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## **KNOWLEDGE INTENSIVE TECHNOLOGIES FOR ADVANCED TRAINING OF SPECIALISTS IN CONSTRUCTION AND HOUSING AND UTILITIES INFRASTRUCTURE**

The present paper is concerned with the tasks of arrangement of the conditions for technology intensive, innovative and effective development of construction industry. The issues of advanced training and retraining of specialists in construction industry and housing and utilities infrastructure have been thoroughly studied and analysed. The new innovative approaches to improvement of intelligent potential of specialists and senior officials have been proposed to meet the up-to-date requirements. The main tendencies and trends for further development of professional education in the Russian Federation have been set out and verified for the next few years.

**Keywords:** construction, housing and utilities infrastructure, supplementary vocational education, educational centre, specialist, occupational retraining

### **INTRODUCTION**

Analysing the tendencies of global development of construction industry, it's worth mentioning that construction sector plays an essential role in the European economy. With the annual turnover accounting for 1 billion euro and the total labour force exceeding 11 million people (mostly involved in micro- and small enterprises), the additional 15 million people are employed indirectly, the construction industry contributes to 10% of GDP of developed market economies. It's important to note that construction is also the largest consumer of goods produced by allied industries (raw materials, chemicals, electrical and electronic equipment and machinery, etc.) and related services. Due to its economic importance, the operation of construction sector has a great influence on the developing economies of European countries in general.

Stability and dynamic development of construction industry plays the critical part in achievement of the target set by the European Union countries and the Russian Federation, to reduce greenhouse gas emissions by 80÷95%. In accordance

to 'Roadmap of pursuing competitive low-carbon economy up to 2050', the economically effective contribution of housing into reduction of greenhouse gas emissions by 2030 is set to reach 40÷50% and 90% by 2050 correspondingly.

It's important to note that in Russia the task of arrangement of the conditions for technology intensive, innovative and effective development of construction industry and housing and utilities infrastructure is set at the country level; those conditions are supposed to satisfy the increasing demand of country's population for comfortable living standards. In Russia, the new effective system of corporate responsibility for training and retraining of specialists is being implemented in academic and educational environment and also among the employers in compliance with scientific and economic forecast of development of the state. Please note that, the newest high-tech developments of leading scientists and academic professionals from higher educational institutions and research institutes are incorporated into the educational complexes realised at the modern stage. The outcomes of such investigations are published in Russian and foreign scientific papers [1-13]. Continuing education of senior officials and specialists was compulsory in Russia during the Soviet period and was carried out every 5 years for the period of 1.5-2 months in the specialized institutes for vocational training in such sectors as construction, housing and utilities infrastructure, transport and highway construction, etc. The effectiveness of educational process can't be emphasized too strongly as it gives a cumulative effect of implantation of effective scientific developments into production sphere.

## **1. THE MAIN TENDENCIES AND PERSPECTIVES OF DEVELOPMENT OF SUPPLEMENTARY VOCATIONAL EDUCATION IN THE CONSTRUCTION SECTOR**

The passing of the new Federal Bill 'The Law of the Russian Federation on Education' dated 29.12.2012 No. 273-FZ has become the starting point of the development of the system of supplementary vocational education in Russia. The institutes of supplementary vocational education were merged to the universities in the form of corporate units. Along with this, specific attention was given to the ways of integration of educational and scientific (research) activities in one educational institution. Thus, design and technical evaluation bodies, incubators and other scientific (research) departments were established in universities, while research institutes were given an opportunity to carry out educational activities. As an example, we can mention the successful cooperation of Moscow State University of Civil Engineering (MGSU) and the Technical Committee 'The Green' ('Zelenye') for technology of life's activity environment and 'green' innovation products' (TC 36) by Federal Agency on Technical Regulating and Metrology, led by V.I. Telichenko, the president of NIU MGSU, Doctor of Engineering, professor, Honoured master of sciences of the Russian Federation, member of the Russian Academy of Architecture and Building Sciences. They deal with the issues of natu-

ral environment protection, ecological security, and the problems of sustainable development concept. Let's emphasize that many ecological problems could be solved by means of engineering methods.

The Federal Educational Standards and Federal State Requirements serve as the main substantive and organizational base for professional education. The professional standards approved by the authorized trade unions of sector employers and regulatory requirements to graduates competencies are taken into account at the corresponding qualification levels.

It's important to mention that at the present time, cooperation of educational institutions and enterprises of construction and communal services is developed in the following principal fields which make provision for synchronising professional and educational standards (regarding the level of education), stating the requirements to educational results depending on a level of training and retraining, as well as the number of teaching hours. Along with that, the issues of participation of representatives of potential employers in interim and final examinations are approached; they include development of networking cooperation of educational and scientific and research centres, enterprises of real sector of economy with high-tech technology intensive equipment and instrumentarium. Then, the joint development of general professional education programmes and the programmes of supplementary vocational education is carried out.

To our mind, in a near-term outlook it's necessary to create the effective and independent system for professional and public accreditation of professional educational programmes and public accreditation of educational institutions and centres.

In order to improve the quality of specialists training in a sector and also stating the fact that state control over advanced training and professional retraining of specialists was abolished, it's required to raise the significance of a procedure of professional public accreditation.

In particular, to get authorization for works affecting safety of capital construction projects, it's necessary to validate the recommendation to undergo advanced training of specialists exceptionally according to the educational programmes accredited by employers, their trade unions or organizations authorised by them.

The Ministry of Construction Housing and Utilities of the Russian Federation is currently working on formation of modern urban habitat, total building renovation and rehousing of residents of condemned buildings. Facing the modern challenges, the Ministry established a temporary structure for processing industrial and household waste, including municipal solid waste (MSW). Now the market of advanced processing of building waste with the use of Russian innovative technologies is actively forming; that requires the decisive actions of developing sufficiency of specialists with the relevant competences for construction sector companies and departments of executive power in the majority of Russian regions. All this will encourage perfecting legal regulation, reduction of administrative barriers and improvement of entrepreneurial climate.

When organising the system of supplementary vocational education, it's recommended to use good professional practice of performance of the contracts for

educational services related to training specialists responsible for energy saving and enhancing energy performance in the state-financed organizations and establishments in the period of 2011-2012, the President programme 'Continuing professional development of engineers for the period of 2012-2014'.

In compliance with new professional standards developed by the Ministry of Labour of the Russian Federation, employees' qualification has to meet the up-to-date performance and competence requirements which include: participation in the courses of supplementary vocational education and occupational retraining for senior officials and specialists, building tradesmen in the field of construction and housing and public utilities, qualification examination.

## 2. ESTABLISHMENT OF UNIVERSITY OF MINSTROY

In the Research Institute of Building Physics of the Russian Academy of Architecture and Building Sciences (NIISF RAASN), since 2014 subordinated to the Ministry of Construction and Housing and Communal Services of the Russian Federation, it was established the University of Minstroy. It specializes in supplementary vocational education of senior officials and specialists in advanced issues of construction industry such as: energy saving, environmental monitoring of the urban areas and agglomerations of Russia, creation of safe lighting systems of premises, buildings and structures, heat-saving technologies, noise protection, aerodynamics in urban areas, utilization of waste materials in sustainable building, reliability of building structures, design and construction of smart homes, etc.

Supplementary professional retraining (SPR) is implemented combining the methods of distant learning and work placement in real work sites of the successful Russian companies. NIISF RAASN is staffed with highly-qualified professionals, it has all the necessary facilities and resources and the valid licence for educational activity including supplementary vocational education.

The primary objective of supplementary professional retraining (SPR) is enhancement of professional knowledge of specialists and senior officials of organizations, establishments and companies of various forms of incorporation, as well as occupational retraining with the purpose of obtaining competences required for new type of a professional activity. The special attention is given to practice-oriented training senior students. Moreover, supplementary vocational education is provided for higher-education teaching personnel of universities and colleges of the Russian Federation, employees of NIISF RAASN and other research and educational institutions with the purpose of enhancement of their professional knowledge.

In order to accomplish its purpose and mission, University of Minstroy has developed and approved the wide range of educational programs for supplementary vocational education and professional retraining with due regard to specific features of establishments.

The educational programs include professional retraining in the field of engineering, management, economics, jurisprudence, and supplementary vocational

education in accordance to the company core profile as well as financial, legal and managerial aspects. The University of Ministry organizes short-term seminars focused on advanced contemporary problems, international and Russian workshops and tutorials, specialized conferences and symposiums. The special attention is centred on educational consulting, cost-engineering and engineering.

For educational activity, the University employs highly-qualified academic staff, skilled senior professionals combining teaching and scientific activity with actual work in design and construction organizations, operating entities, auditing, financial and consulting companies, etc. Due to this, our listeners gain fundamental knowledge, acquire practical skills and competences, review sessions during the process of learning. Higher-educational teaching personnel, involved in educational process, comprise doctors of sciences and PhDs, professors and associate professors.

## CONCLUSIONS

To carry out educational activity in the form of supplementary vocational education for working tradesmen, the university signed the agreements with plants and factories possessing production facilities and licenced high-tech industrial equipment and machinery. The forms of training include on-campus, part-time and off-campus (remote) learning (electronic distant learning).

The valid licence for educational activity granted to NIISF RAASN enables the enrolled listeners to receive the certificates of supplementary vocational education and diplomas of professional retraining on the basis of academic performance.

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## **SZKOLENIE SPECJALISTÓW W ZAKRESIE ZAAWANSOWANYCH TECHNOLOGII DLA BUDOWNICTWA MIESZKANOWEGO, PRZEMYSŁOWEGO I UŻYTECZNOŚCI PUBLICZNEJ**

Niniejszy artykuł dotyczy warunków i zadań, jakie stoją przed instytucjami edukacyjnymi przygotowującymi specjalistów branży budowlanej do wdrażania innowacyjnych, efektywnych, zaawansowanych technologii. Wnikliwie zbadano i przeanalizowano kwestie wdrożenia szkoleń i przekwalifikowania specjalistów w zakresie inwestycji budowlanych, infrastruktury mieszkaniowej, przemysłowej i użyteczności publicznej. Zaproponowano nowe innowacyjne podejście do poprawy wiedzy i umiejętności specjalistów oraz kadry kierowniczej, tak aby mogli sprostać aktualnym wymaganiom i rozwiązaniom technicznym. Określono i zweryfikowano główne kierunki i trendy rozwoju profesjonalnego szkolenia zawodowego w Federacji Rosyjskiej.

**Słowa kluczowe:** infrastruktura budowlana, edukacja zawodowa, zaawansowane technologie, ośrodek edukacyjny, specjalista