VSB TECHNICAL
UNIVERSITY
OF OSTRAVA

FACULTY
OF MINING
AND GEOLOGY

DEAN

REVIEW OF A FOREIGN CONSULTANT

on the dissertation work **of Suleimenova Diana** on the topic: **"Research of deformations of high-rise buildings using geodetic methods and automated equipment"**, submitted for the degree **of Doctor of Philosophy (PhD)** in the specialty
6D071100-Geodesy

Dissertation work D. N. Suleimenova's dissertation is devoted to solving an urgent and important scientific and practical problem related to ensuring the stability and safety of operation of high-rise buildings in the conditions of technogenic and natural mobility of the earth's surface. In the conditions of active urbanization, the growth of dense multi-storey buildings and the increase in the risks of seismic and man-made impacts, research aimed at the development of geodetic monitoring methods is of absolute scientific and engineering significance.

The author has developed and implemented a modern methodology for geodetic monitoring of deformations based on the use of automated tools and advanced technologies, such as GNSS, electronic total stations, ground laser scanning (TLS), as well as unmanned aerial vehicles (UAVs). The work is characterized by a high level of scientific and technical development and meets priority areas in the field of geodesy, engineering monitoring and construction diagnostics.

D. N. Suleimenova demonstrates a deep understanding of the current state of the problem, conducts a sound analysis of the regulatory framework, as well as international and domestic experience in the field of deformation monitoring. The goals and objectives of the study are clearly formulated, the structure of the study is logically built, and the methods and approaches used are justified from both theoretical and applied points of view.

It should be emphasized that the author does not limit himself to the use of individual methods but offers an integrated monitoring system that combines data from various sensors and geodetic tools into a single analytical platform. This multisensory integration improves the accuracy, reliability, and efficiency of estimating the object's deformation state. The developed algorithm for accounting for systematic errors, inter-method comparison and visualization of deviations in the space-time section demonstrates a high level of knowledge of the author's methodology and analytical tools.

Scientific achievements and novelty of the work include:

Development and testing of an integrated geodetic monitoring methodology that combines GNSS observations, electronic total stations, ground-based laser scanning and aerial photography with UAVs;

Formation of an algorithm for processing and analyzing deformation processes, considering multisensory data sources and the influence of external factors.

Implementation of the methodology on a real object (the building of the rectorate KazNU of Al-Farabi Kazakh National University), which confirms the applied significance, practical feasibility and high reliability of the results obtained.

Quality of design and presentation of the material:
The materials of the dissertation are presented consistently, logically and scientifically reasoned. The text is characterized by a high culture of scientific presentation, competent use of terminology, clear structure and clarity of presentation of results. All conclusions are supported by calculations, graphic illustrations, as well as experimental and field data.

Conclusion:

Suleimenova Diana's dissertation work was performed at a high scientific and methodological level, has a significant theoretical and practical contribution to the development of geodetic monitoring of construction sites. The results obtained are valuable for designers, operational and monitoring services, especially in conditions of increased seismic risk and dense development.

Based on the above, I believe that the dissertation work fully meets the requirements for dissertations for the degree of Doctor of Philosophy (PhD) in the specialty "Geodesy".

I recommend awarding Suleimenova Diana the degree of Doctor of Philosophy (PhD).

Foreign consultant:

Dean
Hana Staňková – prof. MSc., PhD
Faculty of Mining and Geology
VŠB-Technical University of Ostrava
Department of Geodesy and Mine Surveying, Ostrava, Czech Republic