



## IMPLEMENTATION OF A QUALITY MANAGEMENT SYSTEM IN THE CONSTRUCTION OF RESIDENTIAL BUILDINGS

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***Abstract:** This article is devoted to the introduction of a quality management system in the construction of residential buildings. The importance of the formation and implementation of a quality management system in the construction industry, the principles and stages of this process, the introduction of a quality management system to ensure the safety and satisfaction of customer needs, is covered. Particular attention is paid to the analysis and quality control of equipment used in the construction of residential buildings, as well as technical inspection of foundations. The characteristics of construction and installation work, their achievement of the required quality level and the analysis of demand for construction products are studied.*

***Keywords:** ISO 9000 standards, technical regulations, product safety, quality classification, building materials.*

One of the most universal principles of management is the quality management system, which covers all areas of management activities in an organization and helps to achieve high product quality.

The principles of this approach should be taken into account when developing a quality management system based on ISO 9000 standards. They include the following points.

### **a) Customer orientation**

Consumers are the main financial source for any organization. It is their ability to pay and their assessment of the value of the product that ultimately determines the viability of the company in the market. The quality of the product directly affects

its value, and consumers, who pay different prices for similar products, evaluate the price / quality ratio. However, for each product there is a minimum level of quality, which is not purchased, regardless of its low price.

In order to implement this principle of quality management, close interaction between quality management and marketing is necessary in the organization. Responsibility for meeting the needs of target customers (markets) lies primarily with the marketing system. However, customer satisfaction depends not only on product quality, but also on many other factors, such as the manufacturer's image, service, pricing, delivery, communication strategy, interaction with the manufacturer's employees, etc. In turn, all marketing tools must also be well designed to achieve the organization's goals and meet the needs of customers. Therefore, close interaction between marketing and quality management is necessary to ensure that the organization's goals and customer needs are met.

#### **b) Leadership of the leader**

The success of an organization, including in the area of quality assurance, depends primarily on management, especially top management. It is important to remember that about 90% of defects are caused by mistakes made by managers, not employees, which is a common misconception in many organizations.

A leader in an organization has formal authority, but this is not the only factor in effective management of subordinates. You can often hear the opinion that if a manager's team does not trust him and is not ready to follow him, he is not a leader or has authority over employees at all levels.

In the process of self-improvement, a person can develop leadership qualities, but high professionalism is one of the most important foundations for their formation. Leaders who do not have real knowledge and skills quickly lose their trust and respect among employees. High professionalism allows the manager to make accurate forecasts and offer effective solutions, which contributes to effective management, taking into account the interests of all parties.

Moreover, a leader who is confident in his professional skills is not afraid to show his weaknesses and therefore does not feel threatened by other managers and specialists. On the contrary, he tries to encourage the initiative of all employees, involve them in activities, give them more authority, encourage rationalization proposals and self-study. This allows employees to be more effective in their work and trust their manager, who will do everything to achieve the best results for the organization and its employees.

### c)Employee engagement

Based on McClelland's theory of motivation, the principle described in the title emphasizes that all people, including employees of the organization, need power, ownership and success. Consequently, each employee strives to be a leader in the process of performing their duties, to contribute to common processes and to receive recognition and rewards for their achievements. The satisfaction of these needs largely determines the level of motivation of employees and their efficiency. However, to satisfy their needs, it is not the employees themselves, but the management that should create the conditions, as this will help to attract employees to more productive work. As an architect, I would like to say that the creation of such conditions can be achieved by designing appropriate workplaces and creating a comfortable working environment, as well as developing motivational programs and reward systems.

From a professional perspective, the lack of necessary conditions to meet employees' needs can lead to a loss of interest and motivation to perform their duties to the required level. This can lead to a deterioration in work results and the financial performance of the organization, as well as stress, which negatively affects the performance and health of employees.

Management should remember that each employee has unique and special talents that can only be revealed through appropriate targeted work to involve them in organizational processes. The discovery and development of such talents can lead

to further growth and development of the organization, as well as its salvation in crisis situations.

**d) process approach**

In the context of ISO 9000, the process approach has some differences from the concept presented in management textbooks. The main concept is the understanding that any activity (work, process) has certain inputs and outputs with certain characteristics. The main idea of the process approach within the framework of ISO 9000 is shown in Figure 1

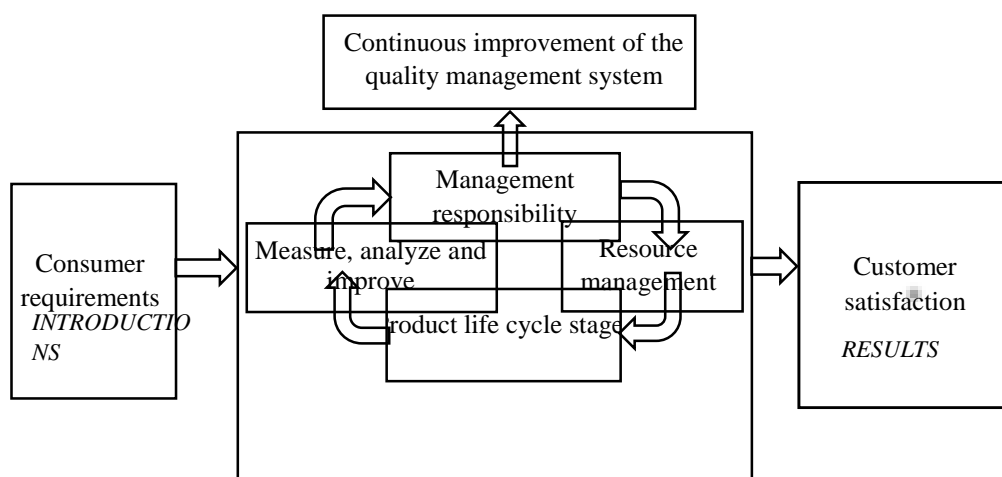


Figure 1. SMT operation scheme based on a technological approach.

To produce a specific product, the SMT must have information about the characteristics that it must have to satisfy customer needs. The product production process involves the responsibility of management with the function of appropriate management decisions, resource management, quality assurance and quality control at all stages of the product life cycle. As a result of this process, the product becomes a product that must meet the requirements of consumers for quality characteristics, since the process of product production and quality assurance is based on customer requirements. However, in order to ensure that consumer needs are fully satisfied, it is necessary to implement appropriate controls, which are achieved through marketing research. Figure 1.1.1 shows the main idea of the process approach within

the framework of ISO 9000, which involves the understanding that any activity (work, process) has certain inputs and certain outputs with its own characteristics.

The proposed interpretation of the process approach within the framework of ISO 9000 standards is not always complete and does not always provide an understanding of its value and importance. Therefore, as an architect, it is useful to consider the process approach from other positions, as shown in Figure 2. This will provide a deeper understanding of the essence of the process approach and its importance for the successful implementation of activities.

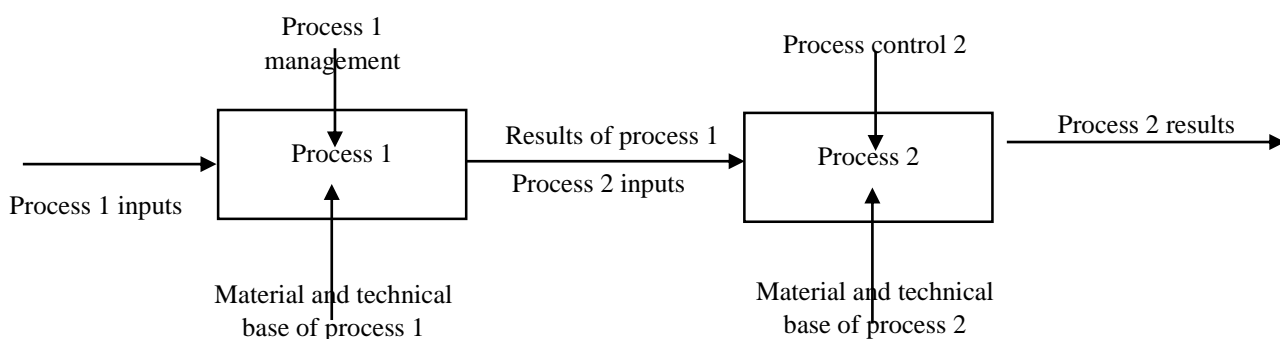


Figure 2. Interaction of processes within the process approach.

In this figure, we can see the relationship between the process components in the overall process of creating a product. Typically, creating a product is a combination of several processes that can proceed sequentially or in parallel (the figure shows only the option of sequential occurrence). This relationship of processes shows that ensuring quality in process 1 depends on the quality of inputs, technologies, data, etc. The results of process 1, that is, materials or data with changed characteristics, become the input of process 2 and determine the quality level of this process. If quality is not achieved in one of the processes, then subsequent processes cannot guarantee the achievement of the required quality level. A similar relationship exists between process 2 and process 3, etc.

It is important to note that Process 2 requires not only the results of Process 1, but also other resources that come to the organization from suppliers. For example, the construction of the walls and ceiling of a building cannot guarantee the

appropriate level of quality if the foundation has an unacceptable slope or unevenness. And it is impossible to build a high-quality foundation with poor quality foundation pit preparation and poor design studies.

Each of the processes shown in Figure 2 must have an appropriate material and technical base that takes into account the needs of that process. In addition, each process must be supported by appropriate management, which may include instructions from managers and quality assurance documents relevant to the process.

In accordance with the concept of the technological approach presented in Figure 1, it can be noted that all the necessary components are already present in the quality management system (QMS). To understand the role of consumers in this concept, it is necessary to consider that consumers can be external and internal.

Workers involved in process 1 are consumers of the input. Workers involved in process 2 are consumers of the outputs generated by process 1. They also have their own quality needs for the outputs of process 1 and may not be satisfied with them. Therefore, quality assurance in process 1 must take into account the needs of participants in process 2 and monitor their satisfaction.

### **A set of documents to start implementing SMT in construction**

The long-term success of an organization depends on understanding and meeting the current and future needs and expectations of its customers, as well as understanding and addressing the needs and expectations of other interested parties. The organization should strive to achieve a balance of interests by setting and achieving appropriate objectives that take into account the requirements of all interested parties.

The high quality of manufactured products and services must be confirmed by a certificate of compliance with international standards. Currently, a large number of manufacturing enterprises have already implemented quality management systems that fully comply with international standards.

Today, the main criterion for the existence of almost any industrial production is the successful sale of manufactured products to consumers. The analysis shows that product quality should be a priority for every enterprise. After all, if we talk about successful foreign companies, then upon careful analysis it can be seen that they achieved successful results and rose to leading positions in world markets only after developing and implementing modern quality management systems.

The analysis of the quality management system begins with the decision of the organization's management to conduct a review of the information obtained by summarizing the information obtained in accordance with the requirements of the international ISO standard, as a result of which the organization collects and analyzes it. In this case, the organization must analyze information from various sources in order to assess the company's performance in accordance with the plan, goals and other objectives, as well as identify areas for improvement, including benefits for potential stakeholders.

After the analysis, a decision should be made to implement effective measures, including:

1. Use of proven methods and analysis techniques.
2. Applying statistical methods appropriate to the analysis
3. Develop follow-up actions and measures based on the results of the analysis, balancing intuition and experience.

The quality management system should also have a certain structure. This system should include the following elements:

- organization;
- documents;
- processes;
- resources.

The first element is the construction organization, which consists in the presence in the enterprise of a certain group of employees with special knowledge

in the field of construction activities, therefore, the powers and responsibilities, their relationships are differentiated.

The next defined element is documentation. Today it is impossible to imagine the activities of any organization without documentation. In addition, the quality management system includes other documents of an organizational and administrative nature. As an example, various job descriptions, regulations on structural units can be cited. Also, an integral element of the quality management system are processes, which are understood as the interrelation and interaction of elements of activity. At the same time, procedures should be distinguished from processes, which are understood as a method of organizing and implementing an activity or process. Finally, for the proper organization of the ISO quality management system, resources are needed, which are understood as everything that ensures the functioning of this system.

With ISO 9001 certification, we use:

- ✓ improving the reputation of the enterprise among partners, investors, and customers (obtaining ISO 9001:2015 certification becomes an effective marketing tool);
- ✓ reduce financial costs, increase the company's overall income;
- ✓ minimize possible risks;
- ✓ increase end-user satisfaction;
- ✓ optimize the management system, increase its efficiency;
- ✓ achieving a competitive advantage when participating in tenders and competitions;
- ✓ increasing the level of responsibility, a conscious approach to the work of employees;
- ✓ employee discipline;
- ✓ improving document flow in the enterprise;
- ✓ to gain access to the international market;

- ✓ the possibility of successfully implementing an integrated management system.

ISO 9001:2015 Quality Management System is an international standard that defines requirements in the field of quality management. The standard summarizes world experience in the field of quality management, is recognized in all developed countries of the world and is applicable to absolutely any enterprise, regardless of the type and size of its activities.

Basic principles and requirements of the quality management system:

1. Consumer orientation.
2. Leadership or leadership role.
3. Involvement of company employees.
4. Approach the process.
5. Risk-oriented thinking.
6. Continuous improvement.
7. Make decisions based on facts.
8. Mutually beneficial relationships with suppliers.

An important requirement of the ISO 9001 standard is the documentation of procedures and processes, as well as the effective management of documents and records. The main document is the quality policy - a document that defines the main priorities and values of the organization in relation to customers, employees, suppliers, society. In general, the quality management system involves 6 documented procedures:

1. Document management.
2. Quality records management.
3. Conduct internal audits.
4. Management of non-conforming products.
5. Corrective actions.
6. Preventive measures.

Another important requirement of the ISO 9001 standard is the conduct of an internal audit. This process is necessary to verify the operation of the quality management system (QMS) and is called a first-party audit. It is recommended to conduct internal audits once a year, as this event significantly facilitates the inspection control (third-party audit) carried out twice every three years by an accredited management system certification body. There is a special standard ISO 19011, 15, which describes audit methods for management systems, including quality management. The current version of the document is “ISO 19011:2012 Guide to auditing management systems”, in the Republic of Uzbekistan.

Within the framework of quality management, each organization first determines its objectives in this area. To achieve these objectives, the organization must develop, document, implement and maintain a quality management system (QMS). To maintain its competitiveness, the organization must continuously improve the effectiveness of the QMS in accordance with the requirements of the international standard ISO 9000-9001.

To create an effective QMS in a construction organization, it is necessary to analyze the internal environment and identify the processes that affect quality assurance. These can be marketing research, supplier and subcontractor search, personnel management, work planning and coordination processes. Then the sequence and interaction of all identified processes should be established, taking into account the fact that many of them operate in parallel with each other. For this activity, we can use process modeling using the IDEF0 methodology.

To ensure operational efficiency and process control, the following tasks must be performed:

- Determining the methods for conducting all production operations within each selected process, as well as criteria for evaluating the effectiveness of the SMT and its subsystems;

- ensuring the availability of financial resources, research data, and analysis of collected data;
- Ensure monitoring, measurement and analysis of selected processes using specialists, measuring equipment and instruments;
- Achieving planned results in the field of quality and continuous improvement of processes, including making management decisions on corrections in case of process out of control and taking measures to search for opportunities to improve quality, prevent abnormal situations and reduce costs.

After the successful implementation of a quality management system (QMS), the construction organization must exercise control over the processes taking place in the system in accordance with the international standard ISO 9001. If this organization decides to delegate responsibility for the implementation of certain processes affecting it, the conformity of the product to subcontractors, it must guarantee control over the transferred processes, since consumers are not interested in the activities of subcontractors and impose quality requirements on the main contractor. In order to effectively manage such organizations and processes, it is necessary to define a methodology and management system within the framework of the developed QMS. By performing subcontracted work, the contracting organization retains some responsibility for the provision of resources, management of the product life cycle, and measurement and control.

In the context of creating a SMT, documenting the processes included in the system plays an important role. The documents you create help convey the meaning and sequence of all the steps required to complete these processes. Using this document has the following advantages:

- Ensuring that product quality (including construction and installation work) meets the requirements of the consumer (customer) and increases the level of quality above consumer expectations.
- Ensuring the appropriate level of training for all categories of personnel.

- To ensure the required level of quality is repeated for any number of operations of the same type and with a traceable history of the creation of a particular object or part of it. For example, you need to know who installed a particular wall or ceiling, who was responsible for the finish, what materials they were supplied with, and who their supplier was.
- Ensuring the collection of objective information necessary for making fact-based management decisions in the field of quality.
- To form an assessment of the ongoing level of effectiveness and compliance with the SMT.

When developing a Quality Management System (QMS), various documents need to be created. As part of this process, we use the following types of documents:

a) Documents intended for internal and external use, such as quality manuals for each employee, containing complete and consistent information about the quality management system of a particular organization.

b) Documents that describe how QMS can be applied to a specific product, project or contract and how its mechanisms work. This could be, for example, quality plans.

c) documents that specify requirements for certain indicators of the quality of products or processes, for example, technical specifications.

d) Documents containing recommendations or suggestions for quality assurance, its improvement, etc., such as various methodologies.

e) Documents containing information on the sequence of actions and processes within the SMT or its individual subsystems, for example, documented procedures, work instructions, drawings.

f) documents containing objective evidence of activities performed or results achieved, such as various records.

The use of all these types of documents allows you to create complete and understandable documents necessary to achieve a high level of product and process quality in the organization.

In the process of developing a quality management system (QMS), each organization determines the amount of documentation needed and the media used for it, taking into account its specific characteristics and the requirements of individual employees. The form of the documentation may include a description in words, diagrams, drawings and other elements.

The QMS documentation should include a number of key elements, such as documented quality policies and objectives, quality manuals, documented procedures in accordance with ISO 9001, as well as documents necessary for the effective planning, operation and control of processes, taking into account their specific characteristics. In addition, records should be maintained in accordance with the requirements of the international standard ISO 9001.

Depending on the nature of the organization's activities and personnel, the volume of QMS documentation and the media used, such as paper or electronic, are determined. The form of the documentation may include verbal descriptions, diagrams, and drawings. The QMS documentation should include the quality policy and objectives, quality manuals, documented procedures required by ISO 9001, and documents that ensure the effective planning, management, and control of processes, taking into account the specifics of the work. The organization should develop and maintain a quality manual that includes a description of all processes and the interactions of sub-processes included in the QMS. Maintaining a quality manual means maintaining the physical condition of the current state and recording equipment.

Documents developed in the context of quality management should be managed like other resources, with the exception of records - specific documents necessary to demonstrate compliance with and effectiveness of the QMS. Records

should be understandable, accessible and retrievable, and a documented procedure should be established that defines the controls necessary for the storage, identification, protection and retention of records.

To effectively manage documents, it is necessary to develop a documented procedure that includes the following activities:

- A procedure for approving documents before they are issued to ensure their suitability for use.
- Analyze and update documents, re-approve documents to keep them up to date when necessary.
- Identify changes made to documents during the work process, as well as review and manage their status.
- Ensure that the latest versions of documents are available at their points of use.
- Keep documents clear and easily identifiable.
- Identify and manage the distribution of external origin documents.
- Prevent the use of obsolete documents and manage abandoned documents for any purpose.

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