

Implementation of a methodology for the integration of management systems based on NTC-ISO 14001:2015 and NTC-ISO 45001:2018: A case study in the construction sector

*Implementación de una metodología para la integración de sistemas de gestión basada en las normas NTC-ISO 14001:2015 y NTC-ISO 45001:2018:
Un caso de estudio en el sector de la construcción*

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ABSTRACT

This document proposes the implementation of a methodology for integrating management systems based on the Colombian Technical Standards NTC-ISO 14001:2015 and NTC-ISO 45001:2018, validated in the construction sector in Barranquilla (Colombia). The objective is to present a methodology that facilitates the articulation of processes in standards of safety and health at work and the environment that guarantee the protection, prevention and management of risks and environmental aspects in the companies. For this, a descriptive methodology was used, divided into two stages: a diagnosis of the construction sector in Barranquilla (Colombia) and an integration plan. In the first stage, a comparison was made of the requirements established in the technical standards regarding the evidence of management in the construction sector. In the second stage, requirements were issued to manage the management system according to the integration methodology of the UNE 66177:2005 standard. The application, as a case study, was made to 15 companies in the sector, where it was possible to diagnose that only 33.3% of the companies have both management systems, and it was determined, according to the UNE 66177:2005 standard, that the sector has a basic maturity level with a reactive approach. Some identified factors that oppose integration were: ignorance, resistance to change, staff training, the level of maturity of the company and lack of resources. The integration plan was proposed for one of the companies under study, showing the integration route and identifying its Weaknesses, Opportunities, Strengths and Threats. The proposed methodology is useful in developing the integrated management system necessary for companies in the construction sector to provide their services with guarantees for the preservation and health care of all interested parties. In addition, to minimize the possible consequences of the negative environmental impact that the execution of the company's activities may produce.

Keywords: Integrated management systems, environment, occupational health and safety, construction sector.

RESUMEN

Este documento propone la implementación de una metodología para la integración de sistemas de gestión basados en las Normas Técnicas Colombianas NTC-ISO 14001:2015 y NTC-ISO 45001:2018, validadas en el sector de la construcción en Barranquilla (Colombia). El objetivo es presentar una metodología

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que facilite la articulación de los procesos en estándares de seguridad y salud en el trabajo y medio ambiente, que garanticen la protección, prevención y gestión de los riesgos y aspectos ambientales en las empresas. Para ello, se utilizó una metodología descriptiva, dividida en dos etapas: diagnóstico del sector de la construcción en Barranquilla (Colombia) y un plan de integración. En la primera etapa se realizó una comparación de los requisitos establecidos en las normas técnicas sobre las evidencias de gestión y en la segunda etapa se emitió un conjunto de requisitos para gestionar el sistema de gestión de acuerdo con la metodología de integración de la norma UNE 66177:2005. La aplicación, como un caso de estudio, fue hecha a 15 empresas del sector, donde se pudo diagnosticar que solo el 33,3% de las empresas cuentan con ambos sistemas de gestión y se determinó, según la norma UNE 66177:2005, que el sector tiene un nivel de madurez básico con un enfoque reactivo. Algunos de los factores identificados que se oponen a la integración fueron: el desconocimiento, la resistencia al cambio, la capacitación del personal, el nivel de madurez de la empresa y la falta de recursos. El plan de integración fue propuesto a una de las empresas en estudio, mostrando la ruta de integración e identificando sus Debilidades, Oportunidades, Fortalezas y Amenazas. La metodología propuesta demuestra ser útil en el desarrollo del sistema integrado de gestión, necesario para que las empresas del sector de la construcción presten sus servicios con garantías para la preservación y cuidado de la salud de todas las partes interesadas. Además, de minimizar las posibles consecuencias del impacto ambiental negativo que pueda producir la ejecución de las actividades de la empresa.

Palabras clave: Sistemas integrados de gestión, medio ambiente, salud y seguridad en el trabajo, sector de la construcción.

INTRODUCTION

Management systems allow the administration of processes optimally. Currently, the dynamics of the productive sectors have generated the need to implement management systems, turning them into an instrument with competitive advantages to manage the processes and activities of organizations in an integrated manner [1-3]. The implementation of Integrated Management Systems (IMS) helps to have control over the processes that are used in the execution of business projects [4-6]. This implementation includes the control of documents and records in matters of Workplace Health and Safety (WHS) and Environmental Management (EM); where the requirements and standards are identified and measured to assess and propose strategies that lead to an improvement focused on the comprehensive well-being of the worker and minimization or mitigation of impacts and adverse effects on the environment. Given current trends, organizations desire to be increasingly competitive [7, 8] while remaining friendly to the environment and reducing their accident rates [9].

The Colombian Technical Standard (NTC) ISO 14001:2015 is a guide for the application of technical requirements in the implementation of

an Environmental Management System (EMS) that promotes sustainable practices, the appropriate use of resources and the identification of actions to reduce the negative impact on the environment during the execution of the economic activities of any organization [10]. For its part, the NTC-ISO 45001:2018 seeks to establish a management system for Occupational Health and Safety (OHS) to eliminate or minimize the risks for employees and other interested parties that may be exposed [11, 12]. Although technical standards such as the NTC-ISO 14001:2015 and NTC-ISO 45001:2018 are not mandatory for companies in Colombia, they have been established as a fundamental axis that complements strategic planning to achieve better positioning in the market. In this line, the construction sector is one of the main contributors to the development of any society; to the extent of the need to have coexistence spaces that promote the creation of housing infrastructure, bridges, buildings, and roads, among others [13].

According to statistics of construction licenses issued by DANE, in January 2022, 1,693,704 square meters were licensed, with an increase of 145.0% in the approved area for non-residential destinations and an increase of 11.6% for housing. In this statistic, the department of Atlántico-Colombia (including

the city of Barranquilla) has 109,060 square meters as an area approved for construction, equivalent to a 6.4% share in the growth of construction in Colombia [14]. Taking into account the importance of the construction area and its impact on Workplace Health and Safety (WHS) and the Environment; this document proposes to implement an integration methodology based on the UNE 66177:2005 standard for the management systems proposed by the ISO 14001:2015 and ISO 45001:2018 standards, applicable in the construction sector in Barranquilla, seeking to identify measures of intervention and action plans regarding compliance with the requirements of the technical standard. The UNE 66177:2005 standard helps to select between a basic, advanced or expert integration method and establish the integration plan with stages of monitoring, measurement and support from senior management to achieve organizational and system objectives [15].

This paper is structured as follows. Section 2 presents the state-of-the-art of recent works related to the application of integration approaches in management systems. The methodology used and developed in the document is introduced in section 3. The results and analysis are shown in section 4. Finally, the conclusions derived from this study are presented in Section 5.

RELATED STUDIES

Over time, management systems integration approaches have been implemented and used in different business and organizational environments. For example, [16] proposed to analyze the systemic perspective and the advantages of Integrated Management Systems for organizations in occupational health issues and its relationship with other systems. The author conducted a documentary analysis based on the research results in this field and concluded that safety is related to quality and productivity and that it cannot be separated from the rest of the management systems. [17] Presented an analysis of the implementation of integrated management systems in organizations and how this integration can be used as a competitive advantage. The authors show that the integration manages to favor cost reduction, resource optimization, the improvement of the perception of the corporate image, and the simplification of documentation.

However, they highlight challenges to overcome, such as insufficient management motivation or the need for management tools and precise methodologies. [18] Designed a procedure for identifying and integrating management systems in Cuban biotechnology companies.

As a novelty, the authors proposed to identify the main systems that must be managed in Cuban biotechnology companies and integrate them based on the common requirements of the legal regulations governing them and if they have the same maturity levels in their processes. The proposed integration procedure consists of five phases and twelve steps and can be combined with the UNE 66177:2005 and NC-PAS 99:2008 standards. [19] Proposed a methodology for implementing integrated management systems of the ISO 9001:2015 and ISO 30301:2011 standards in the Colombian notarial context. The methodology was validated in a notary's office in the department of Cundinamarca (Colombia). It included the design of a questionnaire to determine if there are favorable aspects during the implementation process.

The results highlight that the methodology helps to take care of the notarial organizational model, reduces inefficient bureaucracy and offers specific performance benefits. Later, [20] addressed the issue of integrating management systems from the perspective of quality, environment, and occupational health and safety. The proposed approach allowed the design of a procedure for integrating systems with a marked leadership approach to guarantee the organization's success. Recently, [21] analyzed the literature on the impacts of Integrated Management Systems on organizational performance. His contribution helped identify significant benefits of management systems, for example, improvement of operating performance, cost reduction, sustainable development, and reduction of occupational risks, among others. The authors analyzed documents related to the Quality Management System, the Environmental Management System, and the Occupational Health and Safety Management System. Finally, [22] Implemented an Environmental Management System under the UNE-EN ISO 14001: 2015 standard in a company in the Rice Industry in Colombia. The proposal included the implementation phases, the context analysis, and the system documents' elaboration.. In addition,

a methodology for integrating the Environmental Management System with the Energy Management System was proposed following the guidelines of the UNE 66177:2005 standard, seeking to improve the organization's environmental performance. This document proposes implementing a methodology for the integrating management systems based on the ISO 14001:2015 and ISO 45001:2018 standards applicable to companies in the construction sector in the city of Barranquilla (Colombia). This integration proposal is based on the UNE 66177:2005 standard and includes the diagnosis of the degree of integration of 15 companies in the sector and the validation of the methodology in one of the companies.

METHODOLOGY

The research approach used is Mixed since it represents a set of systematic, empirical, and critical research processes that involve collecting and analyzing quantitative and qualitative data. This information will be integrated and discussed collectively to make inferences and better understand the studied phenomena. For this, it was approached in the first instance from the Quantitative to diagnose the degree of integration of the technical standards ISO 14001: 2015 and ISO 45001: 2018 in the sampled companies, identifying the points that need to be strengthened in the sector concerning safety, health, and environment. Furthermore, it was also approached from the qualitative point of view, proposing the analysis of qualities, attributes, and characteristics related to activities that can show compliance with the standard requirements. The sampling of the companies was done for convenience, considering those that voluntarily wanted to provide information on their systems and participate in the diagnostic process of the sector.

For the execution of the present investigation, a diagnosis of the construction sector in Barranquilla was carried out, which consisted of a questionnaire with 30 questions related to compliance and status of the systems to put together a checklist aligned with the requirements of the Technical Standards to be integrated based on the stages of the PDCA cycle (Plan, Do, Check and Act). The questionnaire was applied to 15 contractors (companies), selected with the support of Cámara Regional de la Construcción (CAMACOL) in Atlántico-Colombia, and the degree of integration of the technical standards ISO

14001:2015 and ISO 45001:2018 were obtained. In this stage, the data obtained was tabulated using descriptive statistical techniques, and the information was organized to identify the context of the construction sector. In the integration plan phase, as a case study, one of the construction companies was selected, and the requirements of the technical standards to be integrated were exemplified; all these, based on the analysis of the main weaknesses, opportunities, strengths and threats of the sector. This analysis allows establishing the relationship with interested parties, generating mechanisms for the participation of workers and other parties, and identifying risks, opportunities, and a scheme to establish the objectives of the integrated system. In this way, the level of maturity for the sampled company was determined by employing the UNE 66177:2005 standard, which allowed aligning the companies' strategic planning. In turn, to validate the methodology, identify the resources, competencies, awareness, and program files or documented information required to manage risks, aspects and impacts with emphasis on priorities, performance evaluation, and the continuous improvement analysis of the integrated management system.

RESULTS AND ANALYSIS

Diagnosis of the sector

In the diagnostic stage, 15 companies from the construction sector in the city of Barranquilla were sampled. A questionnaire with 30 questions related to compliance and the status of the systems in EM and WHS was applied. The number of questions were divided and applied, according to the stages of the PDCA cycle (Plan, Do, Check and Act), as follows: "Plan" stage with 8 questions, "Do" stage with 15 questions, "Check" Stage with 4 questions and "Act" Stage with 3 questions.

Table 1 shows the results of the "Plan" phase, which correspond to the numerals: Context of the organization, Leadership, and planning of the systems in EM and WHS. Among the most notable results, it can be seen that only 33.33% (5 companies) have these management systems and obtain compliance with the requirements of this stage. In comparison, 46.67% (7 companies) obtain non-conformity results, and 20% (3 companies) present partial implementation. In addition, the evaluation of the

Table 1. Checklist to evaluate planning within companies in the construction sector. C = Conforming, NC = Not Conforming and P = Partial.

Questions of the “Plan” phase	C	NC	P	Total
Does the company have any mechanism to identify what it must legally comply with?	6	8	1	15
Does the company evaluate the environmental consequences of carrying out its activity?	1	12	2	15
Does the company assess the health and safety risks for workers when carrying out its activity?	6	5	4	15
Does the company have an EM and WHS management system?	5	3	7	15
Is there a safety and environment policy?	6	5	4	15
Has a person responsible for safety and environment been assigned? In health and safety, it has a 50-hour course authorized by the Ministry of Labor in Colombia		7	8	15
Have workers’ safety and environment responsibilities been disclosed and defined?	5	5	5	15
Are planning activities carried out that include aspects of EM and WHS?	4	8	3	15

environmental consequences resulting from the construction activity was inquired, resulting in only 6.6% (1 company) evaluating their environmental impact. In this sense, the null assessment of the damage derived from the sector with a percentage of 80% (12 companies) stands out. In general, it can

be said that the “Plan” is an activity that few of the evaluated companies currently practice.

For its part, the results of the “Do” stage, which are the actions necessary to achieve the objectives set by the organizations, are shown in Table 2. The

Table 2. Checklist to evaluate Doing within companies in the construction sector. C = Conforming, NC = Not Conforming and P = Partial.

Questions of the “Do” phase	C	NC	P	NA	Total
Does the company have constituted committees or health and safety representatives?	3	9	3		15
Does the company have formats or documents for programs, instructions, standards or others regarding safety, health and the environment?	5	6	4		15
Does the company have mechanisms for its workers, contractors and other interested parties to participate and communicate on safety, health and environment issues?	2	10	3		15
Does the company have safety and environmental training records?	8	3	4		15
Does the work area have signs?	10	5			15
Has the company implemented controls to prevent accidents, incidents and illnesses in health and safety?	7	3	5		15
Has the company implemented controls and knows what to do in case of emergency situations in safety, health and environment?	2	8	5		15
Has the company performed periodic maintenance on the equipment, tools and machines used for work?	4	8	3		15
Does the company classify or dispose of waste on the construction site, Project or Company?	3	9	3		15
Does the company have an emergency prevention, preparedness and response brigade?	2	12	1		15
Has the company implemented controls for the environmental impact generated by its activity?	1	13	1		15
Does the company perform occupational medical examinations periodically?	7	7	1		15
Does the company carry out safety, health and environmental controls regarding the products purchased or contracted services?	2	10	2	1	15
Is there a water supply and toilets for use?	10	5			15
Does the company have records of health and safety inspections carried out?	5	7	3		15
Does the company use any mechanism to know which are the personal protection elements that its workers must use?	4	9	2		15

evaluation of topics such as support and operation of ISO 45001:2018 and 14001:2015 standards were considered, which are the foundations of the “Do” stage within the PDCA cycle.

On the one hand, as remarkable results, it can be seen that only 20% of the companies have work safety committees and 33.33% (5 companies) have program documents, instructions, or other work safety and environment requirements. On the other hand, it was detected that only 13.33% (2 companies) care about having mechanisms for their workers, contractors, and other interested parties to participate in occupational health and environmental issues. In comparison, 66.66% (10 companies) have signposted work areas. It was also found that 20% (3 companies) carry out waste classification in the works, projects, or company.

The results of the diagnosis for the “Check” activity (performance evaluation), presented in Table 3, show that only 6 companies (40%) have carried out audits to measure their status in terms of safety, health, and environment. In contrast, approximately 14% (2 companies) have management indicators to measure their activities related to environmental issues and the safety and health of their workers.

Regarding the results of the management processes, which are part of the “Act” stage within the PDCA cycle that are presented in Table 4, it was determined that 40% (6 companies) of the construction sector have mechanisms to carry out inquiries of accidents; while only 6.66% (1 company) identify opportunities for improvement in the area of environment and safety.

The summary of the diagnosis results, consolidated by chapters of the regulations and according to the PDCA cycle, are presented in Figure 1. As can be seen, companies show low compliance with operational and support requirements, as well as and requirements such as the context of the organization, leadership, planning, and performance evaluation. The implementation of the ISO 45001:2018 and ISO 14001:2015 management systems and their integration are not a priority for most of the companies evaluated. The reason for this may be that most companies belong to medium and small contractors associated with the construction sector, which are still in the process of financial growth and have yet to implement an IMS (Integrated Management Systems). Other factors may be ignorance, resistance to change, staff training, the company’s maturity level, and lack of resources, among others. That is why, IMS must be considered in the construction

Table 3. Checklist to evaluate Checking within companies in the construction sector. C = Conforming, NC = Not Conforming and P = Partial.

Questions of the “Check” phase	C	NC	P	Total
Does the company have mechanisms to carry out statistical measurement and evaluation related to safety, health and the environment?	2	13		15
Does the company keep measurements of accidents, illnesses and incidents that occurred to workers?	2	12	1	15
Does the company have defined mechanisms for senior management to review the status of issues related to safety, health and the environment?	1	13	1	15
Has the company received audits or visits regarding the status of its Safety, Health and Environment Management System?	6	9		15

Table 4. Checklist to evaluate Acting within companies in the construction sector. C = Conforming, NC = Not Conforming and P = Partial.

Questions of the “Act” phase	C	NC	P	Total
Does the company have mechanisms to conduct accident investigations?	6	6	3	15
Has the company identified opportunities for improvement in safety, health and the environment?	1	11	3	15
Does the company have mechanisms to analyze the causes when deviations or breaches in safety, health and environment occur?	4	11		15

sector since they generate advantages such as process optimization and recognition of external clients [23]. Efficiency, attracting new clients, and generating credibility with clients and suppliers, among other benefits, are inherent in the application of Integrated Management Systems [24]. Following the results identified in the applied questionnaires, a basic level of maturity of the sector is observed (reactive approach), according to Annex C of the UNE 66177:2005 standard, identifying management systems with existing documentation and minimum monitoring and measurement results.

Integration Plan

As a proposal of the integration plan and to show its application path, a company from the construction sector was selected to show the way in which the requirements of the technical standards, the object of this investigation, can be fulfilled, obtaining the results that are observed in Table 5.

The table shows fundamental and transversal elements: the PDCA cycle, the standards to be integrated, the degree of compliance of the selected company, and the evidence that can be generated of compliance with the integration. The above is based on the results obtained in the diagnostic stage. The table shows partial compliance with the requirements associated with leadership and commitment activities; when observing the fulfillment of the obligations in security and planning of the management system in what corresponds to the evaluation of dangers, which are input for decision-making regarding the controls currently implemented in work.

In addition, the need to strengthen the aspects associated with the organizational context regarding

internal and external issues, management of outsourced processes, and evaluations of convenience, effectiveness, and efficiency of the system is observed, which are mainly focused on the planning, verification, and action stage.

These activities comprise the integration plan that applies the basic method selected in deploying the requirements of the UNE 66177:2005 standard.

Analysis of internal and external issues within the company

The analysis of the context of the selected company was determined through the implementation of the SWOT technique (Strengths, Weaknesses, Opportunities, and Threats). The SWOT analysis makes it possible to analyze the company's internal characteristics and the external situation in a square matrix (As seen in Table 6). In this sense, the vision of expanding the business, being a formally constituted company, was identified as the main Strength (S). The main areas for improvement are more planning and a definition of guidelines for building good health and safety practices (W). The Threats (T) are focused on public safety, changes in current regulations, and adverse environmental conditions considering the geographical location of the city and the type of tasks carried out in the project. The Opportunities (O) lie in associations and alliances to strengthen the recognition and implementation of good practices in safety and environmental management systems.

CONCLUSIONS

Integrated management systems allow organizations to achieve benefits in their management and organization

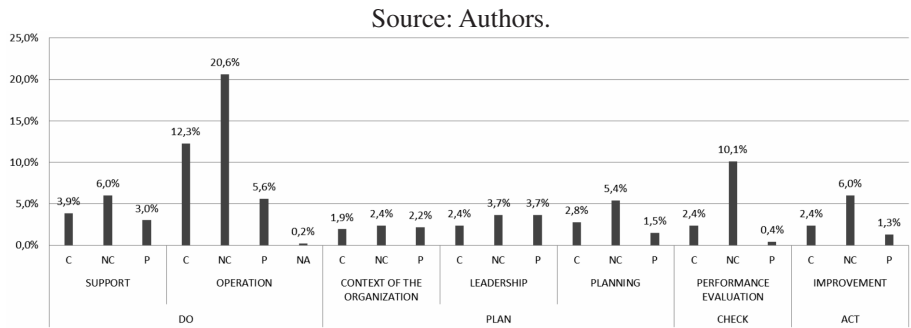


Figure 1. Result of the diagnosis using the PDCA cycle in the construction sector.

Table 5. Degree of compliance and evidence for integration.

PDCA Cycle	ISO 14001:2015	ISO 45001:2018	Level of compliance	Evidence of compliance for suggested integration
Plan	4. Organizational Context	4. Organizational Context	NC: 50% P: 50% C: 0%	Integrated Management System Manual.
				SWOT Matrix, Stakeholders Matrix.
	5. Leadership and Commitment	5. Leadership and Commitment	NC: 0% P: 100% C: 0%	Management System Policy, Role Matrix, Responsibility and Authority, Participation Procedure.
	6. Planning	6. Planning	NC: 66.67% P: 33.33% C: 0%	Matrix of identification, assessment and determination of controls for risks, dangers and environmental impacts.
				Matrix of legal requirements, Access procedure, identification and evaluation of legal requirements.
				Procedure for identification, assessment and determination of controls for risks, dangers and environmental impacts.
				Strategic Scorecard Matrix (contains objectives, associated management strategies and measurement).
DO	7. Support	7. Support	NC: 75% P: 25% C: 0%	Training Matrix.
				Communication, participation and consultation Matrix.
				Communication, participation, consultation and awareness procedure, Documented information procedure.
				Master List of documented information (Internal and external).
	8. Operation	8. Operation	NC: 16.67% P: 58.33% C: 25%	Manual for contractors, selection and monitoring of suppliers.
				Emergency Plan, Hygiene and Industrial Safety Regulations.
				Musculoskeletal epidemiological surveillance program.
				Safe work at heights program.
				Safety and environment inspection program, Personal Protection Elements Program.
				Natural resource management program.
				Waste management program.
				Alcohol, drug and other addiction prevention program.
				Epidemiological surveillance program, psychosocial risk.
				Safe construction work procedures.
CHECK	9. Performance Evaluation	9. Performance Evaluation	NC: 100% P: 0% C: 0%	Board of Indicators, Management review procedure.
ACT	10. Improvement	10. Improvement	NC: 100% P: 0% C: 0%	Non-conformity procedure, corrective and preventive actions and improvements.
				Work accident investigation procedure.
				Matrix of corrective, preventive and improvement actions.

Table 6. SWOT analysis applied to the company as a case study

Nº	Strengths	Nº	Weaknesses
S1	Vision of expansion and business projection.	W1	There is no system of strategic indicators, control panel to monitor environmental impact and safety management.
S2	Commitment to responding to stakeholders.	W2	Safety and environment operational control guidelines are not defined.
S3	Universal product, with good price and product quality.	W3	There is no risk analysis that allows effective action to be taken.
S4	Employee safety awareness.	W4	Activity planning processes do not consider health and safety criteria.
S5	Legally formalized company.	W5	Waste separation and classification habits are not identified.
Nº	Opportunities	Nº	Threats
O1	Implementation of good practices that allow to be more friendly with the environment and obtain benefits.	T1	Changing political factors.
O2	Alliance with construction companies to promote healthy lifestyle activities with workers and the surrounding community.	T2	Public security.
O3	Subscriptions in regional associations to obtain access to training related to safety, health and environment.	T3	Changes in regulations that may generate new unfavorable scenarios for the company.
O4	Submit projects to participate in awards and/or recognition for good security practices.	T4	Competing construction companies with greater recognition and investment in management systems.
O5	Certifications of management systems in safety, health and environment.	T5	Adverse environmental conditions for the development of activities.

of work while meeting certification requirements. In this work, an integrated system of ISO 14001:2015 and ISO 45001:2018 standards were proposed in the construction sector in the city of Barranquilla (Colombia). In its development, 15 companies in the sector were diagnosed, of which one company was taken as a case study to validate the methodology. It was evidenced that, although currently, the established norms do not require a management system in the construction sector, the proposed methodology facilitates the development of an integrated management system for the Environment and Workplace Health and Safety. In the development of the investigation, a specific analysis of all the requirements of the regulations was carried out so that the companies meet only the minimum requirements but also those necessary for them to provide their services with guarantees for the preservation and care of the health of all interested parties, in addition to caring for the environment to minimize the possible negative environmental impacts that the execution of daily activities may produce.

With the development of this project, we were able to conclude that the implementation of several management systems in an articulated manner generates significant savings and synergies, among which it is possible to mention the following:

- Increased confidence in contracting clients and a positive image in the market in the region.
- Unification of controls and operations of different areas or projects to improve their control, generate feedback, and improve processes.
- Reduction of efforts and costs through the standardization of the processes of the contractor and contracting companies so that both comply with the mandatory requirement of Workplace Health and Safety at the national level and also minimize or mitigate the negative environmental impact during the execution of the project.
- Greater visibility of the organization's mission and policies through an integrated document structure.

- Better clarity of the network of responsibilities in matters related to Workplace Health and Safety and the preservation of the Environment.
- Improvement in the execution of projects thanks to the planning of activities based on risk management and environmental aspects that may occur.

Future research will seek to implement this methodology in the construction sector, considering a comprehensive management system that includes quality management, becoming a replicable model for this sector nationally and internationally.

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