CONSTRUCTION UNDER SPECIAL SOIL CONDITIONS

NEW CALCULATION SCHEMES FOR THE "BUILDING–BASE"
SYSTEM IN CONDITIONS OF COLLAPSING LOESS SOILS

V. A. Mezherovskii

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New calculation schemes are suggested for the "building–loess collapsing base" system, with the help of which it is possible to obtain values of the forces and movements occurring in a building as a result of collapses of bases that are close to the real ones in the nature of moistening and deformations of loess strata.

Construction on loess soils of type II with respect to collapsibility with significant thickness (> 15 m) requires the creation of artificial bases on the whole collapsing layer, which, in a number of cases, are distinguished by insufficiently high technical and economic indices [1]. In connection with this, we are conducting investigations on creating calculation schemes for the "building–base" system that would make it possible to perceive the forces occurring in buildings as a result of collapses of loess strata of considerable thickness (without constructing artificial bases) and, consequently, would eliminate impermissible deformations of buildings. Such calculation schemes were created for the most common types of buildings: with frontal composition; with brick and large-panel bearing walls; and frame buildings with a cellular scheme of the columns' arrangement.

The indicated schemes, which are innovative, are based on the model that we suggested of the region of moistening and collapse of a loess base [2] and make it possible to obtain values of the forces and movements occurring in buildings as a result of collapses of the bases that are close to the real ones [3].

In this case, it is assumed that moistening of the bases occurs from buried point sources (BPS), since this causes the greatest forces and deformations in buildings as a result of collapses [4]. A feature of the suggested model was the fact that the level of BPS practically coincides with the level of the footing, where the soil settles and where, in conditions of a collapsing layer of significant thickness, the rigidity of the base can be taken as equal to zero, and then it changes according to a law close to linear until the soil reaches its natural moisture content (Fig. 1). Such a scheme of the distribution of the base's rigidity takes into account the soil's movement from the action of its own weight, with possible disturbance of its contact with the foundation. According to [5], the suggested scheme of a base is close to nonlinear-nonelastic. At the same time, it is convenient for practical engineering application. Solution of the problem of joint operation of the base and the building in this stage makes it possible to adopt a two-dimensional calculation scheme, i.e., to subdivide the building into plane elements: walls or frames, and to take the location of BPS in their plane [6].


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Fig. 1. Calculation scheme of a "building—loess collapsing base" system for a wall 60 m long, with thickness of the collapsing layer of 15 m and various locations of a buried point source: 1) source.

Fig. 2. Calculation scheme of a "building—loess collapsing base" system:
I) one point source; II) two sources; III) three sources.