-strength bolts for the main critically loaded frame joints in combination with the transfer of compressive forces to the milled ends.

The operating platforms are designed as unit-panel structures in the form of large transportable 3 x 12 m units completely prefabricated, the decking being included in the girder work. The longitudinal girders for 300-ton hot-metal ladles are continuous girders.
The column bases subjected to loads up to 4'000 tons are designed so as to permit load transfer by the milled surfaces to exclude the necessity of alignment of frame structural members during erection of the building.

- A wide application of higher and high-strength steels for the main structural members (up to 50 o/o of the overall amount of the steel consumed). The shop roof is designed of smooth thin sheets as transportable prefabricated 3 x 12 m units. The sheets are of corrosion-resistant material ("10ХДП" steel) which requires no protective coatings.

The wall framing structures are light-weight panels of the profiled galvanized sheeting.
The application of the above-mentioned structural solutions provided the steel saving up to 10 - 12 o/o in the main buildings of the converter shops with the large-capacity converters.
Thus, in the projects of the main buildings of the oxygen-converter shops at the West Siberian, Novolipetsk, Cherepovets and "Azovstal" plants the economy of steel obtained amounts to 10'400 tons and the construction cost have been cut by 3'230'000 roubles.
In addition, the application of labour-consumption cutting solutions for fabrication and erection of metal structural members allowed to reduce erection duration. For example erection period for the main building of the converter shop No. 2 of the West Siberian metallurgical plant (Volume = 22'000 tons) was only 9 months.

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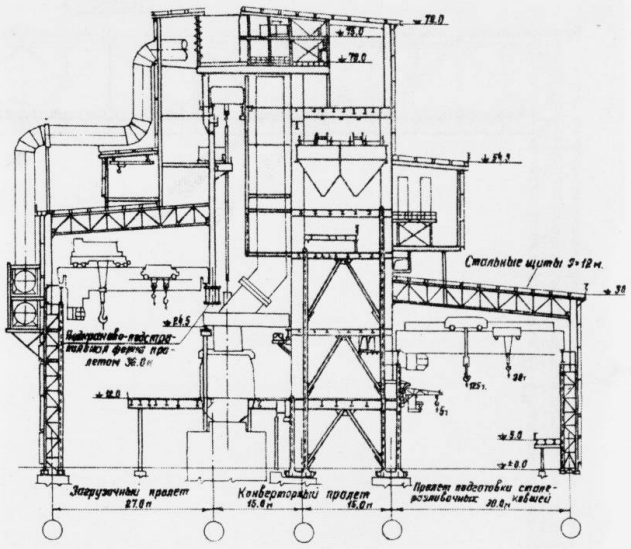

Fig. 1 Cross Section of the Shop with 400 ton Capacity Converters