The implementation of occupational health and safety management systems in one construction company in Brazil

A.G. Benite (1); F.F. Cardoso (2)
(1) agbenite@cte.com.br
(2) francisco.cardoso@poli.usp.br
Dept. of Civil Construction Eng., Escola Politécnica, University of São Paulo, Brazil

Abstract

The purpose of this work is to present a methodology for implementation of an Occupational Health and Safety Management System in a construction company, based on OHSAS 18001 - Occupational Health and Safety Management Systems standard requirements. The implementation leads the company to an occupational health and safety performance improvement through the hazard elimination or risk control, workplace health improvement, and a better relationship with workers, trade unions, clients and regulatory bodies.

The methodology developed was applied in one building construction company in the State of São Paulo – Brazil and led the management system to a certification by an international registration body. This paper presents also the preliminary results obtained due to this methodology application that can be well suited to construction companies of other countries.

Keywords

Occupational Health and Safety Management Systems; construction safety; construction

1 Introduction

The accidents occurred recently and divulged by the press, like petrol leaking, explosions, land slipping and others make clear that the companies must adopt an ethical and responsible posture, respecting the environment and the workplace conditions.

The OHSAS 18001 - Occupational Health and Safety Management Systems (1999) have been developed in response to urgent customer demand for a recognizable occupational health and safety management system.
This standard intends to be unique, internationally recognizable and applicable to any kind and size of organizations and against which their management system can be assessed and certified.

The implementation leads the company to an occupational health and safety performance improvement through the hazard elimination or risk control, workplace health improvement, and a better relationship with workers, trade unions, clients and regulatory bodies.

This work presents a methodology for implementation of an occupational health and safety management system in a building construction company that has been developed in response to customer demand of Brazilian companies. It was developed through researches such as detailed studies of management system standards, four surveys with certified industrial companies, experience of this author as quality systems consultant and mainly through the implementation of it in one building construction company, which preliminary results are presented in chapter 3. It does not present the results of the studies concerning management system nor the surveys with certified industrial companies.

This pioneer methodology is an important contribution to the sector in Brazil even if the studied building construction company is not the first one to be certificated by OHSAS 18001 in this country.

2 The developed methodology

2.1 General Structure

The methodology consists of a list of tasks that are intended to be carried out by the construction company in a logical sequence allowing a progressive and organised implementation of the management system.

Each task contemplates one or more OHSAS 18001 requirements, thus when the company complies all the tasks proposed the standard requirements are immediately fulfilled.

The first step is the creation of an implementation work group, which will be the manager of the methodology implementation process.

This group shall include the following members of the organization: safety engineer, construction and project manager. They will spend some time in the implementation process, so they must be committed to the system and to continual improvement.

Such group shall establish an implementation plan, which must take in consideration the size of the company and the available financial resources and staff.

2.2 Task 1 –Health and Safety Policy

It is known that the actions that focus on the workplace safety and health are well succeeded when they flow from the top to the bottom in an organizational structure, therefore, the top management shall draft and authorise a policy that clearly establishes a general aiming of the company, as well as the principles of its actions.

According to HAMER (1985), a primordial requirement for any successful program is not to leave doubts for any one of the employees that the top management is engaged in the prevention of accidents.
Moreover, the top management has moral and legal responsibility for the maintenance of workplaces in safe conditions, or either, in conditions favourable to the health and the physical integrity of the organization employees.

It can be said that the H&S policy is a letter of intentions that shall have the topics that will be effectively followed by the organization and can be clearly evidenced (Figure 1).

A policy shall contain, at least, commitments:

- To provide a safe and healthful workplace;
- To continual improvement; and
- To at least comply current applicable occupational health and safety legislation and other requirements subscribed by the construction company.

<table>
<thead>
<tr>
<th>Document</th>
<th>Topics not complied</th>
<th>Action Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire department regulation Number 18 – November 1977</td>
<td>18.4.1 Lower number of fire extinguisher</td>
<td>Acquire four new fire extinguisher, Install the fire extinguisher in the work site, Review and revise the fire prevention procedure</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>

**Figure 1. Example of a Safety and Health Policy**

**2.3 Task 2 - Legislation and other requirements**

The construction company shall do a research to find out all applicable occupational health and safety legislation and other requirements to which the company subscribes.

This research can be done by the following ways: Internet researches, contracting specialised companies, contacting regulatory bodies and trade unions, surveying books and other publications. The company shall obtain all necessary documents creating an indoor legal library.

After that, the implementation work group shall carry out a review of each document, taking note of all topics that are applicable to the company, but are not complied by it. This review could require some consultation to regulatory bodies or even though contracting specialists’ services.

For every topic not complied by the company shall be established action plans (Figure 2) that detail all necessary activities, responsible and time limits to comply them.

The implementation work group shall also establish a procedure to keep this research updated and to assure that obsolete documents are promptly removed from all points of use.

**Figure 2 – Example of an action plan**
2.4 Task 3 – Hazard identification and risk assessment

The construction company shall identify all activities, workplaces and equipments inside the scope of the H&S management system. It shall include construction activities (masonry, demolition, roofing and others), handling and material storage, equipment operation, maintenance activities and office activities. Activities conducted by suppliers and subcontractors inside the work site are also concerned.

After that, implementation work group shall create work groups to identify all hazards related to activities, workplaces and equipments previously identified. Such task shall include arrangements to involve and consult the employees or its representatives. Identified hazards shall have its risks evaluated taking into account the likelihood and the severity of consequences of injury or damage (Figure 3). The managers shall use this evaluation for establishing their priorities’ actions.

The construction company shall also establish a procedure to keep an ongoing identification of hazards and assessment of risk process that could cover new developments and new or modified activities, equipments and work sites, etc.

<table>
<thead>
<tr>
<th>Activities, workplaces or equipments</th>
<th>Hazard</th>
<th>L</th>
<th>S</th>
<th>RD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Masonry</td>
<td>Repetitive movement</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>High height (fall)</td>
<td>3</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Inadequate handling of materials</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Chemical exposition (Portland cement / dermatitis)</td>
<td>3</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Dust exposition (sweeping)</td>
<td>3</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

Figure 3 – Example of hazards identification and risk assessment

2.5 Task 4 - Objective, Goals and Plans

The top management and the implementation work group shall establish and maintain documented occupational health and safety objectives and goals (Figure 4), at each relevant function and level within the organization. It should be quantified wherever practicable.

When establishing its objectives and goals the company shall consider: its legislation and other requirements, identified hazards and its risks, existing operational controls, the financial constraints, and technological options and business requirements.

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Goals</th>
<th>Measure method</th>
</tr>
</thead>
<tbody>
<tr>
<td>To reduce the number of accidents</td>
<td>Reduce at least 50% till December 2002</td>
<td>Accidents Report (monthly)</td>
</tr>
<tr>
<td>To reduce the number of activities with high Risk Degree</td>
<td>Eliminate at least 3 activities with RD = 9 till December 2002</td>
<td>List of high risk activities</td>
</tr>
<tr>
<td>To apply new safety technologies</td>
<td>Apply at least 2 new technologies till December 2002</td>
<td>Number of implementation reports</td>
</tr>
<tr>
<td>To increase safety training</td>
<td>Training at least 2 hours each employee monthly (average)</td>
<td>Training hours report (monthly)</td>
</tr>
</tbody>
</table>

Figure 4 – Example of objectives and goals
The implementation work shall also establish an action plan for achieving each objective and goal. This shall include necessary activities, defined responsibilities and authorities and the time-scale (Figure 5).

<table>
<thead>
<tr>
<th>Action Plan</th>
<th>Number 035</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objective</strong>: reduce the number of activities with high Risk Degree</td>
<td></td>
</tr>
<tr>
<td><strong>Goal</strong>: Eliminate at least 3 activities with RD = 9 till December 2002</td>
<td></td>
</tr>
<tr>
<td><strong>Measure method</strong>: List of high risk activities</td>
<td></td>
</tr>
<tr>
<td>Necessary activities</td>
<td>Responsible</td>
</tr>
<tr>
<td>Study the substitution of the process of manual digging for another process, with the support of a foundation specialist</td>
<td>Wilber</td>
</tr>
<tr>
<td>Study the elimination or substitution of the use of the XZ-R02 (hazardous substance)</td>
<td>William</td>
</tr>
</tbody>
</table>

**Figure 5 – Example of an Action Plan**

2.6 Task 5 - Operational Control

After the identification of hazard and risk assessment the implementation work group shall establish control measures for the elimination of the hazard or reduction of its risk. It shall determine and implement Safety Instructions (SI) for the activities, workplaces and equipments (Figure 6).

Such SI shall include:
- Worker responsibilities and competences needed;
- Adoption of personal protective equipment (PPE);
- Adoption of collective protective equipment (CPE);
- Equipments needed;
- Safety guidance for employees, supplier or contractors;
- Procedures for the design of workplace;
- Legal requirements and others.

This shall be carried out considering the legislation, international bibliography, benchmarking studies and the practices of the organization. The employees shall be involved in the SI review, because they have greater knowledge of the process and will be directly affected by them.

<table>
<thead>
<tr>
<th>Safety Instruction – Masonry</th>
<th>SI.01 Version 02</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Responsible</strong>: bricklayers team</td>
<td></td>
</tr>
<tr>
<td><strong>2. Personal Protective Equipment (PPE)</strong></td>
<td></td>
</tr>
<tr>
<td><img src="image1.png" alt="Obligatory Boot" /></td>
<td><img src="image2.png" alt="Obligatory Gloves" /></td>
</tr>
<tr>
<td>Obligatory Boot</td>
<td>Obligatory Gloves</td>
</tr>
</tbody>
</table>

3. Safety Guidance
- As soon as possible remove the rubbish and dirties
- Use scaffold to work above 1,5 meters

4. Competencies needed;
- Team trained in use of safety belt and PPE conservation

**Figure 6 – Example of a simplified safety instruction**
For the implementation of the SI, the construction company shall provide every resource needed and establish a timely and systematic training process. It is extremely important for the success of the implementation and to obtain the expected results.

2.7 Task 6 - Documents, Data and Records Control

The construction company shall establish and maintain a procedure for creating and controlling all documents and data required to operate the management system. It shall indicate the person(s) authorizing approve the documents for adequacy before its use, and promptly remove obsolete documents. This procedure shall include a master list or indexes, list of controlled documentation and its location and a distribution control process.

The organization shall also establish and maintain a procedure for controlling its records (medical test reports, training records, inspection reports, reports of emergency response drills and others) in such a way that they are readily retrievable and protected against damage, deterioration or loss.

<table>
<thead>
<tr>
<th>Identification</th>
<th>Current Version</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety Instruction SI.01 - Masonry</td>
<td>02</td>
<td>Wilber - 01 copy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>William – 01 copy</td>
</tr>
</tbody>
</table>

Figure 7 – Example of a documents control form

<table>
<thead>
<tr>
<th>Identification</th>
<th>Storage local</th>
<th>Type of the archive and protection</th>
<th>Retention Time</th>
<th>Final Disposal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily Inspection Report (DIR)</td>
<td>Safety department</td>
<td>- Folder indexed by date - Free Access</td>
<td>Ten years</td>
<td>Picot</td>
</tr>
</tbody>
</table>

Figure 8 - Example of a record control form

2.8 Task 7 - Emergency plans

The implementation work group shall identify every potential emergency like fatal accidents, fire, leaking and others. After that, it shall create and document emergency plans and train every involved worker for preventing and mitigating the likely illness and injury that may be associated with these situations.

Such plans shall include:

- Provision, control and maintenance of organization’s plant and equipment;
- Provision and control and maintenance of PPE;
- Shutdown systems;
- Fire detection and suppression equipment;
- Details of actions to be taken by personnel during an emergency, including those actions to be taken by external personnel who can be on the site, such as contractors or visitors;
- Responsibility, authority and duties of personnel with specific roles;
- Interface with external emergency services (i.e. hospital, fire department);
- Evacuation procedures, signalling, and others.

Practice drills should be carried out according to a pre-determined schedule for assuring its effectiveness. The construction company shall review its plans, in particular, after the occurrence of incidents or emergencies.
2.9 Task 8 - Performance measurement and monitoring

After the implementation of operational control, the implementation work group shall establish and maintain procedures to monitor and measure the occupational health and safety performance of the construction company on a regular basis.

Table 1 presents the essential topics that shall be measured and monitored and some examples of measuring and monitoring methods.

Table 1 – Monitoring measuring topics

<table>
<thead>
<tr>
<th>Topics</th>
<th>Examples of measuring and monitoring methods</th>
</tr>
</thead>
</table>
| Extent to which the Objectives and Goals are met | - Measurable indicator;  
- Monitoring of the action plan results. |
| Applicable Legislation and Safety Instructions compliance | - Results of the legislation review;  
- Results of hazard identification and risk assessment;  
- Systematic workplace inspections using checklists;  
- Inspections of specific machinery and plant to check that safety related parts are fitted and in good conditions;  
- Environmental sampling: measuring exposure to chemical, biological or physical agents (e.g. noise, volatile organic compounds);  
- Behaviour sampling: assessing worker’s behaviour to identify unsafe work practices that might require correction;  
- Number of accidents, illnesses and incidents;  
- Costs of accidents happened and others. |

If monitoring equipment is required for performance measurement and monitoring, the construction company shall establish and maintain a procedure for the calibration and maintenance of such equipment to assure correct results.

The mainly function of the performance measurement and monitoring process is to provide all necessary information to the managers so they can review the results and define actions plans to keep a continual improvement.

The construction company shall also establish and maintain a procedure for periodic occupational health and safety management system audits to be carried out, in order to determine whether the management system conforms to planned arrangements and OHSAS 18001 requirements, has been properly implemented and maintained and is effective in meeting the organization’s policy and objectives.

This procedure shall include scope, frequency, methodologies and competencies, as well as the responsibility and requirements for conducting and reporting results.

2.10 Task 9 - Corrective and preventive actions

The implementation work group shall prepare a documented procedure to ensure that all accidents, incidents and nonconformities are investigated, and corrective or preventive actions are implemented.

All the managers shall be trained in this procedure, in such a way that all the occurrences are reported and studied to identify the root causes and to establish corrective or preventive actions (Figure 9). Checks should be made on the effectiveness of corrective or preventive actions taken.

Nonconformities: a worker has hurt his hand cutting a plastic pipe.

Causes: he uses a knife → he doesn’t have the correct and safe tool (a pipe cutter tool) → he doesn’t know how to use the pipe cutter

Corrective action: Train the worker about how to use the pipe cutter
- Eliminate every knife available in the work site

Figure 9 – An example of a corrective action
2.11 Task 10 - Management review

The top management shall review, at planned intervals, the organization’s occupational health and safety management system, to ensure its continuing suitability, adequacy and effectiveness.

This review shall cover the results obtained through the performance measurement and monitoring process, results of internal or external audits, previous management reviews, reports from individual lines managers on the effectiveness of the system locally and reports of available resources. This review shall be documented and shall address the possible need for changes to policy, objectives and other elements of the management system, as well as to define corrective or preventive actions.

3 Results

The methodology presented was implemented in a building construction company in the State of São Paulo – Brazil. The company had already a quality management system based on ISO 9001 standard requirements, which facilitates the implementation process as some requirements of OHSAS 18001 and ISO 9001 are quite similar and compatible (i.e. documents control, audits and corrective actions).

The implementation process included a series of training and technical meetings in the office and construction sites, where each task was explained and adjusted for the existing practices.

The implementation process lasted 12 months and allowed the assessment and approval of the occupational health and safety management system by an international registration body in October 2002.

Despite the recent certification, some results were collected during the implementation process through interviews with managers and workers, as well as internal audits realised by one of the authors.

The results are presented in Table 2 and 3 subdivided by the methodology tasks.

Table 2 – Preliminary results

| Task 1 – Safety and Health Policy | - Awareness of the workers in the construction sites and in the offices about the importance of a safe and health workplace and the company policy;  
| - The top management presented a commitment to control the safety and health of the company. |
| Task 2 - Legislation and other requirements | - It was identified that the construction company did not have all the applicable legislation and some of them were obsolete; therefore they were acquired and updated;  
| - It was identified some topics that were not complied because unfamiliarity of the company;  
| - The first evaluation represents 85 % of legal documentation completely complied; after the implementation it was achieved 97 %;  
| - It was identified some legislation that had been elaborated based in the industrial sector, having some obstacles for an application in construction companies;  
| - Improvement of the relationship with the regulatory bodies, because some difficulties of interpretation and doubts were solved by contacting them. |
### Table 3 – Preliminary results

| Task 3 – Hazard identification and risk assessment | - It was identified that the number of activities, areas and equipment for the construction companies is very high comparing to those of industrial companies;  
- The majority of the identified hazard has medium or low risk degree and there are few hazards with high risk degree;  
- It is clearly noted that after the implementation of the SI the average of risk has reduced; |
| Task 4 – Objective, Goals and Plans | - With the establishment of objectives and goals the managers were encouraged to involve their subordinates to achieve them;  
- The manager has a guide for his actions in the company and a useful tool for leadership; |
| Task 5 - Operational Control | - Much training was necessary to enable the Safety Instruction which have new practices for the organization;  
- The acquisition of new and better safety equipments was necessary;  
- The contribution of the employees in the elaboration of the SI was greater then expected;  
- The creation of partnerships with contractors was necessary for SI compliance, creating in some case especial requirement in the contract;  
- Documented instructions allowed all engineers of the construction company to carry out the safety and health training that was typically done only by the safety engineer;  
- The construction site had a visible improvement in terms of cleanness and organization of storage areas and living areas;  
- The furniture and equipments of the offices was changed in order to create a workplace with an ergonomic conception; |
| Task 6 - Documents, Data and Records Control | - Process already existed in the construction company and the mainly change was the including of all safety and health documents and records in the existing controls; |
| Task 7 - Emergency plans | - Personnel trained in first aid and fire brigades in all constructions work sites and in the officer;  
- Practice drill were carried out simulating a fire and accidents with victims in all constructions work sites and in the office;  
- The workers became awareness about their roles in an emergency situation and became more committed with the H&S policy; |
| Task 8 - Performance measurement and monitoring | - There are quantitative information that allow the manager take actions based on real data and not subjective like before;  
- The results of inspections reports pointed a significant reduction of nonconformities;  
- The results of the inspections reports had been used by the engineers of the construction sites in order to create a kind of a competition between work sites stimulating the commitment and involvement of workers; |
| Task 9 - Corrective and preventive actions | - This process already existed in the company and the mainly change was the including of all nonconformities related do safety and health, accidents and incidents. An initial difficulty for reporting the incidents was observed, which was surpassed with training; |
| Task 10 - Management review | - Process already existed in the construction company and the mainly change was the integration of the safety and health matters in the strategic level of the organization. |
4 Conclusions

The predominant culture on the building construction sector privileges aspects like costs and delays, considering safety and health as an additional costs. However, the implementation of occupational health and safety management system establish a new posture, which considers the health and safety results as one of the components of the performance of the company.

The proposed methodology has proved its efficiency not only thanks to certification by an international registration body but also to the managerial and even cultural changes, affecting the organization and men.

Based in the initials results of the Brazilian construction company it is clear that the implementation of an occupational health and safety management system is extremely positive for construction companies, of any country. Every improvement obtained at each task of the methodology certainly results in a reduction of accidents, illnesses and incidents. Moreover, we must expect as results the following subsequent advantages, which could not still be demonstrated:

- Cost reduction (fines, lawsuits and productivity reduction);
- Preserve and development the image of the company for its customers, investors, suppliers, contractors, trade unions, regulatory bodies and society;
- Adopt a posture that exceeds the legal requirements compliance resulting in a competitive differential; and
- Increase of the satisfaction and quality of life of the workers resulting in a productivity improvement.

5 References