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DURABILITY OF ELEMENTS OF CONSTRUCTION OF TOWER OF ATTRACTION

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Анотація

В роботі представлено результати розв'язання задачі забезпечення надійності виготовлення елементів конструкції башти атракціону. Показано способи розрахунку внутрішніх зусиль в елементах стрижневих систем методами механіки де формівного твердого тіла. Представлений розрахунковий апарат дозволяє оцінити вплив вітрового навантаження на міцність та стійкість споруди.

Ключові слова: міцність, деформація, експлуатаційні напруження, рівняння рівноваги конструкції, вітрове навантаження, механіка деформівного твердого тіла

Abstract. *There are calculations of the internal forces in elements of core systems using the mechanics of deformable solids. It was found the structural scheme of the tower provides the necessary strength and stability margin model. The preposed method of calculation is also possible to determine the internal forces in the support for fixing the tower.*

Keywords: strength, deformation, working stress, wind loading, mechanics of deformable solids

Demand on the high towers of entertainments increases still. They remain the interesting and profitable elements of industry of entertainments. These building must be maximally easy, hard and reliable [1, 2]. At the same time for a survival in the conditions of crisis the producers of entertainments must diminish a prime price the basic constituent of that is resource-demanding. It defined researches of internal efforts in core elements of the cored system of attraction "Tower of spin-scan" by the methods of mechanics of the deformed solid. Thus the important and actual is remained by the search of reasons of loss of durability, inflexibility and firmness of such building, search of rational construction decisions of supporting platforms after determination of the power loading in the weak section of such building, research of their behavior in the conditions of the extreme wind and power loading, development and research of new high-fidelity knots for providing of assembling-disassembling.

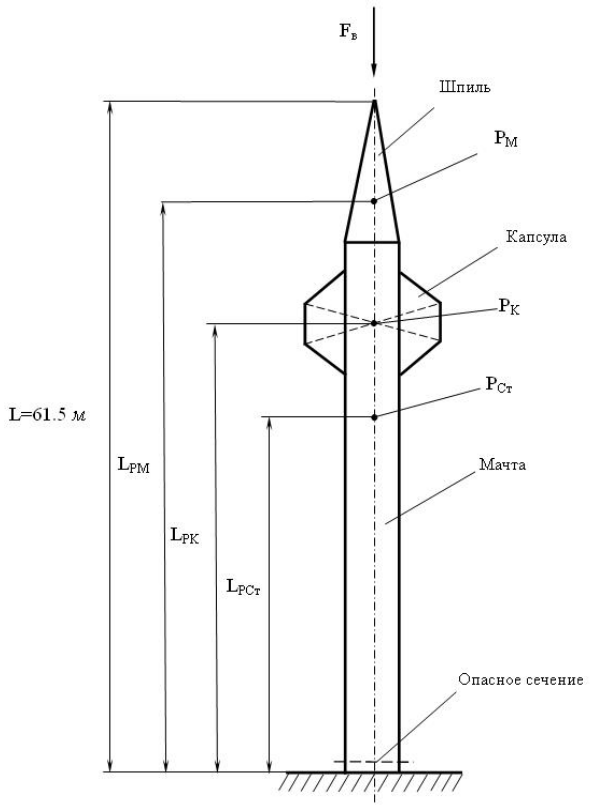

Fig. 1 – The General view of attraction

The calculation of internal efforts in the chimneys of lower, most loaded section of attraction is executed for lower position of capsule at the maximal wind loading of qв at speed of wind 30 m/s. On a fig. 1 position of weak section is shown.

A calculation chart is shown on a fig. 2. The analysis of internal efforts in a weak section is executed for two variants of the wind loading. Condition of durability of construction:

$$n = \frac{\sigma_y}{\sigma_{\max}} \geq n_{adm},$$

where σ_y = 245 MPa – is a limit of fluidity for steel 245,

$\sigma_{\max}$ – is maximal working tension in a support bar.

Minimum margin of safety:

$$n_{adm} = 1{,}5.$$

Maximal internal tension was 161 MPa, consequently, the minimum coefficient of supply (in the maximally loaded bar) responds to the condition:

$$n = \frac{\sigma_y}{\sigma_{\max}} = \frac{245}{161} = 1{,}52 \geq n_{adm},$$

that sufficiently for providing of durability of construction.

A calculation on firmness was executed taking into account influence of terms of fixing of the cored system on the size of critical force. The arrow of attraction found out flexibility λ- 67, characteristic for the bars of small flexibility. It confirmed the necessity of determination of critical tensions on the terms of durability within the limits of proportion of material. The use of theory of firmness of building proved on resilient soil, that in the first approaching it is possible to consider that a tower overturns near the size.

This principle is based on assumption, that building does not overturn about the axis of knocking over, if useful (antihunt) moment about this axis, form own weight of building with a platform and weighing there will be a more than maximal moment equipment.

$$M_p = \sum_{i=1}^{n} F_{xi} \cdot h_i ,$$

where F_{xi} – is a horizontal constituent of loading;

h_i – is a height of appendix of horizontal constituent F_{xi};

n – it is an amount of all loading on the cored building.

Calculations on durability are executed on two variants of loading and educed more dangerous variant of the wind loading. The terms of durability for all points of the most loaded section are executed.

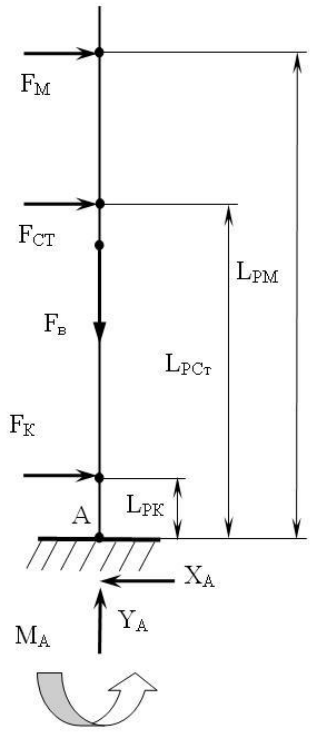

Fig. 2 – The Calculation chart

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