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Structural analysis of tension tower subjected to exceptional loads during installation of line conductors

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Abstract

The paper presents results of study dealing with verification of the impact of different installation options (defined by the distance and tilt of anchoring cables from the tower axis and the distance and tilt of winch from the tower axis) to meet the limit state conditions for the tension tower subjected to exceptional loads during installation of overheads lines. 36 optional positions of anchor and winch have been considered. In current practice both the winch and the anchor are mounted at the distance from the axis of tower equal to 2 times H (where H - the distance above ground level on which an anchor or cable are fixed to the tower). It has been shown that the anchor as well as the winch can be fixed to the temporary foundations at the distance equal to H without any hazard to the safety of the structure.

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Keywords: tension transmission tower; installation of line conductors; anchoring cables

1. The scope of the paper

The subject of the work is the analysis of the limit state conditions of a strong tension tower during installation of line conductors.

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The demand to reduce the cost of temporary supporting structure and difficulties with space available during construction of power lines has led to the question: how short distance between tower and foundations of anchoring cables is safe with respect to all limit state condition. Different locations of winch and anchoring cables, important factors which may influence on safety of construction, have been considered.

2. Anchoring cables

Installation of line conductors depends on work of winch, which drag the conductors along of the new electrical line. In the last phase, tensioned conductor is pulled by 20 cm, what results in a significant increase not only in tension of the line but also extraordinary load is imposed on the tension tower, which is not included in service loads. To prevent destruction of the tower temporarily stays called anchor cables are applied [1].

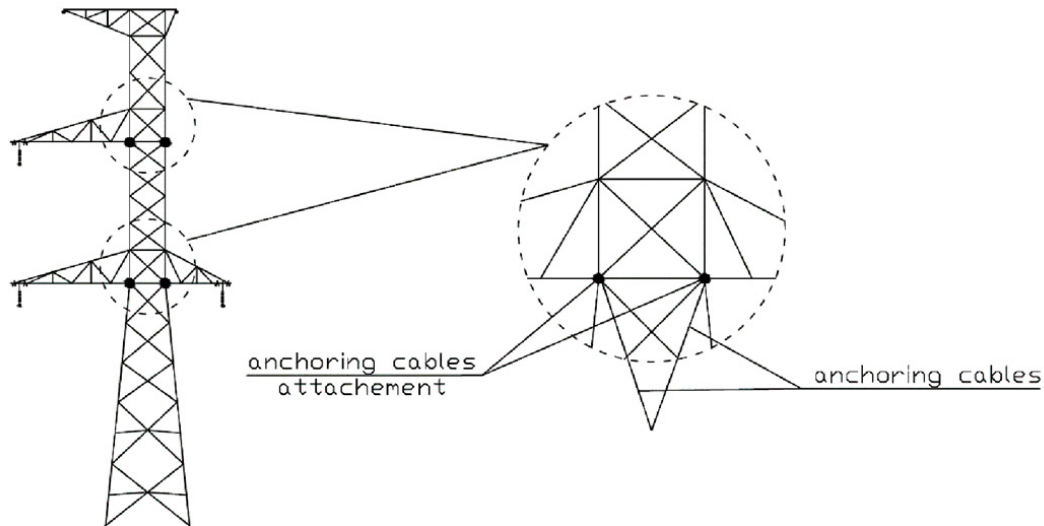


Fig. 1 Position of points at which anchoring cables are mounted to the tower

Fixing of anchoring cables takes place at the level of the bottom chord of cross arm. There are many possibilities for the location of the winch and anchor cables in reference to a power line (conductors) and a plane of symmetry of the tower. Fig. 1 shows the two fixing points to the tension tower, at height H and H' - respectively to the upper and lower cross arm, where H is the height from ground level to the bottom chord of the lower cross arm. (see Fig. 2). In this paper both levels H' and H are treated in the same way.

In nowadays practice, the anchoring cables are mounted at a distance of $1.5 H - 2 H$ from the axis of the tower body. Due to the field difficulties (river, forest, lakes, and mountains) or buildings, the desired solution is to reduce the distance of foundation of anchoring cables to H

From variety of possible angles of fixing the anchoring cable three cases of the horizontal angle to the axis of the tower have been considered: -30° , 0° , $+30^\circ$ (see Fig. 2).

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