

Specialist Training and Retraining in Building Reconstruction

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The article deals with the main problems of modern construction quality as well as the quality of restoration and reinforcement of buildings and constructions. It underlines the urgency to train and retrain engineers for building reconstruction. The study materials developed by the Department of Ferroconcrete and Stone Constructions of TSUAB are presented. They provide a methodical basis for training highly qualified civil engineers.

Key words: *specialist training and retraining, reconstruction, construction, restoration and strengthening, manual.*



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The problem of quality increase in design, construction and operation of ferroconcrete buildings is still at issue and of great economic importance.

As the issues concerning design, reconstruction and reinforcement of ferroconcrete and stone constructions are getting more important, there appears an urgent need for training and retraining highly-qualified bachelor's and master's degree professionals, post-graduates and doctoral students within the discussed subject area. Tomsk State University of Architecture and Building (TSUAB) is working towards handling this growing demand.

TSUAB provides civil engineering training programs in Building Reconstruction, Operation and Property Management, as well as a number of retraining courses for civil engineers on the basis of the Institute of Continuing Education. Department of Ferroconcrete and Stone Constructions is actively involved in this kind of work.

Transition to the two-level system of higher education urges universities to address the needs in develop-

ing more advanced Master's training programs by constant enhancement of teaching technologies and procedures. Besides, a number of new disciplines focused on leaning unconventional reconstruction technologies, new methods for structural inspection, reconstruction and reinforcement of structures and buildings have been introduced.

The topic of fifth-year student papers, who are pursuing degree in Industrial and Civil Construction, are concerned with Restoration of Buildings and Constructions and aimed at developing new methods for reinforcement of ferroconcrete ceiling panels, continuous flooring joists and built-up column of multistory industrial buildings. This work is a sequel to the previous course papers on "Ferroconcrete and Stone Constructions of Multistory Industrial Buildings". The initial data applied in these student works are always different. For example, it is required to estimate bearing capacity of the construction and propose the

variants of its reinforcement against temporary increase in load which is a common place in building reconstruction leading to the change of its intended purpose. Such initial parameters as concrete strength degradation during building operation and reduction in reinforcement steel diameter due to corrosion are always changed.

The use of practical examples concerning the inspection of real buildings and constructions characterized by the same defects and damages can help students to reinforce theory in the classroom. By giving a demonstration, illustrations and photos of damaged building bearing constructions which have been already reinforced, students can connect engineering theory with practical applications in order to carry out their assignments successfully.

Besides, internships give students the opportunity to gain valuable applied experience in structural inspection of real buildings and constructions working independently or as a member of an engineering team. Participating in real structural inspection, students can propose construction solution, detect and lag defects and damages, determine strength characteristics of construction materials, estimate bearing capacity of building bearing constructions. Then, based on the existing manuals and teaching materials students are to propose the variants to reinforce and reconstruct these damaged constructions and defend their internship report.

While perusing Master's degree in "Reconstruction of Buildings and Constructions" students acquire advanced knowledge in application of various building reconstruction methods and technologies. During a study period, a master student has all possibilities to gain valuable experience in structural inspection and development of reinforcement and reconstruction schemes which can be applied in different constructions and buildings. Above all, while working on final qualification project, a master's student is not limited by the existing theories and

technologies but rather encouraged to develop new methods for construction reinforcement and restoration with further possibility to patent his/her invention. Particularly, a new manual devoted to the aspects of structural inspection, reconstruction and reinforcement of ferroconcrete and stone buildings and constructions has been recently developed by the research team which includes two Master's students.

Complex analysis of the scientific works focused on developing appropriate calculation methods and technologies for ferroconcrete and stone buildings and constructions is carried out in TSUAB.

Theoretical and experimental research regarding ferroconcrete and stone buildings and constructions has been conducted; valuable practical experience in creating and developing real-life design-and-engineering solutions which can be applied for reconstruction of buildings and constructions has been acquired; a number of monographs and textbooks have been developed [1...5], inventor's certificates and patents have been obtained. The textbooks are designed so as to demonstrate students and engineers how to conduct structural inspection, calculations concerning reconstruction and reinforcement of ferroconcrete building constructions. Besides, the work is carried out towards standardization of calculation methods, technologies of reconstruction and reinforcement of ferroconcrete, concrete, stone and reinforced masonry structures and constructions.

The inventions made by the Department of Ferroconcrete and Stone Constructions of TSUAB were given favorable considerations by the specialists of design and development companies, building contractors and leading universities of CIS countries. Five textbooks are recommended by the Ministry of Science and Education of the Russian Federation and Education and the Methodics Association of Russian Universities as textbooks for students of

higher educational institutions pursuing degree in speciality 270100 "Building and Construction".

Based on the gained experience in structural inspection and obtained data in theoretical and experimental research, a number of computer software programs which allow specialists to carry out calculations and structural inspection, design and select appropriate method for reconstruction and reinforcement of ferroconcrete and stone buildings and constructions have been developed. Due to these software programs, it is possible to display possible defects and damages of ferroconcrete and stone constructions, select a relevant method for reinforcement and reconstruction. Software programs provide users with access to more than thousands of variants of reconstruction

and reinforcement of ferroconcrete and stone buildings and constructions.

The usage of software programs while designing ferroconcrete and stone constructions significantly reduces time expenditure and labor intensity.

Thus, it can be stated that the problem of training and retraining specialists, Bachelor's and Master's students in Reconstruction and Reinforcement of Ferroconcrete and Stone Constructions is still at issue. Therefore, TSUAB is working towards building a culture of continuous improvement in undergraduate teaching within the discussed subject area, including both theoretical knowledge and practical experience.

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