

## The latest ISO 14001:2015 and its contribution to Sustainable Construction

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**ABSTRACT:** The ISO 14001 is an international standard, worldwide recognized, whose purpose is to improve corporations' environmental performance, through the management of their environmental issues, thus contributing to sustainability, by preventing pollution and by meeting legal requirements. This article aims to discuss sustainability and the application of this standard within the construction sector in Brazil and its impacts upon construction companies. The methodology consists of the study of the concepts of sustainability and discussion of the major changes of the 2015 version as compared to the 2014 version. This comparative analysis has resulted in the observation of a new positioning of companies regarding the current version and the benefits that can be achieved by the construction companies that choose the ISO 14001:2015 certification. It was also observed how this new version can contribute to a more sustainable construction. This article also contributes to a comprehensive review of the implementation of an EMS (Environmental Management System) in construction companies.

**Keywords** *ISO 14001 Standard, Sustainability, Construction.*

## **1. INTRODUCTION**

Concerns about the large ongoing global changes in the world, regarding to the economic situation of countries, climate change and the increasing social pressure, led governments to make efforts to take actions aimed at sustainable development and, in this context, organizations also play a key role. The construction sector stands out as far as the current environment and sustainable development are concerned, due to the large impact on the environment, since it displays a significant consumption of natural resources, energy and water. In addition, when there is the implementation of a project, all its surroundings is impacted during the construction phase, its use and even its deconstruction.

In this scenario, at the end of 2015, the new version of ISO 14001 was published, whose aim is to provide a structure with requirements for environmental protection, based on the prevention or reduction of adverse environmental impacts generated by business activities, and the need for compliance with legal requirements.

The aim of this paper is to discuss the main changes in the ISO 14001 standard, its application in the construction sector and the impacts on construction companies due to the implementation of the new version. The specific objectives are:

- Present the main changes and the impact on construction companies;
- Analyze the new ISO 14001:2015 version to identify the contribution of this standard, aiming at the achievement of a sustainable construction, taking into account the requirements of the ISO 21931:2010.

The methodology will be based on the analysis of the requirements of the ISO 14001:2015, comparing it to the ISO 14001:2004 version and the ISO 21931:2010 standard, which establishes guidelines for an environmental assessment of sustainable construction.

## **2. THE ENVIRONMENTAL MANAGEMENT SYSTEM BASED ON THE ISO 14001 AND THE REQUIREMENTS FOR SUSTAINABLE CONSTRUCTION**

In the face of the current problems related to the environment and the increasing demands of environmental agencies to issue licenses, companies are pressured to demonstrate that they have an adequate environmental management. The set of ISO 14001 standards provides organizations with a guideline for the implementation of an EMS (Environmental Management System) for the adequate management of these issues and the aspects and impacts caused by such activities.

According to ISO 14001, an environmental management system is part of the management system used to manage environmental issues, meet legal and other requirements, addressing risks and opportunities.

The ISO (International Organization for Standardization) is an independent international organization, composed of 167 member countries, and, in Brazil, it is represented by ABNT (Brazilian Technical Standard Association), through the CB 38 (Brazilian Committee), in which its representatives participate in international meetings of the ISO/TC 207 committee, for the development of new ISO standards in order to build the Environmental Management.

The ISO 14001 standard has requirements to assess conformity in relation to its environmental management and, according to this new version, companies can either perform their own assessment, as well as a self-declaration, or a 2nd-party auditing (customers or other interested party) can be performed, or even get a certification body to perform an external audit and evaluate their EMS.

In order to meet ISO 14001, the following requirements must be fulfilled: the context of the organization, leadership, planning, support, operation and performance and improvement evaluation.

The ISO 14001 standard helps the implementation of the EMS, which contributes to improving the environment, the organization and its stakeholders. It may be applicable to any type of organization, provided that the environmental aspects of its activities, products and services are addressed, considering the life cycle.

In order to simplify and optimize resources, organizations seek to have an integrated system, that is why the update of ISO 14001 has been aligned with the Quality Management System ISO 9001 standard and the ISO 45001 standard for Safety and Health, which it is expected to be published by the end of 2016.

According to the American Industrial Hygiene Association, the ISO 45001 – Occupational Health and Safety Management System – was approved by the Committee members in June 2015. This standard will replace the current OHSAS 18001. ISO 45001 is an international standard, designed to assist organizations in improving their performance, regarding safety, health and well-being of workers.

In order to have an alignment among the Management System standards, the ISO/IEC Directives (ANNEX SL - High-Level Structure) was developed, which describe the structure to be used by all ISO management system standards.

Each organization should define the scope for its EMS, analyze the context in which the organization operates, checking issues related to the environment, both internal and external, and stakeholders' needs and expectations. For the successful implementation of an environmental management system, the commitment and involvement of leadership are essential.

After the implementation of ISO 14001, according to the 2015 version, the organization may either perform a self-assessment and self-declaration, or seek confirmation from a 2nd-party audit, such as customers or other interested party, interested in the organization, or seek a confirmation by another party, external to the organization, or even seek certification of its EMS by an external organization, i.e., an Certification Body (CB).

Figure 1 shows on the next page the structure of the EMS, according to ISO 14001:2015.

Context of the Organization	Analyze the internal and external environment, considering results and environmental conditions.
<b>Leadership</b>	At this stage, the organization should demonstrate the commitment by its leadership and directive board.
<b>Planning</b>	The organization should establish the EMS planning, considering the context, stakeholders and the scope of the EMS. It should determine the risks and opportunities related to its environmental aspects, legal and other requirements.
<b>Support</b>	The organization should provide resources, define competences, communicate with and raise awareness of the people working for the organization, taking into account its EMS.
<b>Operation</b>	At this stage, the organization establishes, implements and controls its processes in order to meet EMS requirements. It should also consider its preparation for emergencies.
<b>Performance evaluation</b>	The organization should monitor, measure, analyze and evaluate its environmental performance, considering the compliance to legal and other requirements. The directive board should perform critical audits and analysis.
<b>Improvement</b>	At this point, opportunities for the improvement of the EMS should be determined. Actions should be taken to deal with non-compliances and to improve the environmental performance.

Figure 1 – Structure of the Environmental Management System.

In Brazil, the Accredited Certification Bodies are accredited by INMETRO (National Institute of Metrology), which is in charge of doing so in the country. Currently, according to INMETRO website (2016), 21 active ACBs are registered, which can issue certificates to companies that comply with the ISO 14001 standard.

Data published by ISO survey in 2009 had 1,186 companies certified by ISO 14001 in Brazil, showing an increase in 2010 to 3,329 certifications. In 2014, this number decreased to 3,222 companies certified by ISO 14001, as shown in Figure 2 (ISO Survey, 2016).

This very research shows that, in other countries, such as France, in 2014, there were 8,306 certified companies, in China, 117,758 and, in the United States, there were 6,586. These data show that companies actually seek ISO 14001 certification, which minimizes its environmental liabilities and improves business environmental management and environmental impacts of the production of their goods. According to Mustafá (2016), among the rejection factors, the one that stands out most is the additional cost, because this is often analyzed separately, not taking into account several other factors that can facilitate the adoption of the system.

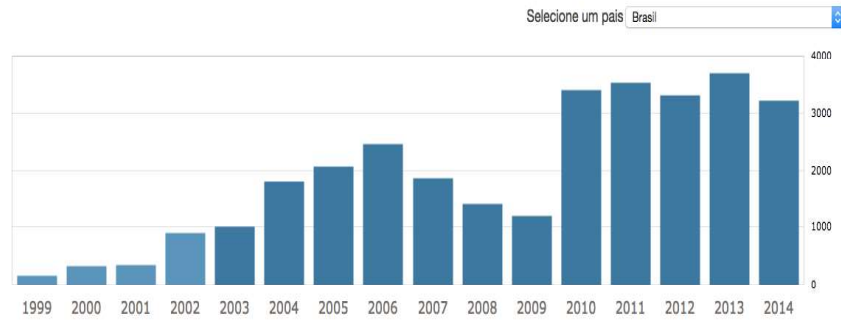


Figure 02 – Graph of the development of ISO 14001 in Brazil I (ISO Survey, 2016),  
(Available in <http://www.iso.org/iso/home/standards/certification/iso-survey>)

According to Magrini and Tombo (2008), the main difficulty faced by companies in Brazil for the maintenance and implementation of EMS is the financial issue. The costs regarding the implementation consulting, investment on adequating production equipment and processes, the contract with the certifier, the EMS supervisory audits and system maintenance are significant obstacles.

Since 2012, companies in Brazil have been facing several financial difficulties, and this might be one of the causes for the drop in the number of certifications. Another factor that affected the market was the difficulties faced by Petrobras, Vale do Rio Doce, the automotive industry and other major industries, which established requirements to their suppliers, a leading and motivating factor for companies to maintain their EMS. Due to the economic crisis the country has been facing in the past years, the significant investment reduction of large companies made it difficult for many of them to keep their EMS.

Companies have difficulties to measure the gains from the implementation of the Environmental Management System, but, according to Mustafá (2016), many EMS actions do not increase the budget, on the contrary, they ensure reduction of waste and accidents, besides providing increased reuse and recycling of waste, with consequent cost reduction.

According to Aguiar and Nascimento (2014), the ISO 14001 certification is a renowned set of standards for EMS certification, but there are other environmental certificates that seek to classify organizations and show the next links in the chain, be them businesses or final consumers, that the practices and products are manufactured or extracted based on environmental concern.

Examples of such EMS certifications: CERFLOR (the timber industry), FSC (which reports on appropriate forest management), IBRAF - Sustainable Fruit, among others. Strategic sectors, such as Industry and Construction, might develop their own EMS certification, considering the three pillars of sustainability, economic, social and environmental, requirements of ISO 14001, ISO 21931 and ISO 15392. According to Fonseca (2012), including sustainable development in organizations' agenda is now one of the most important issues, and ISO has a range of standards that can help companies and organizations worldwide to obtain progress, considering the three pillars of sustainable development.

## **2.1 Main changes of the ISO 14001:2015 and their impacts on EMS implementation in the Construction sector**

Every seven years, the ISO 14001 standard undergoes a review process, and the changes aim to meet market needs, and encourage better environmental management. The current version also presents greater adhesion, still with the structure of ISO 9001, thus facilitating the integration of systems. Companies will have a period of three years to conform to the new version of the standard.

With the new version, the concept of stakeholders has been expanded and the construction company should, at the time of the implementation, check people or organizations that might affect, be affected or perceive themselves affected by a decision or activity of the company, thus making a survey of these stakeholders and identifying their needs, taking into account customers, community (neighbors), suppliers, regulators, investors, employees and third parties.

The high direction directive board might succeed in the long run and contribute to sustainable development through environmental protection, in compliance with stakeholders' and legal requirements, using the life-cycle perspective during the design of the project, during the construction of the building, and during its use, resulting in financial and operational benefits, and still having a better image in the market.

The fundamental and strategic role is replaced on the high direction directive board, since now there is a specific requirement for leadership, and it is expected a greater involvement and participation, being it necessary that the leadership knows the environmental aspects and impacts, ensuring that the EMS requirements are being considered in the organization's processes and business. Environmental Policy must make it clear the organization's commitment to protect the environment, meet legal and other requirements, and improve the EMS to increase environmental performance.

Analyzing the context of the organization, of the project and of the work influences the strategic direction, regarding internal and external issues, which might be associated to environmental conditions relating to climate, air quality, water quality, land use, existing contamination, availability of natural resources and biodiversity. External issues related to compliance, legal requirements, regulation, information technology, finance and economy, culture and society.

Another significant change was the need for planning by adopting actions to analyze the risks and opportunities, taking into account the significant environmental aspects and impacts, legal requirements and other issues related to stakeholders. The construction company can also identify risks due to environmental spill, flood increase due to climate change, scarcity of resources, economic constraints, introduction of new technologies, shortage of water and energy.

According to ISO 14001 Annex A, when determining environmental aspects, the following aspects must be considered: air emissions, disposal in water and land, use of raw materials and natural resources, energy use, energy emission (for instance: heat, radiation, vibration, noise and light, generation of waste and/or by-products, use of space).

As for the aspects and impacts, the construction company should consider project changes, activities, new or modified products and services, and take into account the emergencies that can be predicted as well.

As to preventive actions, the item has been replaced, in the new version, the organization should assess the risks and propose actions to eliminate or reduce them. Thus, taking preventive action should be intensified, based on the need to assess the risks in all activities and also perform assessment of change.

According to ISO 14001:2015, it is necessary to consider the life cycle, consecutive and linked stages of a given product system (or service), from the acquisition of raw materials, or their generation from natural resources, until the final disposal. The stages in the life cycle include the acquisition of raw materials, design, production, shipping/delivery, use, post-use treatment and final disposal. Thus, the construction company must establish controls to address environmental issues in the development process of the project and during the construction, taking into account the stages of the life cycle. It should also consider information on potential environmental impacts associated with the delivery, use and post-use and final disposal of the enterprise.

Changes in the new ISO 14001 version are very significant, especially when it comes to the construction sector, since there are few incentives for companies to implement an SEM. Besides, being it a very traditional sector, very resistant to change.

The new version will bring a great impact to the construction companies, regarding the issue of context analysis and the active participation of leaders (high direction directive board), who must now demonstrate full knowledge of the organization's EMS. Making management changes, analyzing risks and opportunities, and performing analysis the life cycle; tasks that are far from the reality of the construction sector.

## **2.2 Requirements for a sustainable construction**

According to ISO 15392, in order to apply the concept of sustainable development in construction and promote sustainable development at the same time, it will be necessary to achieve six objectives: the progress of the construction sector; reduction of negative environmental impacts; stimulus to innovation; stimulus to a proactive approach; the decoupling of economic growth and the increase of negative impacts on the environment and/or on society; the reconciliation of conflicting interests or requirements between planning or decision-making within a short term and a long term.

Also, this same standard describes 10 principles applied to sustainable development: continuous improvement, equity, thinking globally and acting locally, holistic approach, stakeholders' involvement, long-term vision, risk management precaution, accountability and transparency (ISO 15392, 2008).

The ISO 21931-1 standard establishes guidelines for an environmental assessment of sustainable construction. The organization should state the scope of the certification, be it for a new construction, a renovation, acquisition of a building, design and construction, evaluation of an existing building and deconstruction. The purpose of the environmental performance of the construction might vary, depending on the circumstances and the different scenarios. The following should be taken into consideration: the acquisition of building materials, the project and new constructions, improvement of the operation of

existing constructions during the phase of use, the “retrofit” project, in addition to the improvement of the equipment during the operation phase and analysis of the environmental performance of existing constructions.

Using requirements of ISO 21931:2010, the author has defined minimum requirements for sustainable construction, as shown in Table 1, in order to compare with the requirements of ISO 14001:2015, which directly address the issue of sustainability.

Table 1 – Comparison between ISO 14001 requirements and sustainable construction requirements.

Sustainable Construction Requirements	ISO 14001:2015 requirements that address sustainability
Relation between the building and its surroundings;	Context of the organization;
Energy use;	Environmental aspects;
Water consumption;	Environmental aspects;
Life cycle of the construction;	Planning and operational control;
Quality of components (products, including type, amount, material supply, logistic and the estimated life cycle of the material);	Planning, actions to address risks and opportunities, environmental aspects;
Construction process;	Operation, planning and operational control;
Maintenance services, repair and equipment improvement;	Operational planning and control and environmental aspects;
End of life cycle, including demolition/deconstruction, reuse, recycling and final disposal;	Operational planning and control
Occupants' behavior during the operation phase;	Operational planning and control
Location of the construction and the influence of transportation upon users,	Context of the organization;
Construction management and the effects of energy and water consumption during the construction itself;	Operational planning and control;
Waste production, including commissioning of construction systems;	Operational planning and control;
Available infrastructure;	Context of the organization;
Land use at the construction site.	Environmental aspects, operational planning and control.

Source: Own elaboration

As shown in Table 1, the construction company that chooses to carry out its project, considering sustainability criteria, is very close to achieve the implementation of an EMS, also meeting the ISO 14001 requirements. Sustainable construction criteria are focused exclusively on the enterprise. When the construction company chooses to implement ISO 14001, they consider requirements for completion of the project, compliance with legal requirements and also aspects of Business Management.

When there is implementation of ISO 14001 in a construction company, some benefits and advantages can be observed, such as: compliance with legal requirements and subsequent monitoring of the project conditions; reduction of waste amount, which leads to saving,



since discharge will be lower; motivation and better commitment by employees, due to training sessions; and environmental education, reducing air, noise and visual pollution and the consequent reduction of environmental impacts.

From the point of view of stakeholders, the company's image is improved, promoting a competitive advantage and greater confidence in the market. There are also some funding agents that value the implementation of EMS and environmental certification at the time of authorizing a loan to the organization.

Thus, from the issues of ISO 14001 standard, addressed in item 2 of this article, it can be said that only the leadership requirements, performance evaluation, support and improvement are not part of the sustainable construction items. This is so, because these are exactly ISO 14001 requirements dealing with Organization Management. Another important point is that, when a company opts for the implementation of ISO 14001, EMS practices should be applied to any business enterprise it carries out, unlike the sustainable construction certification, which certifies only a single enterprise.

### **3. FINAL CONSIDERATIONS**

This article aims to discuss sustainability and the application of ISO 14001 standard in the civil construction sector in Brazil and the impacts on construction companies, from the publication of the new version

Based on this study, we can see that the standards studied have many points in common, and that the construction companies who want to implement the Environmental Management System or just build the enterprise with sustainability requirements have at their disposal guidelines to help with this process. The new ISO 14001 version displays significant changes regarding the management issue and the directive board, with an expected greater commitment and involvement from the leaders. These new requirements are aligned with market requirements, causing companies to worry about planning and risk management. Construction companies will have to make an additional effort to comply with the new version, especially those companies in which the directive board is not so involved with the EMS.

The main contribution of this study was to analyze the changes of the new ISO 14001 and make a comparison with the requirements for sustainable construction, based on ISO 21931:2010, considering the principles of sustainable construction in ISO 15392.

It was evident that ISO 14001 is more comprehensive, since it deals with the production process, of the company's management, compliance with legal requirements, and, when applied in full, it can bring great benefits to the company's management, to the environment and to the realization of sustainable construction projects.

A new study may be performed to measure the financial gains with the implementation of an EMS, considering that the compliance with legal requirements does not generate environmental liabilities, there are management efficiencies, waste reduction, better waste management, like recycling and no generation, in addition to the water and energy savings.

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