

# For a better definition of ‘quality’ in construction projects

Pentru o mai bună definiție a „calității” în proiectele de construcții

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***Abstract.** As quality becomes a more and more weighty concept in the field of construction, as a general client expectation on the one hand, as well as a constructor/developer commitment and claim, on the other hand, we have found that there is no such thing as a specific definition of it. As such, in the present paper we have sought to put together a clearer and more practical perspective on what ‘quality’ actually means – or should mean – in construction projects, in addition to coming up with recommendations for establishing and meeting such requirements throughout the duration of a project.*

***Key words:** Construction Project, Quality Definition, Stakeholders, Design, Project Requirements*

## 1. Introduction

The notion of quality refers to how good or bad something is, a characteristic or feature that something (or someone) has.

On a first try, quality can be defined as meeting the legal, aesthetic and functional requirements of a project. These requirements may be simple or complex, or they may be stated in terms of the expected end result or as a detailed description of what is to be done. However expressed, though, (a general standard of) quality is considered to be achieved if the completed project conforms to the initial requirements, but also if these requirements are adequate.

Law defines quality in terms of professional liability, a legal concept that requires all professionals to know their trade and practice it responsibly. Every architect and engineer who offers his or her expertise to owners is subject to professional liability laws.

Some design professionals believe that quality is measured by the aesthetics of the facilities they design. According to Stasiowski and Burstein [1], this traditional definition of quality is based on such issues as how well a building blends into its surroundings, a building's psychological impact on its inhabitants, the ability of a landscaping design to match the theme of adjacent structures, and the use of bold new design concepts that capture people's imaginations. Because aesthetic definitions of quality are largely subjective, major disagreements arise as to whether quality has been achieved or not. Since objective definitions of aesthetic quality do not exist, design professionals generally take it upon themselves to define the aesthetic quality of their designs.

Quality can also be defined from the view point of function, that is by how closely the project conforms to its requirements. Using this definition, a high quality project can be described by such terms as ease in understanding drawings, the level of conflict in drawings and specifications, the economics of construction, the ease of operation, ease of maintenance and energy efficiency.

In the construction industry, quality can be defined as meeting the requirements of the designer, constructor and regulatory agencies, as well as the owner. According to an ASCE study [2], quality can be characterized as follows:

- Meeting the requirements of the owner as to functional adequacy; completion on time and within budget; life-cycle costs; operation and maintenance.

- Meeting the requirements of the design professional as to the provision of a well-defined scope of work; the budget to assemble and use a qualified, trained and experienced staff; the budget to obtain adequate field information prior to design; the necessary time for making decisions, for the owner and design professional; the contract to perform the required work, at a fair fee and with an adequate time allowance.

- Meeting the requirements of the constructor as to the provision of contract plans, specifications and other documents prepared in sufficient detail in order to allow the constructor to prepare the pricing proposal or competitive bid; timely decisions of the owner and design professional in regards to the authorization and processing of change orders; fair and timely interpretation of contract requirements from field design and inspection staff; contract for performance of work on a reasonable schedule, which will yield a reasonable profit.

- Meeting the requirements of regulatory agencies (the public) as to public safety and health; environmental considerations; protection of public property, including utilities; conformance with applicable laws, regulations, codes and policies.

A modern definition of quality can be derived from Juran's "fitness for intended use", which basically says that quality is "meeting or exceeding customer expectations" [3]. So, who is the customer? Firstly, customers may be either internal or external. Satisfying their needs and requirements is an essential part in the process of delivering a quality product to the final external customer.

Secondly, Juran claims that each of the three parties involved in a process (supplier, processor, and customer) has a "triple role". Figure 1 shows Juran's "triple role" concept applied to construction. The designer is the customer of the owner

For a better definition of 'quality' in construction projects

because the former needs to receive the project requirements from the latter in order to provide a feasible design. Further on, the designer supplies the plan and specifications to the constructor; in this case the constructor is the designer's customer, because the constructor uses the designer's plans and specifications, then conducts the construction process and finally supplies the completed building to the owner. The owner is now the constructor's customer. Quality in each phase is affected by the quality in the preceding phases. Therefore, customer service in each phase is important for the overall quality performance of the process.

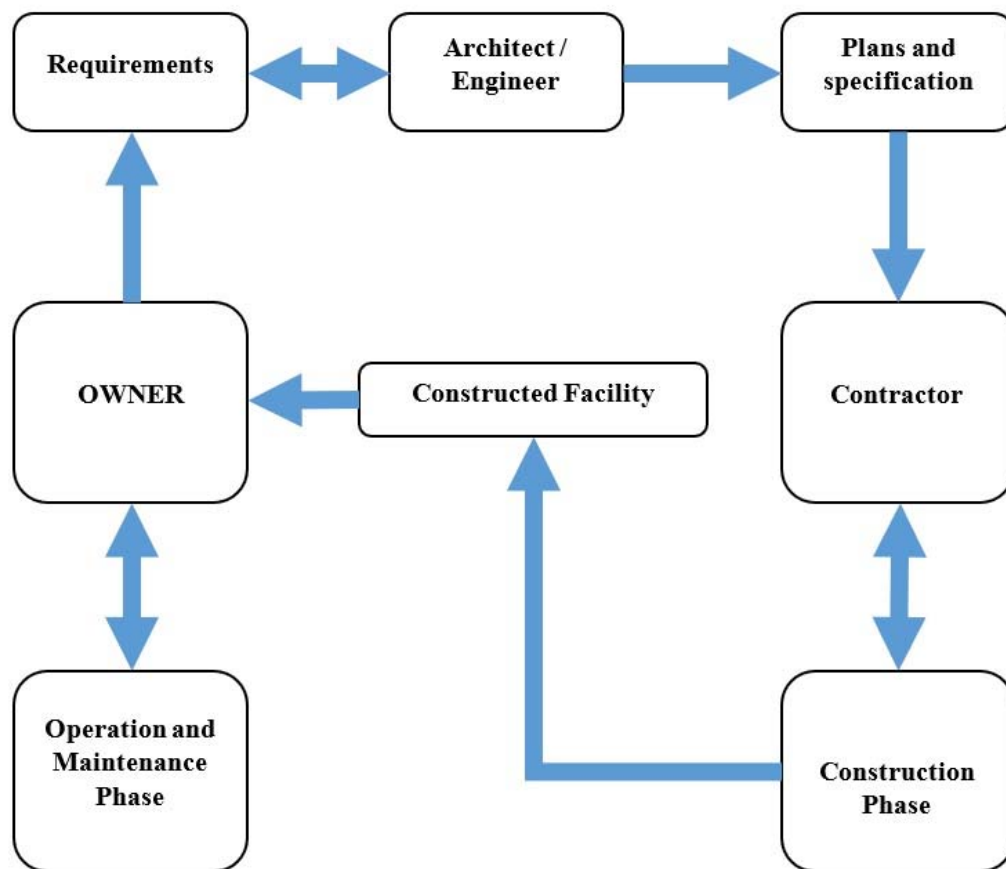


Fig. 1. Phases of the Construction Process

## 2. Quality in the designing process

The standard of design quality required of a project should be defined by the client. It must be noted that design quality is not always the primary objective for the client, as time or saving costs may be more important to him. Furthermore, it is

realistic to specify and expect very high standards of design quality only if the budget to achieve these standards is available.

Design quality too can have a number of different meanings, so it needs to be defined in a clear-cut way, that is measurable and testable – and can also be prioritized. An important recommendation in this respect is that the client should appoint an internal senior design expert to take on the responsibility of ensuring the design achieves the required design quality.

The aspects of a design that might be assessed are various and include the following:

- How well the design represents the client's values.
- How well the design creates places for entry, reception, breaks, catering and so on.
- The impact on the local community and environment.
- Whether the design is accessible and welcoming.
- Accessibility for people with disabilities.
- Quality of views and outlook.
- The internal environment: lighting, heating, air quality, acoustics etc.
- The comfort provided by furniture.
- Use of color, texture, light and architectural features to enliven the environment.
- Overall standard of materials and finishes (including life-span and maintenance issues).
- Sustainability of materials.
- Build quality and robustness of systems, finishes and fittings, furniture and equipment.
- Energy consumption and pollution, both during construction and use of the building.
- Whether the design promotes reduction, reuse and recycling of materials.
- Whether the design exploits opportunities for standardization and prefabrication.

If the client has little experience in design and construction projects, they may wish to appoint an independent client adviser.

### **3. Contract documentation**

The contract documentation describes the design that the contractor is being paid to build. It will include a series of specifications describing the materials and workmanship required.

The various aspects of the works are generally specified by:

- Products (defined by standard, a description of attributes, naming (perhaps allowing equivalent alternatives) or by nominating suppliers).

For a better definition of 'quality' in construction projects

- Workmanship (defined by compliance with manufacturers' requirements, by reference to a code of practice or standards or by approval of samples or testing).

It should be possible to verify standards of products and workmanship by testing, inspection, mock-ups, samples and documentation such as manufacturers' certificates. These requirements need to be set out in the contract documentation.

#### **4. Construction process**

The contractor's obligation is to carry out and complete the works in a proper and workmanlike manner, as indicated in the contract documents. This means that the contractor must carry out the works with reasonable skill and care, to the reasonable satisfaction of the contract administrator.

The quality of materials and standard of workmanship might be controlled by the contractor on site, by implementing a quality plan. The plan establishes the resources required and associated documents (lists, purchasing documentation, machinery, equipment etc.) and the control activities (verification of compliance with specifications, validation of specific processes, monitoring of activities, inspections and tests). These activities can be carried out by inspection, testing plans, action plans and, where applicable, specific tests (for example, load tests for structures).

The standard of workmanship can be improved by providing adequate training, appropriate instructions and clear checklists, as well as ensuring there is on-site supervision and monitoring, as well as an ongoing process of feedback between the parties, to allow for continuous improvement.

In addition to the contractor's own quality control measures, site inspectors working on behalf of the client will inspect the works as they proceed, in order to verify the compliance with the requirements of the contract documents. Site inspectors may be based on site permanently or may make regular visits. Specific inspections may also be carried out during the construction phase, as part of the general contract administration process.

#### **5. Design control**

This activity calls for the development of procedures for the control and verification of the design of the product, in order to meet the specified requirements, for the identification of design activities, the definition of user/customer specifications (design input), the expression of design output in terms of requirements and its verification in meeting user specifications and, similarly, for the control of design changes. Goulias [4] addressed the development of pavement quality assurance specifications and defined criteria for selecting the best specification to be used in different construction processes, for a particular product or project, by assessing the suitability of the types of each specification. The Mallon and Mulligan [5] approach considered quality function deployment (QFD) as a methodology during the design

phase to allow for better decisions, focus project budgets, define project quality and meet customer's needs. QFD consists of expressing customer requirements (e.g., security) into quality characteristics (e.g., exterior door), and deploying a series of relationships (e.g., correlation) between them to develop a design quality. QFD has been widely addressed in the construction industry – Sikorsky [6], Diaz-Murillo [7], Ahmed [8], Oswald [9] – as a model to understand and develop priorities for customer requirements. East et al. [10] adopted a case-based reasoning in developing a prototype computer-based system as a tool to assist design reviewers in capturing, documenting, and retrieving design-review comments and thus providing lessons to be learned. This approach improves the design-review process, which requires reviewers to examine plans and specifications, identify potential errors and deficiencies based on a culmination of past experience and references, and list review comments for designers and other reviewers.

Among the identified challenges were the segregation of functional aspects best performed by human or machine and the appropriate representation and structure of data. Case representation, indexing mechanism, storage and retrieval means and method for case adaptation have been tackled by exploiting a relational database system for implementation. A prototype expert critiquing system has been developed and implemented for the assistance of both designers and reviewers in the design and review processes, of flat and low-slope structure roof [11].

The support environment for design and review (SEDAR) derives its supporting functional duties from error prevention, error detection, design review critiques and design suggestion critiques. Its method for structuring its critiques was induced from the way roof designers break the roof design into smaller subtasks related to the layout of roof subsystems. It provides a flexible means of tracking the progress of roof designers and advising at appropriate intervals during the design process. The user interface was channeled in a design environment built on a CAD system and offers a direct manipulation of the design and textual/graphical display of critiques derived from condition-action rules about constructability – compiled partly in East et al. [11].

## **6. Review and further discussion**

Construction projects are a balance between cost, time and quality. One of these will almost always be presented as a type of constraint by the sponsor or client, so that it may be possible to have high quality and low cost, but at the expense of time, and, conversely, to have high quality and a fast project, but at a cost. If both time and money are restricted, then quality is likely to suffer. High quality is not always the primary objective for the client; time or cost may be more important. A very high standard of quality can be achieved only if the necessary budget to achieve it exists.

When defining quality objectives, the client should consider:

- Available funding and time.
- Existing corporate policies (such as environmental policies).
- Key requirements of the business.

- Key requirements of stakeholders.
- The views of external organizations, such as the local planning authority.
- Local and national legislation (for example, the local planning requirements for energy use).

As quality in construction has yet no universally accepted definition, it is vitally important that briefing documents in the planning phase of a project set out clearly the quality requirements that are to be met. Specific standards of quality can generally be defined, prioritized and measured quite precisely and criteria weighting can help in the appraisal of design options, in particular where conflicting views exist amongst stakeholders.

## 7. Conclusions

In conclusion, quality in construction projects refers to the level of performance, reliability and durability of the end product, as well as to the safety and satisfaction of the end user. The definition of quality in construction projects is that the work meets or even exceeds the expectations of stakeholders.

Quality should always be a priority in any construction project, as it is essential for its successful outcome. In general, quality is considered to be achieved when the project is completed on time, within budget and with minimal risks – but also when the project meets the stated goals and objectives of the stakeholders.

In addition to clarifying what quality in construction means – or should mean –, in the present paper we have shown that quality assurance processes and procedures must be in place in order to confirm these standards are met and maintained throughout the project. This is an essential requirement for the successful completion of any construction project.

## References

- [1] F.A. Stasiowski, D. Burstein, „Total Quality Project Management for the Design Firm”, Wiley, New York, 1994.
- [2] H. Ferguson, L. Clayton (Eds), „Quality in the Constructed Project: A Guideline for Owners, Designers and Constructors”, vol 1, ASCE, New York, 1988.
- [3] J.M. Juran (Ed.), „Juran's Quality Control Handbook”, 4th edn., McGraw-Hill, New York, 1988.
- [4] D. Goulias, „Quality assurance and specifications”, Ph.D. dissertation, The University of Texas at Austin, 1992.
- [5] J.C. Mallon, D.E. Mulligan, „Quality function deployment – a system for meeting customers' needs”, ASCE Journal of Construction Engineering and Management, 119(3), 1993, pp. 516–531.
- [6] C.S. Sikorsky, „Product and process integration for the US design–construction industry. Ph.D. dissertation”, Texas A&M University, 1990.
- [7] M. Diaz-Murillo, „A strategy for the implementation of quality function deployment in the design–construction industry”, Ph.D. dissertation, Texas A&M University, 1993.
- [8] S.M. Ahmed, An integrated total quality management (TQM) model for the construction process. Ph.D. dissertation, Georgia Institute of Technology, 1993.

- [9] T.H. Oswald, „A model for using quality function deployment in engineering project development”, Ph.D. dissertation, Clemson University, 1995.
- [10] E.W. East, T. Roessler, M. Lusting, „Improving the design review process: the reviewer’s assistant. ASCE Journal of Computing in Civil Engineering”, 9(4), 1995, pp. 229–235.
- [11] M.C. Fu, C.C. Hayes, E.W. East, „SEDAR: expert critiquing system for flat and low-slope roof design and review”, ASCE Journal of Computing in Civil Engineering, 11(1), 1997, pp. 60–68.