

# Development of a Numerical Model of the "Soil-Foundation-Building" System

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**Abstract.** The aim of this work is to develop a numerical model and perform numerical simulations of avalanche-like collapse of buildings and structures in case of fire and explosions, taking into account the peculiarities of soil performance and its properties. The LIRA-SAPR software is a promising tool for calculations and modelling.

## Introduction

The growth of the urban population, the constant pressure on available land, and the need for security in the face of a full-scale Russian invasion are creating a challenge to find new methods of development [1, 2]. The use of underground space is a strategic response to this challenge, as it allows for the efficient use of space within the city without worsening the environmental situation or affecting existing land resources [3].

The use of underground space allows preserving natural landscapes and green areas, historical monuments and architectural objects.

In addition, underground buildings can be more resilient to natural disasters, ensuring safety for residents and property [4, 5]. It can also contribute to energy savings due to natural insulation, which reduces energy consumption for heating and cooling.

Also, attention should be paid to the relevance of using underground space during war. Underground premises can serve as a shelter for civilians during attacks and bombings [6]. They can be used as places for evacuation and medical care for the wounded. To protect important facilities and infrastructure, such as command posts, power plants, water sources, etc. from aggressor attacks [7, 8]. Provide a strategic advantage to troops by deploying troops and equipment in safe conditions, which is important during military operations. Underground structures can be used to house secret facilities, military bases, weapons depots and other strategically important objects, ensuring their secrecy and protection from enemy intelligence.

Given the great potential of using underground space for construction in solving modern urban challenges, the issue of ensuring the stability and reliability of the soil-foundation-building system arises to detect signs of destruction, soil subsidence or fatigue of the structural material in time [9, 10].

## Analysis of Publications

The soil-foundation-building system in construction plays a key role in ensuring the stability and reliability of a building. The foundation acts as a support structure that transfers the weight of the building to the ground, distributing the load evenly [11]. Its size, shape and material are chosen depending on a number of factors, including the characteristics of the soil and the load of the building [12]. In today's environment, soils are subject to chemical, physical and mechanical stresses [13]. Physical and mechanical parameters of soils must be taken into account in computer models [14, 15].