

IMS

The development of a construction project, from inception, design and planning to project startup, sometimes, to the end of the "assurance period"). The second (CM) typically includes the management effort during the execution phase, and sometimes it may include the contract award phase (it usually does not include the design phase). In the CPM format, the owner designates the so-called "Project Manager" and in the CM format the owner designates the so-called "Construction Manager". In both cases, this manager could be the owner's in-house personnel if the owner has such capabilities, but often it is an external expert (single person or an organization, acting on behalf of the owner).

In some cases (e.g. European Union Directive 92/57/EEC), these professionals are also called "Project Supervisors" being responsible for supervising the design and/or the execution of the project. When their responsibilities are restricted to the design phase, they are usually called "Project Supervisors for the design phase/stage" and when their responsibilities are restricted to the execution phase they are usually called "Project Supervisors for the execution (or construction) phase/stage". When a CM approach is considered, the construction manager, acting on behalf of the owner, has the primary duty of overseeing (and to assure the accomplishment of) the contracts established between the owner and the various contractors. In many cases, they do not participate in the formulation of these contracts and, additionally, they have no responsibility in the quality for the design documents. They supervise the construction of the project based on the owner's requirements included in the contract with the contractors. If the requirements are not appropriate or the design documents are poor, the construction manager usually has a reduced responsibility for the quality of the final product. If this condition exists, it may be more difficult for the project execution to be successful and the objectives defined by the owner may also be more difficult to be achieved. On the other hand, in a CPM approach the project manager will have the responsibility for the entire process, including design documents approval and the supervision of the contract documents with the contractors. The implementation of an integrated management system has, in this case, a greater probability of being successful depending on the commitment and the skillfulness of the project manager team, of the design team and of the contractor team (staff personnel, subcontractors, workers). In some cases, the CPM approach is also complemented with a CM team, acting under the responsibility of the project manager. This paper is organised in three main sections. In the first, some requirements for implementing an integrated management system (IMS) in construction are presented. The following section refers to the identification of the main documents and the hierarchy of an IMS in construction. The next section refers to a proposed structure for the main documents identified in the previous section, which is based mainly on the ISO 9001:2000, taking into account the ISO 14001:1996, the guide ILO/OSH 2001 and the ISO 10006:1997. Finally, some conclusions and recommendations are provided, to assist in the generation of a discussion that is needed on these matters between all construction experts.

2. Requirements to implementing an IMS in a Construction Project

The successful implementation of an integrated management system for a construction project using the CPM approach, relies on the ability of the design team and of the construction team and must be planned at the very beginning of the contract award process. It is then essential to evaluate the team's ability to assure a high probability of success of the management system.

The parties to the construction process should be prepared and organized in two sections:

- (i) requirements for the implementation of the IMS to be considered in the contract award phase; and
- (ii) requirements to be considered during the design and execution phases.
- (iii) The first "requirements" should be included in the "competition program", which contains the rules for awarding the contract and they must be followed by all potential competitors. The second "requirements" should be included in the "specifications", which contain the rules during the design and execution phases of the construction project and they must be followed by the successful contractor.

Within the guidelines of the compulsory legislation, the international standards ISO 9001:2000 (quality) and the ISO 14001:1996 (environment) may be considered, together with the guide ILO/OSH 2001 and, when applicable, also the European Union Directive 92/57/EEC. This demonstration should be based on the integrated management system that the competitor proposes to implement for the construction project under consideration.

The IMS should:

- (i) include an adequate plan to cover the three areas (environment, quality and safety and health) and the associated procedures, and include the specific monitoring, measurement and prevention plans, work instructions, and audit program, taking into account the different work involved in the project;

- (ii) Consider the creation of IMS working commission for each construction site and for the project as a whole (in this case representatives of the owner will be included); this commission is intended to follow up the implementation of the system;
- (iii) Take into account and be compatible with the organizational structure of the owner.

The specifications must also include some statements to clarify the relationship between the owner (or owner's representative) and the contractor as, for example, the followings:

- (i) during a fixed period (e.g., two months) after the contract is signed, the contractor must present the IMS according to the above mentioned requirements, as well as an implementation plan, allowing the owner sufficient time (e.g., one or two months) to introduce changes to the proposed system ;
- (ii) Without prejudice of the above mentioned periods, no relevant activity related to the design or to the execution phase can start before the contractor presents the plan for assuring the accuracy of that activity, concerning the environment, quality and safety and health;
- (iii) The owner has the power to audit the IMS in any time beginning three months after the contract is signed and the contractor has the obligation to implement the changes needed as a result of any recorded non conformity; the owner may also participate in the audits carried out by the contractor with any subcontractors;
- (iv) The owner may order the creation of new records or redefine the scope and extent of the traceability, and the contractor must reformulate the system within one month or within an agreed period depending on the extent of the changes to be introduced;
- (v) The owner is entitled to access to all documentation and records of the IMS (including that of the contractor and the subcontractors), including internal audit reports and the owner may also ask for hard copies of this documentation;
- (vi) The contractor must propose the assignment of a responsible (manager) for the IMS, who is subject to approval by the owner; this manager is responsible for the implementation, maintenance and the continual improvement of the system; this individual's qualifications must be specified for each project (e.g. requirement to be a civil engineer, possess at least 10 years of documented experience, etc.); in the case of very important projects, it can also be Integrated Management System in Construction (IMSinCONS) Luis Alves Dias required that this manager be assisted by an expert for each of the areas (environment, quality and safety and health); these assistant managers must also be qualified in the respective area of expertise;
- (vii) The contractor must bear the costs of assigning all the resources needed to implement an effective IMS; the owner may also require, at the expenses of the contractor, the installation or use of any collective or personnel equipment recognised to be essential for the improvement of the system;
- (viii) At the end of the project, the contractor must provide all the relevant IMS documentation, including, the records generated, the tracking documents, safety and health plans, safety and health files, maintenance plans, etc.;
- (ix) The contractor must conduct a survey of all situations related with work that can affect third parties, namely, of the existing buildings and other installations in the area of influence of the project; this survey must include inspections of buildings or installations, the use of documentary reports of the initial situation and the follow up;
- (x) The contractor must present a monthly report summarising the situation on the implementation of the IMS during the project (design and execution phases); this report must be organised for each construction site and for the project as a whole; it is intended to evaluate the performance and progress of the IMS during the period of the contract; the model of this report must be proposed by the contractor within 2 months after the contract is signed; the owner may order the introduction of changes, namely, other relevant information needed for this evaluation.

3 Documentation in an IMS in construction and its hierarchy An integrated management system may be organised and structured in different ways. It is the author's belief that a system involving the areas of quality (including cost and time controls), environment, and safety and health, must include the elements of the international standards ISO 9001 and ISO 14001, and also the elements of the ILO/OSH 2001 on

safety and health and, when applicable, they should also meet the requirements of the European Union Directive 92/57/EEC. It may also consider the ISO 10006:1997 on quality to project management. Of the mentioned areas, the implementation of quality systems is the most widely known and the most widely used in the construction industry, where considerable experience has already identified many of the strong and weak points. Therefore, the author believes that in the construction industry an integrated management system should be based and aligned the ISO 9001, which must be adapted to accommodate the elements for the other areas that are not included or related to any element of this standard. The documentation of an integrated management system in construction and its hierarchy could be similar to the one shown in Figure 1, which is briefly described below.

Documentation of an IMS in construction and its hierarchy According to this figure, the IMS includes the following main documents:

- IMS Manual (for the whole organization);
- IMS Procedures (those that are common or general to the three areas, those related specifically to quality including cost and time, those related specifically to the environment, and those related specifically to safety and health);
- IMS Plans (for each construction project, which may include and/or be related to specific plans on quality, environment, and safety and health);
- IMS Records (documentation of the implementation of the system). The IMS Manual is the main document of the integrated system and should be prepared when the system is to be implemented by a construction company, i.e. for the whole organization. It defines the general rules for the entire organization and it contains the management policy, the structure of the organization and the responsibilities of all personnel of the organization that influence the management of the organization.

This manual can be developed to meet the elements presented in section 4, i.e., it may be organized by following the elements considered in the proposed structure. The IMS Procedures must complement the information of the manual. They must be detailed with the necessary information needed for the most relevant elements of the manual, including the procedures mentioned in the ISO 9001 and ISO 14001 standards.

For example, the “control of a nonconforming product” requirement may refer to a written procedure describing the operational process for this control. It is recommended that all procedures be grouped in one single dossier, usually called the “Procedures Manual”. The IMS Plans are documents with particular information concerning each construction project of the organization. They must conform to the IMS manual and to the applicable laws and regulations, in particular in the areas of environment and safety and health. They must set up the specific preventive measures to be implemented for a particular construction site, taking into account the construction processes and the working methods that will be used. There will be as many plans in an organization as there are construction projects undertaken by the organization. The IMS system will also include the work instructions, documents describing the work process concerning each construction operation. These working instructions are the basis to identify and assess the monitoring, measurement and hazards involved in the execution of any construction operation and to define the appropriate corrective Integrated Management System in Construction (IMSinCONS) Luis Alves Dias and/or preventive measures that must be implemented to avoid or reduce the risk of poor quality work and the occurrence of injuries/diseases. They are essential documents for the definition of the monitoring, measurement and hazard prevention plans.

For the implementation of the IMS in the construction industry, there are two situations to be considered:

- (i) The system is to be implemented in an organisation (a construction related company) or;
- (ii) The system is to be implemented on a specific construction project. In the first case, the organisation should consider developing all the above mentioned documents. In the second case, it should consider developing just the relevant plans (and their related documents, e.g. procedures, monitoring, measurement and hazard prevention plans, etc.). In some cases the organisation and the construction project may be the same entity (as is the case when a group of companies join to perform a specific project, e.g. consortiums, joint-ventures, groups of economic interests). In these cases, the organisation should decide on developing either an IMS Manual or an IMS Plan for that specific construction project, but not both. Once the documentation and its hierarchy are identified, the next step is to establish the contents of the IMS manual and/or plan, as described further in the next section.
- (iii) **4 Proposed structure of the main documents in an IMS in construction**
On the practical level, the IMS Manual (for an organisation) and/or the IMS Plan (for a specific construction project) should consider all the applicable elements of the standards and/or guidelines related to the three areas as mentioned above:

ISO 9001:2000 for quality, ISO 14001:1996 for environment and ILO/OSH 2001 for occupational safety and health.

6 References

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