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### **GEODYNAMICS OF FORMATION OF EMERGENCY SITUATION OF A BUILDING RESULTING FROM A SUBWAY CONSTRUCTION**

The analysis is based on a range of available data, including visual inspections of the deformation observed in a hostel building, with photographic documentation of subsidence at the corner section. It also incorporates an inspection of the building's basement, year-long observations of the surrounding area prior to the incident, and confirmation of the absence of suffusion soil loosening under the building or nearby areas before the emergency. Additional data includes evidence of loess slurry accumulation in a ditch excavated on the sidewalk opposite the Dnipro University of Technology's educational building and findings from engineering and geological investigations.

Hostel building where emergency basement subsidence has happened, belongs to the upper part of Dnipro City located at loess geological deposits being ground bases for all available buildings.

During the previous 25-30 years, background formation of the ground water surface level took place at  $\approx 15$ -20-m depth compared to former  $\approx 30$ -40-m depth. The abovementioned resulted in background (planar) subsidence of both surface and building foundations due to specific characteristics of loesses, which experience subsidence if their watering exceeds critical value. In the context of cities, the plane water table rise is connected with technogenic leakage flow from the water-bearing supply lines. In the course of the engineering and geological survey, the watered soil zones have been identified within the areas of emergency hostel building shares as well as near southeast part of the structure.

Visual soil description and laboratory tests of water content on the samples taken from all probe wells outside the watered zone demonstrate almost half as much values to compare with the values from the recorded zone. The watered sites indicate technogenic impact on water network soil as well as disturbance of asphalt pavement.

As for shares of the hostel building adjoining the emergency zones, the laboratory tests have helped assume that soil watering in the area took several stages; first, gradual deep soil watering happened due to leakages from water network of a boiler room located in the hostel basement; then, the top soil share watering took place owing to emergency flow accumulation. The assumption contained a contradiction since a probe well on the other side of the building did not record similar results in terms of a graph of changes in soil moisture depending upon depth.

In this regard, it is required to explain the drastic decrease of soil moisture in the indicated way if dome-shaped saturation from the boiler room basement is meant. Dense water network between the boiler room and neighbouring building in D. Yavornytsky Avenue should also be taken into consideration. The contradiction is supported by the availability of analogous zones being recorded at a considerable distance in another direction. The contradiction helps conclude that the boiler room impact is similar to the general background. Numerous buildings in the upper part of the city response to the process differs depending upon their functional status; nevertheless, in the majority of cases, the deformations are not of emergency nature.

The current emergency situation with the building under analysis results from local intensive water supply of soil formation of aeration zone which formed extensive dome-shaped watering of loess soil when critical value was exceeded; the abovementioned caused rapid basement subsidence as well as perimeter pavement hole in the corner share of the hostel building.

Downward earth leakage was supplied by a ditch located at a distance of several meters from a corner part of the building. More than a year, the ditch remained open without any waterproof fencing. Taking into consideration the asphalt surface slopes, time, and water absorption amount, such a dome-shaped earth leakage manifested after the accident in the building basement in the form of occasional drops from the structural wall separation zone and foundation blocks (corner part of the buildings). It corresponds to earth leakage of loess soil as well as water saturation contour.

The weight of evidence suggests that intensification of the leakage flow towards corner share of the building and further along it through backfilling up to a discharge zone (the Dnieper River) resulted from hydraulic soil erosion during trenchless laying of service lines. Geophysical survey data record it.

Suffosion flow between the ditch near the hostel corner and ditch excavation in the neighbourhood of massive granite pedestal has been identified (visual amount of the excavated ground denoted ~ 5-m depth which is quite sufficient for more than 0.4 flow gradient formation causing suffosion loess loosening). The abovementioned agrees with the data on water content changes in the adjacent well. Asphalt pavement hole, basement subsidence with separation from the structural wall as well as an archwise crack with an opening being visualized over 10-cm range correspond to laboratory definitions of relative 3-5-% subsidence, and are limited by soil layers settled down 10 m which localized further emergency subsidence. Moreover, immediate hole concreting also favoured it.

Taking into consideration local manifestations of soil subsidence and archwise deformation of the structural wall within the ground floor, fast strengthening of the misshapen wall share in the form of metal reinforcement has been recommended and performed. In addition, according to requirements, all ditches were liquidated in Dmytro Yavornytsky Avenue within the boundaries of adjacent buildings.

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