Requirements and Exigencies in Construction Quality Assurance

Ana Maria Grămescu, Dana Domolescu, Bucur Dan Pericleanu, Mihaela Pericleanu and Geanina Mihai

Abstract – Ensuring the quality system in construction is a priority issue both at national and European level. The experience of the last years highlights the fact that the destructive events produced on constructions are the effects of some mistakes in design, execution and operation, but also the impact of new confrontations of constructions with the effects of climate change, energy saving or the reduction of destructive emissions. In this complex of factors that make constructions vulnerable, the role of the specialist in ensuring the quality system becomes increasingly important and at the same time visible in the concerns of all European Union states. In the content of the paper, the authors develop the aspects regarding the current requirements and demands of the construction quality system in Romania in the current context of the European Union.

Keywords - construction quality, regulations, the quality system

1. INTRODUCTION

The quality system in constructions represents a set of activities regulated by laws, regulations, procedures applied by organizational structures, which compete to ensure the requirements and exigencies with an impact on the quality of constructions in all its stages, namely design, execution, exploitation and post-use.

The construction quality system consists of a set of factors:

- technical prescriptions and normative acts;
- the quality of the products used in all construction stages;
- verification of projects by certified verifiers;
- verification and expertise of the execution works, of the construction;
- project expertise according to legal provisions and constructions;

• providing adequate management to ensure the application of legal provisions for quality assurance in constructions;

• authorization and accreditation of analysis and testing laboratories in the construction activity;

• the application of the legal metrology activity in constructions to ensure the accuracy and uniformity of the works carried out in constructions, in areas of public interest;

• compliance with the procedures in the reception of constructions;

• ensuring the requirements and exigencies in the exploitation behavior and interventions in time of the constructions;

- analysis and application of the decision in the post-use of constructions;
- ensuring the control, the checks necessary to ensure the quality in constructions.

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The experience of recent years has highlighted the fact that compliance with legal regulations plays an important role in ensuring the quality of buildings. Residential construction provides a broad scene of non-quality case reports. In this context, the quality of constructions represents a particularly important issue for every member country of the European Union, and the system of relevant indicators in quality assessment is the cost of correction due to failure.

2. SPECIFIC NATIONAL REGULATIONS

The technical regulations are established through regulations, procedures, technical and normative prescriptions and have as their object the conception, calculation, composition, execution and operation of constructions, but at the same time they ensure the quality conditions that the constructions, products and processes used in construction must have, as well as the way of their verification.

In ensuring the quality of constructions, the specific regulations that ensure the minimum requirements as well as the procedures for issuing notices and agreements with the assurance of a control system play an important role.

More and more constructions are subject to serious incidents, among which we mention fire, explosions, floods, seismic action, and uncontrolled actions of people.

In this sense, we highlight a series of serious inadvertences generated by issuing notices and agreements, authorizations without complying with the legal provisions and which led to serious accidents such as: the event at Colectiv in October 2015, the fire at Millenium, homes collectives destroyed due to explosions generated by the loss of gas emissions, the collapse of blocks from seismic actions and the causality of which can be found in deficiencies in design, execution, operation, flooding of basements in new blocks and many others.





Fig. 1 Office building after the fire Fig. 2 Block of flats after gas installations explosion

This state of affairs demonstrates that authorizations and approvals are still easily given where the requirements set out in the regulations are not always met. We find that at the European level, the regulations regarding the quality system are equally aimed at design, execution, exploitation and where appropriate, post-use.

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Fig. 3 Permits / Authorizations issued in unstable terrain



Fig. 4 Basement Parking flooded during rains due to a poor street drainage system

Recently in Romania we notice that the construction quality control system is a mixed system ensured both privately and institutionally as can be found in many European states.

From the point of view of the nature of the regulations, they can belong to public or private law. At the same time, regulations can take on an economic or social character. The economic regulations can be those issued by European directives, such as those relating to products bearing the CE mark - procedure that refers to the marketing of construction products in any EU state. This aspect is aimed at the marketing of products without barriers and is intended to ensure the quality requirements of any construction material marketed by any European state (Decision 750/2017 published in Official Monitor 829 of 19 October 2017, regulation establishing, under the law, the framework content and the main elements of the organization of the activity with reference to the technical approval in constructions, the obligations of the manufacturers, their authorized representatives, importers and the bodies preparing technical approvals in constructions). The technical approval represents a favorable technical evaluation of the skills of use according to the fundamental requirements applicable to constructions and is a component of the quality system in constructions. The technical specifications refer to both European and national standards.

For materials that do not have this requirement, they must be subjected to laboratory tests, laboratories that must be authorized and nominated by the European Union.

Social regulations are the most important and concern whether buildings meet basic quality standards (safety, sanitary requirements, comfort, energy and sustainability, durability in time).

3. EUROPEAN REGULATORY PROVISIONS

In the last period, the European regulations aimed at the quality system in constructions have been influenced by the effect of climate change, the reduction of energy consumption and the reduction of emissions. In this context we can talk about a new concept of "sustainable quality".

A brief overview of these regulations and their evolution in recent years highlights the fact that they have become more permissive (authorization, registration in the land register, building documents and others).

Requirements and demands have decreased, but one can also observe a transfer of control actions related to the quality of constructions to the private environment and a decrease in the involvement of the state in these actions. In Europe, control actions, their necessity, are assigned to important constructions classified according to importance classes. For the construction materials industry, the existence of new certification systems can already be observed. At the same time, in Romania HGR 750/2017 and HGR no 668/2017 come in support of European policies with reference to the quality of construction materials and their commercialization conditions.

Similarly, there is the legal framework promoted by the European Union with reference to the recognition of specialist training through the recognition of higher education specializations through their adherence to the Bologna system. Also in this spirit, Directive no. 2013/55/EC of the European Parliament and the Council of Europe of 13.11.2013 regarding the recognition of professional qualifications was issued. In its content, there is recorded the need for the European professional card, which aims to simplify the process of professional recognition in any state of the European Union. In this context, Ordinance 2/2000 on judicial and extrajudicial technical expertise was completed and updated in Romania.

At the level of the European Union, there is a tendency for the responsibility of control over compliance with technical requirements to be transferred from public authorities to private structures, being appreciated that such a measure can be beneficial to constructions. The studies presented in the specialized literature aimed at a comparative analysis between England and Wales, Ireland, Germany, France, Norway and Sweden, where the option of applying private control of constructions was adopted, proposing the most modern quality control systems for constructions in Europe.

The implementation of private control can also be observed in Romania as in fact in any European state, so that:

• Qualifications are recognized at European level, and architects as professionals were the first recognized qualification;

- Recognition of skills in any member state of the European Union;
- Harmonization of the regulations of each member state of the European Union;

• Involvement of the architect and the engineer in the private design activity, the verification of the projects;

• Involvement of specialists in the execution activity through own regulations regarding work verification operations on the construction site;

• Establishing the determining phases in which both representatives of private structures and a representative of the state structure participates.

• Signing of the reception report by all the factors involved in ensuring the quality of the constructions.

The latest requirements and exigencies applicable in the European Union states highlight the importance of harmonized technical regulations but also the application of specific control procedures by categories of constructions, by classes of importance. At the same time, new requirements regarding energy and sustainable performance appeared in the European Union, requirements that were introduced in national regulations.

The analysis of the latest aspects aimed at the quality of constructions in conjunction with climate change and the importance of reducing energy consumption and polluting emissions require new measures to increase the durability of constructions, new requirements applicable to quality control.

It can be observed that also in Romania there were measures to reduce some procedures for reducing some regulations in order to be rationalized and decrease - with reference to the newly introduced articles in Law 50/1991 updated and completed up to date. It can also be observed that many constructions are placed outside of quality control, the current structure in state control being much diminished compared to the volume of investments.

Research carried out at the level of the European Union highlights the fact that the outsourcing of control and its orientation towards the private can bring new positive results. This aspect would require new certification and recognition systems within the construction industry, increasing the professional level of private control, but also the adoption of control procedures over the private system to guarantee the quality of the control carried out.

In Romania, as in fact and in the other states of the European Union, the quality system is based on the requirements and exigencies contained in the regulations that aim at aspects such as: durability, resistance and stability, protection against the action of fire, etc. Of course, all the parameters contained in these regulations refer to the minimum requirements. However, it is observed that there are often violations of substantial regulations. The deficiency of control due to the fact that the current apparatus invested with such attributions is undersized appears more and more clearly. First of all, small interventions are bypassed by inspections and other categories of construction works that have a degree of complexity are not inspected in a serious way.

The system of regulations highlights the fact that the typological structuring of constructions is based on the risk, the degree of use, the importance and the necessity of its operation, therefore the classification of constructions is generally based on a risk analysis, on Eurocodes. Variables that play a fundamental role with respect to the complexity of the construction is the risk of failure of the construction, the severity and the extent of the subsequent consequences.

4. COMPARATION OF EUROPEAN PRACTICES

The regulations also differ between countries, depending on the degree of clarification of the notices and agreements, of the authorizations. For example, Norwegian regulations classify constructions requiring a building permit into three classes. The Norwegian classification is based on the complexity of the structure, the difficulty of building it and the consequences it may have in the event of a disaster. Example in Bergen (city in Norway) in 2003 the buildings were classified as follows:

• Class 1 - simple structures where errors can have minor consequences;

• Class 2 - constructions with a low degree of difficulty where errors can have medium consequences (for example, housing blocks);

• Class 3 - constructions with an average degree of difficulty where errors would have serious consequences;

• Class 4 - constructions that can have a high degree of difficulty where errors lead to serious consequences.

Of these categories, only those in class 1 did not need control, the rest were required by systematic controls.

This classification considers the effects on:

- structural safety;
- fire safety.

In Germany and France, construction quality control and its attribution has been transferred from local authority structures to private specialist architects and engineers. In Ireland a regulation has been adopted to hold the engineer or architect responsible for signing off for compliance at both the design and construction stages.

In the UK, the architect is protected, while in Sweden, neither the title nor the profession is protected.

Regarding the choice of state versus private control the study analyzed public versus private control, countries also show some variety. In England and Wales, an applicant can choose between quality control by a local authority or by a licensed private inspector. In Germany, local authorities play an important role in the quality control process. The German model can be considered as a mix between public and private quality control. Local authorities are formally responsible for quality control.

Therefore, throughout Europe, construction quality control is increasingly privatized.

Control activities are evenly distributed during the construction process so that at the various stages of execution there is certification of the quality of the work done and not only for work that becomes hidden. On-site inspections are mandatory. This inspection process ends with a final inspection, just as in the Romanian system there is a final reception.

In France, important constructions are controlled by private organizations. A procedure is developed for each construction.

In Germany, to apply the procedure the application must be signed by an architect or engineer. Usually, a state-recognized expert verifies compliance with technical requirements. During construction, control of the building is exercised by the local authority and a site manager appointed by the applicant. Local authorities usually delegate a state-recognized technical expert for on-site structural stability inspections. Upon completion, the local authority issues a certificate of final reception.

In the Irish system, private builders are responsible for quality control. Beneficiaries at the start of work must send a notification, include a certificate of compliance with the design, must provide proof that a specialist has been hired to inspect and certify the work to be executed. The Notice of Commencement of Construction must be accompanied by a frame inspection and an inspection plan.

In the Netherlands, quality control in construction is privatized. Private inspectors are certified/verified by independent professional organizations. Measuring tools are also checked Local authorities remain responsible only for checking the planning requirements.

In Norway, the building permit is issued after all factors responsible for quality reach a consensus: designer, beneficiary, builder and inspector/site manager. The execution of the

work begins with a preliminary consultation meeting where the parties involved decide on the inspection plan.

At the end of the execution work, the inspector must submit a completion report and submit a request for a final reception.

In Sweden, it is mandatory to make an inspection plan and organize a meeting with all parties involved. The local authority issues a permit once it approves the inspection plan. An independent quality inspector must take care of planned inspections in execution. After the project is completed, a final meeting is convened and if the local authority is satisfied, a written certification is issued to the applicant. As can be seen in Europe, the quality system is well organized.

However, it is not fully known how the quality control procedure works in practice and which is more effective. In addition, as it appears from the specialized literature, only a part of all constructions are subject to this procedure. Some countries have also developed procedures/regulations that inspectors must follow. The research results show that there are almost no demands made on the nature, content and depth of inspections [7].

Some countries have developed procedures that quality controllers can use. In England and Wales, public and private inspectors have voluntarily committed to Building Inspection Performance Standards. These standards provide guidelines on how a proper quality control of the building should be carried out.

The legal obligations that are in force in the countries focus on structural and fire safety rules. This especially applies to the quality control of complex constructions [7] (Meijer and Visscher, 2016). French regulations state, for example, that inspectors/specialists are legally required to check structural safety and personal safety.

Single-family homes are inspected less often. In Germany, the state assigns the inspection to a recognized expert who focuses on the inspection of structural elements. Typically, constructions are checked for fire or structural safety and stability requirements.

In Norway, control is mandatory for critical building elements (eg structural components, fire safety and building envelope).

5. CONCLUSIONS

Across Europe, on-the-spot inspections tend to be random. However, control usually occurs when performing difficult constructions.

The current framework of a country's quality system can be seen as the result of decades of tradition, depending on the evolution of the concept, regulations and laws. A particularly important aspect is compliance with existing regulations and equally their clarity. The construction quality control system focuses mainly on new construction and ends with putting into operation.

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Note:

Dana Nicoleta Domolescu – PhD, Ovidius University of Constanta, Bd. Mamaia nr. 124, 900356, Constanta, Romania (e-mail: <u>dnd8055@gmail.com</u>)

Mihaela Pericleanu - Ovidius University of Constanta, Bd. Mamaia nr. 124, 900356, Constanta, Romania (e-mail: pericleanu.mihaela@univ-ovidius.ro)

Ana Maria Grămescu - Ovidius University of Constanta, Institute of Doctoral Studies, Bd. Mamaia nr. 124, 900356, Constanta, Romania (corresponding author to provide e-mail: <u>am_gramescu@yahoo.com</u>)

Bucur Dan Pericleanu - Ovidius University of Constanta, Bd. Mamaia nr. 124, 900356, Constanta, Romania (e-mail: pericleanu dan@yahoo.com)

Geanina Mihai - Ovidius University of Constanta, Bd. Mamaia nr. 124, 900356, Constanta, Romania (e-mail: mihai.geanina@univ-ovidius.ro)