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Block Panel Structures with the Prestressed Membrane

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Abstract

During the last 15 years in Russia carrying metal structures of the coverings of the new type appeared to become widely spread: space block panel systems, in which prestressed membrane works as a part of the block's chords and as a boarding surface simultaneously.

The main element of the prestressed coverings of this type is a panel of the maximum transport overall dimensions factory of the ultimate factory readiness. This panel is presented as a tough frame with the membrane tightened on it (thickness - 1--2,5 mm).

In accordance to constructive shaping such a panel can work as a part of the covering on the square, rightangular, round, elliptic or other more complex plane. Up to the present time similar coverings are carried out in the form of spans from 24 to 84 m. Project elaborations show its rationality for the spans up to 120 m, including the production buildings with a suspended cranes.

The usage of the given structures enables to solve the following problems: the uniting of carrying and boarding functions; factory elaboration of the large elements on the automatised lines; industrial erection up to the ultimate factory readiness in the form of large elements; reducing of the expenditure of the steel on the covering at the expense of excluding boarding construction proper.

The choice of the way, consequence of erection and the level of preliminary stress are accounted for by calculating and depend on the possibilities of elaboration, conditions of erection and exploitation.

When designing elements of the prestressed steel structures of the given type one has to take into account not only the norm requirements, but also the peculiarities of constructing, production and erection, described below.

The realisation of panel prestressing with a thin sheet plating leads to combining the carrying and boarding functions.

The choice of the method and the level of prestressing is accounted for by the calculation and the production considerations.

The design of such structures must contain, firstly, the scheme of works production, that are connected with the panel elaboration and their prestressing, secondly, information on the control of the level of prestressing, and also calculations needed.

In the Melnikov Central Research and Design Institute of Steel Structures complex experimental--theoretical investigations are made. The present report is devoted to the original methodics of the calculating of the prestressed membrane and the structure as a whole on the stages of elaboration, erection and exploitation.

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