

The Estimation of Systems' Reliability

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Abstract

In the study of constructions' reliability it is necessary to know all legal stipulations of this domain. Then will be applied calculation methods/ techniques/ algorithms of reliability. This is the reason why we considered "attacking" the first part (legislation part) in this approach (essay).

Key words: *reliability, house, legislation, quality, maintainability, designer*

Introduction

Quality represents, in a developed market economy, one of the most current problems. Upon Romania applying for UE admittance it becomes absolutely necessary the alignment at the International Standardization System ISO, Romanian market joining its maturity point, where it is increased one of the essential attribute of the competition: quality of products and services.

According to standard ISO 9000, quality is the ensemble of properties and qualities of a product or service, which give it the property to satisfy the expressed or implicit needs. Examples of quality characteristics could be: functional characteristics, construction characteristics, technological characteristics (inter-commutability), esthetic, ergonomic, environmental characteristics etc.

Quality concept had a deep dynamic character, because it represents an ensemble of properties and activities going from delivery, terms, offered services, payment facilities, guarantees, efficient and quick service assurance, personal qualifications. In its essence, quality is a matter of trust, because it is "the most important capital of any firm, without which nothing can be realized". It creates the premise for a prosperous evolution in any domain (A. Schweitzer0).

The quality system supposes the following orientation axis:

- the spread processes, the progress mode and its relationships identification (the management processes, resources assurance process, services achievements and the monitoring process);
- the documentation of Quality Management System by Quality Manual, system procedures, work procedures and instructions;
- establishment of documents elaboration mode, verification and approval by the involved responsibility levels' and of the documents' spread and withdrawal rules;
- establishment of documents and data modifications rules;
- establishment of external documents rules;
- demands referring to keeping, identification, protection, retreat and of quality registrations' which demonstrates the Quality Management System's functioning.

Constructions' Quality

Quality is maintained and assessed according to specific settlements in any domain.

Constructions' quality is the result of all behavior performances in duty, with a view to satisfying all exigencies of users and communities.

To realize suitable quality constructions it is compulsory to meet and maintain, during all the construction's life time period, the following requirements:

1. resistance and stability;
2. safety use;
3. safety against fire;
4. hygiene, people safety, recovery and protection of the environment;
5. thermo insulation, water insulation and energy savings;
6. noise protection.

All these obligations apply to for the factors involved in creating, constructing and exploiting the constructions. These factors are: investors, researchers, designers, the ones responsible for project functioning, the builders and the suppliers of constructions' products, executors, owners, users, technical assistants in execution, technical experts, and also the public authorities and professional associations.

The constructions system of quality is made up of the following:

- technical regulations for constructions field;
- quality of products used in constructions;
- technical agreements for new products and procedures;
- verification of projects, work execution and project examination, verification of the constructions themselves;
- managing and ensuring the construction quality;
- authorizing and accrediting the tests and sample laboratories for the constructions field;
- the constructions metrology activity;
- reception of constructions;
- behavior in exploitation and real time interventions;
- post-usage of constructions;
- quality state control in constructions field.

The constructions' reception represents the certification of its achievement on the basis of its examination, with respect to the execution documentation and to the documents from the constructions technical book. The constructions technical book also contains the execution documentation and the documents regarding its achievement and exploitation. It is given to the owner of the construction, who has the obligation to keep it and to daily update it; the provisions in the technical book concerning the exploitation are mandatory for the owner as well as for the user.

The reception of the constructions is done by the investor – owner, in the presence of the designer and of the executor and/or the specialist representative, legally named by the first ones.

The pursuit of the behavior in constructions exploitation is made over the entire life period and is made up of all the activities regarding direct observation or investigation with observation and specific measurement tools, with the precise purpose of maintaining the requests. The interventions on the existing constructions are referring to the reconstruction works, consolidation, transformation, enlargement, partial abolishment and repair works, all done only on the basis of a project certified by the initial designer of the building or of a technical expertise done by a certified technical expert, and everything must be written down in the constructions technical book.

After-usage of the constructions consists in the activities of decontamination, dismantling, demolition of constructions, reconditioning and reusing of the recoverable elements and products, but also the offal's recycling for ensuring the protection of the environment according to the law.

Quality and Reliability. Maintenance

The investors are natural persons or corporate bodies that finance and make investments or interventions in the existing constructions according to the law and have the following main obligations towards the quality of constructions:

1. establishing the quality status by projecting and execution according to the technical regulations, studies and research;
2. obtaining the agreements and the notifications requested by the law, but also the authorization for constructing;
3. ensuring projects verification by certified specialists;
4. ensuring verification of proper execution of construction works by specialized masters or specialized consulting dealers over the whole period of work;
5. acting for managing the non-keeping with, the faults discovered on the time of works execution and of the projects' deficiencies;
6. ensuring the constructions work reception after the close of works and at the guaranty period expiration;
7. making up the technical book of the construction and giving it up to the owner;
8. expertising the constructions with certified technical experts.

Constructions designers are in charge with fulfilling the following main obligations regarding the constructions' quality:

1. establishing the constructions class of importance by project;
2. ensuring by projects and execution details the level of quality according to each demand, according to the technical regulations and contract clauses;
3. presenting the projects in front of the certified evaluation project specialists, named by the investor, and also presenting the pointed out non-keeping with and the non-concordance;
4. making out the job specifications, technical details regarding the execution of works, exploiting, maintenance and repairing, and the following time behavior construction projects. The documentation regarding the afterwards use of constructions is done only by owner request;
5. establishing of execution phases, by project, determined for the fulfilment of requirements and site participation for the quality verification linked to that;

6. establishing the execution malfunctioning treating way, caused by the designer's fault, on constructions that should have ensured the necessary level of quality, and looking over the application on site of the adopted solutions, after the acceptance of the certified project verification specialists, on the investor's request;
7. participation in the making of the technical book of the construction and in the executed works reception.

The constructions works executor has the following main obligations:

- informing the investors of the non-concordances noticed in the projects, in order to solve them;
- starting the works execution only on law-authorized constructions and only with respect to projects verified by certified specialists;
- ensuring the right requested quality level through an own-made quality system, realized by own employees and with certified technical execution managers;
- gathering the factors which have to participate in the verifying of determined execution level works and ensuring the necessary making conditions for them, in order to obtain the work continuance agreement;
- solving the faults and the non-concordances shown in the stages of execution, only on the basis of designer's established solutions with the investors agreement;
- using in the works' execution only the products and procedures provided by the project, certified or with technical arguments, that can lead to requests achievement and witness-tests administration, changing the products and the procedures mentioned by the project with others that fulfill the established conditions and only on the basis of the designers' chosen conditions with the investor's agreement;
- respecting the projects and the execution details in order to achieve a proper requested quality level;
- a 24-hour informing of the Constructions, Public Works, Urbanism and Territory Design State Inspection if technical accidents occur during the time of works execution;
- submit for reception only of constructions that are according to the quality requests and for what was given to the investor the necessary documentation for the technical construction book;
- the fulfillment, in the established time-table, of the measures taken or of the ones taken by the reception construction works documents;
- repair on own expense the own guilt quality faults, either from the execution period, or the guarantee law established period;
- bringing the temporary occupied space in the initial form, after the end of work execution;
- establishing the responsibilities of all the production process participants – responsibility factors, co-workers, underlying contractors – with respect to the quality insurance adopted system and in accordance to the legal procedures.

The certified project verification specialists are responsible together with the designer in the matter of ensuring the proper project required quality level.

Certified technical execution managers are responsible, according to the attributions they have, for reaching the proper required quality level on the construction works for which they are employed.

Certified technical experts employed for project expertise, construction works or constructions under exploitation expertise, are responsible for the given solutions.

The owners of the constructions have the following main obligations:

1. in real time execution of the maintenance and repairing works that belong to them, provided with respect to the legal specifications by the technical book of the construction and resulted from the activity of observing in time behavior of the constructions;
2. keeping and daily maintaining the construction technical book and giving it at the time of changing the owner of the construction with the new owner;
3. ensuring the constructions' continuity in time, according to the specifications from the technical book and from the technical regulations;
4. execution, if there is the case, of the reconstruction, consolidation, transformation, enlargement, partial destruction and repair construction works only on the basis of projects made by natural or legal persons, certified and verified according to the law;
5. ensuring the achievement of intervention works to the constructions, imposed by legal regulations;
6. ensuring the after-usage constructions stage works accomplish, with respect of the legal procedures.

The constructions administrators and the users have the following main obligations:

1. using the constructions according to the exploitation instructions mentioned in technical constructions book;
2. doing the maintenance and repair works in real time, according to the contract;
3. making the intervention works to the existent construction in the way of the Article no. 2, line 2, from the E.G. no. 766/1997 only with the owner's agreement and with respect to the legal regulations;
4. doing the follow-up of the constructions behavior according to the technical book and to the contract made with the owner;
5. informing in a 24-hour period the Constructions, Public Works, Urbanism and Territory Design State Inspection for any technical accidents at the site of a used construction.

The units that are delivering services of research activities in constructions have the following main obligations:

- carrying out theoretical researches and preliminary experiments to substantiate the constructions technical regulations;
- substantiating, elaborating and experimenting the technical solutions, new products and procedures for constructions;
- verification and control of the new products and procedures on the producers' request, in order to give technical regulations in accordance with the law.

The designer, the certified project assessment specialist, the producers and the delivery of materials and products for construction usage, the execution person, the certified technical execution responsible person, the specialist site-master, the technical expert are responsible for the hidden faults of the construction, for a 10-year period since the work reception, as well as after this period, on the entire life period of the construction, for the resistance structure faults resulted from not respecting the design and execution standards existing on the time of construction.

Pursuit of the behavior in exploiting, in time interventions and after-using of constructions are components of the quality constructions system. The point of the looking for the behavior in constructions exploitation and of time interventions is the evaluation of the constructions technical status and attitude exploiting maintenance during the entire life period.

According to the law, a general frame is settled for activities development regarding the pursuit of the behavior in constructions exploitation and of time interventions and constructions after-using, frame that is applied to all constructions classes and is compulsory to all legal and natural persons involved: investors, designers, executors, owners, administrators, users.

The pursuit behavior in constructions exploiting, in time interventions and constructions after-using represent distinguished, complementary actions, as follows:

- the following of the behavior in constructions exploiting is done for the checking of some faults in real time, faults that can lead to exploiting ability diminishing;
- in time interventions on constructions are done in order to maintain or improve the exploiting ability;
- constructions after-using is made up of the activities of safe-conditions constructions and efficient recovery of the materials and environment protection.

All these actions are carried through the owner's assumed responsibility.

The In-Time Pursuit of Constructions Exploiting

The pursuit of the behavior in constructions exploiting is done by:

- normal pursuit;
- special pursuit.

The ways of performing a normal pursuit or a special one regarding the established period, methods, characteristics and parameters wanted are established by the designer or the expert, taking into consideration the constructions importance level and other characteristics, and are included in the technical constructions book, which will also include the specified results of these activities.

The normal pursuit is a systematic technical constructions status observing action that is correlated to the maintenance activity and aims at maintaining of the ability in exploiting those. The normal pursuit is done over the entire life period, on all of the constructions, according to the law. The normal pursuit is done by direct visual observation and with simple measuring tools, according to the technical book and to the specific technical regulations, on works and constructions classes. The activities regarding the normal pursuit are executed by employed personnel or by contract with natural persons with at least medium level technical constructions experience.

The special pursuit contains the regulated specific investigations, with parameters that characterize the whole construction or only parts of the construction; the parameters are established in the design phase or after a technical expertise. The special pursuit is made on the request of the owner or of other interested legal or natural persons, but also for the still-exploiting constructions with a dangerous evolution or that are in special safety situations. The special pursuit is done in an established period of time, on the basis of a project or a specific procedure, by the certified technical specialists employed. The special pursuit does not lead to interrupting the normal pursuit. The owner is obliged to ask for a technical expertise, at the discovery of some situations beyond the established limits or which are considered to affect the safety of the constructions exploitation.

Quality Systems' Documents

Standard Family ISO 9000:2000

Standard family ISO 9000 had the following structure:

- ISO 9000 – Quality Management Systems - Fundamentals and Vocabulary
- ISO 9001 - Quality Management Systems - Demands
- ISO 9004 - Quality Management Systems – Directory lines for improving performances
- ISO 19011 – Directory lines for quality management systems examination and environment management

The ISO 9001:2000 Standard – Demands

The quality system stipulates:

- The identification of the spread processes, of the spread mode and of the relationship between those (management processes, resources providing processes, services monitoring processes);
- Quality Management System documentation through The Quality Manual, system procedures, procedures and working instructions;
- establishing the elaboration, check and documents' approval mode, responsibility levels involved and of the documents spread and retreat rules;
- establishing the rules of effected modifications in dataset and documents;
- establishing the rules regarding external documents;
- demands referring to identification, keep, protection, retreat and archive of quality registrations, whose maintaining demonstrate The Quality Management System's functioning.

ISO 14000

ISO 14000 series standards are divided in:

- Environment management systems' referring standards:
 - ISO 14001 – specify the demands for an environment management system which could be audited for certification by a third part;
 - ISO 14004 – furnish the directory lines to help an organization in compiling and implementing an environment management system.
- Environment audit;
- Management referring standards:
 - ISO 14010 – establish environment audit general principles, which could be applicable to any audit category;
 - ISO 14011 – establish the audit procedures regarding the planning, the management and the carrying out of an environment management system audit, to establish its conformity with the audit criteria;
 - ISO 14012 – contain directions referring to qualification criterion for environment controllers and chief-controllers and is applied to both internal and external controllers.
- Life cycle evaluation referring standards:

- ISO 14040 – establish the directory lines, the framework and methodological demands for products and services' life cycle evaluation;
- ISO 14041 – establish the directory lines for determination of the objective and the purpose of life cycle evaluation study and for a life cycle inventory effect.
- Terminology standards:
 - ISO 14050 – contain the fundamental terms definition referring to environment management.

Quality Referring Costs' Analysis

Quality referring costs' analysis had as main objective the coordination and under control keeping of economic aspects of quality insurance activities to satisfy clients' demands.

In keeping with the PEVA model the coordinating and control process had four main stages, cyclically covered:

- Problem identification (establishing the deviance given from the foreseen objective and instrument assurance for identifying the critical points),
- Problem analysis (establishing the found deviance and analysis of the identified critical points),
- Solutions' identification (establishing the necessary measures for critical points elimination and avoiding repeating the deviance),
- Solutions' application (assurance of the implementation of the foreseen measures).

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5. * * * , Standard Family ISO 9000:2000

Estimarea fiabilității sistemelor

Rezumat

În studiul fiabilității construcțiilor este necesar să fie cunoscute toate prevederile legale în domeniu. După aceea se vor aplica metode de calcul/tehnici/algoritmi ai fiabilității. Acesta a fost motivul pentru care în acest articol au fost abordate aspectele legislative.