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Proposal for the design of the Occupational Health and Safety System for the control and mitigation of occupational hazards in the aqueduct and sewage company in the municipality of Guachucal, Nariño

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Abstract

Objective: to determine the measures that should be included in the Occupational Safety and Health Management System (OSHMS) in order to control the existing occupational risks in the company. **Methodology:** non-experimental-observational cross-sectional study, with quantitative approach and descriptive scope. **Results:** Currently, the company has a qualification of 60% according to the evaluation of the minimum standards, which indicates a critical risk level; therefore, it is necessary to carry out improvement actions according to the economic activity to prevent occupational risks. **Conclusions:** There is a need to implement an occupational health and safety system in the Guachucal Aqueduct

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Article resulting from the research entitled: *Propuesta para el diseño del SG-SST para el control y mitigación de riesgos laborales en la empresa de acueducto y alcantarillado en el municipio de Guachucal-Nariño*, developed from January through August 2023, in the municipality of Guachucal, Nariño, Colombia.

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and Sewerage Company that meets the current legal requirements and complies with occupational health and safety standards, as well as being a leader in this field, since this contributes to the improvement of the organization.

Keywords: safety; health; system; occupational risks; reduction; control; organization; PHVA cycle

Propuesta para el diseño del Sistema de Seguridad y Salud en el Trabajo para el control y mitigación de riesgos laborales en la empresa de acueducto y alcantarillado en el municipio de Guachucal, Nariño

Resumen

Objetivo: establecer las medidas que debe contener el Sistema de Gestión de Seguridad y Salud en el Trabajo (SG-SST), tendientes a controlar los riesgos laborales existentes en dicha empresa. **Metodología:** estudio no experimental-observacional de corte transversal, con enfoque de tipo cuantitativo y alcance descriptivo. **Resultados**: en la actualidad, la empresa tiene una calificación del 60 % de acuerdo con la evaluación de estándares mínimos, apuntando a un nivel de riesgo crítico, por ende, es necesario que se lleven a cabo acciones de mejoramiento según la actividad económica, con el fin de prevenir riesgos laborales. **Conclusiones:** existe la necesidad de implementar un sistema de seguridad y salud en el trabajo en la empresa de acueducto y alcantarillado de Guachucal, que cuente con los requisitos legales vigentes y con el cumplimento de los estándares de seguridad y salud en el trabajo; además, es necesario contar con un líder en este ámbito, ya que esto contribuye con el mejoramiento de la organización.

Palabras clave: seguridad; salud; sistema; riesgos laborales; mitigar; controlar; organización; ciclo PHVA

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Proposta para o projeto do Sistema de Saúde e Segurança Ocupacional para o controle e a mitigação de riscos ocupacionais na empresa de aquedutos e esgotos do município de Guachucal, Nariño

Resumo

Objetivo: determinar as medidas que devem ser incluídas no Sistema de Gestão de Segurança e Saúde Ocupacional (SGSSO) para controlar os riscos ocupacionais existentes na empresa. **Metodologia:** estudo não-experimental-observacional de corte transversal, com abordagem quantitativa e escopo descritivo. **Resultados:** Atualmente, a empresa tem uma qualificação de 60% de acordo com a avaliação dos padrões mínimos, o que indica um nível de risco crítico; portanto, é necessário realizar ações de melhoria de acordo com a atividade econômica para prevenir riscos ocupacionais. **Conclusões:** É forçoso implementar um sistema de segurança e saúde ocupacional na companhia de aquedutos e esgotos de Guachucal que atenda aos requisitos legais vigentes e cumpra as normas de segurança e saúde ocupacional, além de um líder nesse campo, pois isso contribui para a melhoria da organização.

Palavras-chave: segurança; saúde; sistema; riscos ocupacionais; redução; controle; organização; ciclo PHVA

Introduction

This work is based on a non-experimental-observational study, cross-sectional, with a quantitative approach and descriptive scope, aimed at answering the question: What measures should contain the Occupational Safety and Health Management System (OSHMS), which allow the control of existing occupational risks in the aqueduct and sewerage company of the municipality of Guachucal? Attending the different areas of the organization and complying with the current legal framework on the matter, tending to establish preventive measures for risk factors that affect the health and safety of workers (accidents, incidents, diseases, and adverse occupational events), to improve the welfare and working conditions of employees and thus, comply with the legal requirements.

The aqueduct and sewerage company of the municipality of Guachucal is a public utility company, responsible for water collection, treatment, and distribution, as well as garbage collection in the rural and urban areas of the municipality. It does not currently have an OSHMS to mitigate and control the occupational risks to which its workers are exposed, such as physical, chemical, ergonomic, mechanical, psychosocial, and even environmental and biological risks; therefore, they are in a state of vulnerability to these risks.

Although initial evaluations of the risks present in the different work positions have been attempted, they have not been implemented, since the company does not have personnel trained in the design of the OSHMS. In this sense, the percentage of compliance with occupational health and safety is nil.

At the national and international level, there are several studies related to the topic under investigation. Most of them focus on the evaluation, mitigation, and control of

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occupational risks and diseases at a general level in various companies; for example, in Argentina, the study by Ramírez (2021) identified unsafe conditions and a lack of preventive measures; therefore, an OSHMS was implemented based on ISO 45001, which allowed identifying hazards and controlling risks in the company, to avoid accidents and comply with the relevant legislation.

In San Salvador, Chavarría et al. (2006) obtained as a result of their research, the reduction of occupational accidents and illnesses in the study population, as well as the creation of strategies that facilitated the improvement and prevention of such accidents and illnesses.

Regarding research at the national level, the study conducted by Gómez et al. (2021) in the city of Bogota, noted that an OSHMS aligned to the requirements of the Single Regulatory Decree of the Labor Sector 1072 of 2015, allows the strengthening of administrative processes, optimizing the provision of services through the physical and psychological well-being of workers, which positively affects the positioning in the market.

Moreno and Godoy (2012) addressed various reflections on the needs that companies should have in the face of the occupational risks they present in their environment, considering the need to develop occupational health and safety programs to improve the working conditions of their human talent.

Although the above are some of the studies that have been carried out on the subject, they focus on the evaluation, mitigation, and control of occupational risks and diseases at a general level, affirming that these measures are of utmost importance for the OSHMS. For the specific case and, for the company under study, in the present work it is necessary to identify the working conditions of the employees, to evaluate them and to design an efficient proposal for the control of mechanical, biological, physical, chemical, psychosocial, and environmental risks related to the daily work activities they perform in it.

Methodology

The type of study was non-experimental-observational, cross-sectional since it avoids manipulating the variables. It had a quantitative approach with a descriptive scope, considering that the tendencies of a group or population were described, by detailing the variables to be identified. The participants in this research are mentioned below:

a. The researchers, in charge of establishing the measures to be contained in the company's OSHMS.

b. The group of employees of the company, composed of 17 people from different areas: General Management (1), Administrative Area (3), sewage operators (2), water operators (4), collectors (5), custodian (1), and driver (1), for a total of 15 men and two women.

No sample or inclusion and exclusion criteria were considered in this study, since the population was reduced and limited. It is essential to highlight that, due to the economic activity carried out by the company, such as the collection, treatment, and distribution of water, following the regulations of Decree 768 of 2022, the company is classified in a Class III Risk Level.

For the collection of information, surveys were conducted and aspects such as the company's informed consent, the occupational risk matrix, the checklists with the items corresponding to the identification of occupational safety and health hazards, GTC-45, were considered, which helped to identify the occupational safety and health hazards and risks to which the study population was exposed. Resolution 0312 of 2019 made it possible to meet the minimum standards of OSHMS.

The information was analyzed according to the frequency with which workers were exposed to occupational hazards. A comparison was made between the secondary information consulted and the primary information collected in the field, which was synthesized and used to identify and evaluate the risks faced by workers. The quantitative analysis was carried out using

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the Microsoft Excel program; in this way, the results are presented graphically for a better understanding. It should be noted that the data entered into the program were purified and synthesized to avoid the margin of error. Based on the above, the following phases have been identified:

1. **Diagnosis**: initial assessment of compliance with minimum OSHMS standards to know the current status of the company and to identify the needs of the workers and the company.

2. **Application of methods**: Identification of risks and hazards of the company's work areas, mainly using the risk matrix according to GTC-45 and other tools such as socio-demographic profile and perceived morbidity surveys, recommendations for occupational medical examinations, to determine the applicable controls and obtain the qualitative results of the research.

3. **Statistical analysis**: following the application of the risk matrix, the data were systematized to be statistically tabulated and to obtain the quantitative results of the research.

4. **Preparation of the final report**: it was based on the final results and adjustments for the completion of the research project.

Results

Demographic Characterization

In the company, 88% of the employees are male and only 12% are female. This is due to the fact that most of the company's employees are operational and responsible for tasks such as water and sewer maintenance and garbage collection, tasks that are performed by men in the region. The majority of employees are between 26 and 45 years old, accounting for 82% of the workforce.

In the municipality of Guachucal, the census is divided between the indigenous population and the Sisben. Most of the workers who live in the urban area belong to stratum 2; therefore, it was preferred to classify them by urban or rural area; 71% of them live in rural areas; 35% live in a free union; many of them say they do not want to get married, but they have been living with their partner for several years; 3% are married and 29% are single. Seventy-five percent have a family home and 25% rent a house.

Three of them are professionals; the operational personnel have graduated as technologists or technicians in fields related to pipelines, water, and sewerage; some have only a high school degree, but due to their experience in the position, they perform their work to the best of their abilities. Considering that most of the personnel are operational and occupy operator positions, they do not have personnel under their responsibility, since they limit themselves to following the orders issued by the general manager, who is the only one who has people under his responsibility. Seventy-six percent (13 people) work in the field as operators, either in the water, sewerage, or sanitation sectors, and four people perform administrative tasks.

Accident, Illness, and Absenteeism Reports

The accident, illness, and absenteeism reports showed that of the 17 workers who reported no occupational illness, four suffered minor accidents due to being struck by tools (there were no serious or fatal accidents). All 17 workers were absent from work for at least one day, all within a five-year period.

The absences (see Figure 1) were due to general illness, force majeure, family reasons, personal reasons, disability, and other unjustified absences. None of the employees reported that they were absent for work-related reasons, dissatisfaction, or other business reasons. In total, there were 54 cases of absenteeism.

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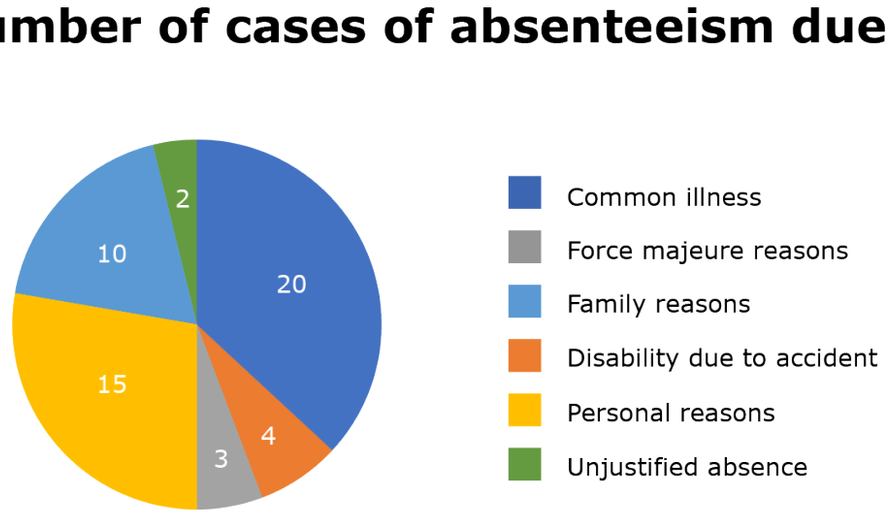
Figure 1

Number of cases of absenteeism in the company



Diagnosis of the company

A checklist was used to determine the current state of the company in terms of infrastructure, assets, resources and human talent that would allow the correct development of occupational health and safety; it considered the following points:

- Administration of occupational risk prevention
- Information and training for workers
- Basic services
- Emergency preparedness
- Personal protective equipment
- Working with contractors, subcontractors, and suppliers
- Specific conditions for chemical risk prevention
- Task analysis
- Basic requirements
- Local conditions
- Signage and demarcation
- Noise and vibration
- Alternating, continuous, and static electricity
- Environmental pollution
- Machines and tools
- Hand tools and equipment
- Material handling and transportation
- Training and education.

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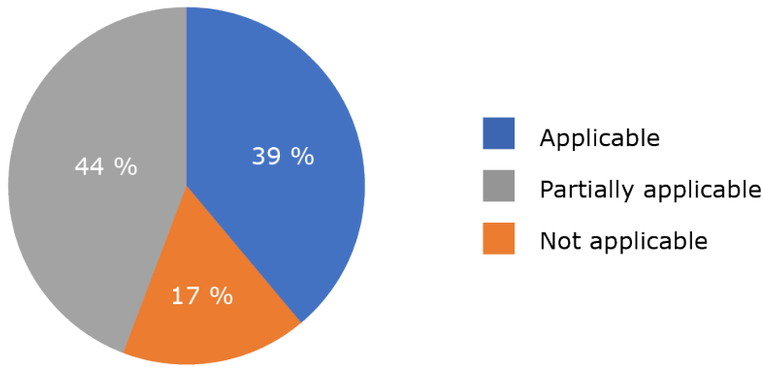
Figure 2

Company compliance by checklist items



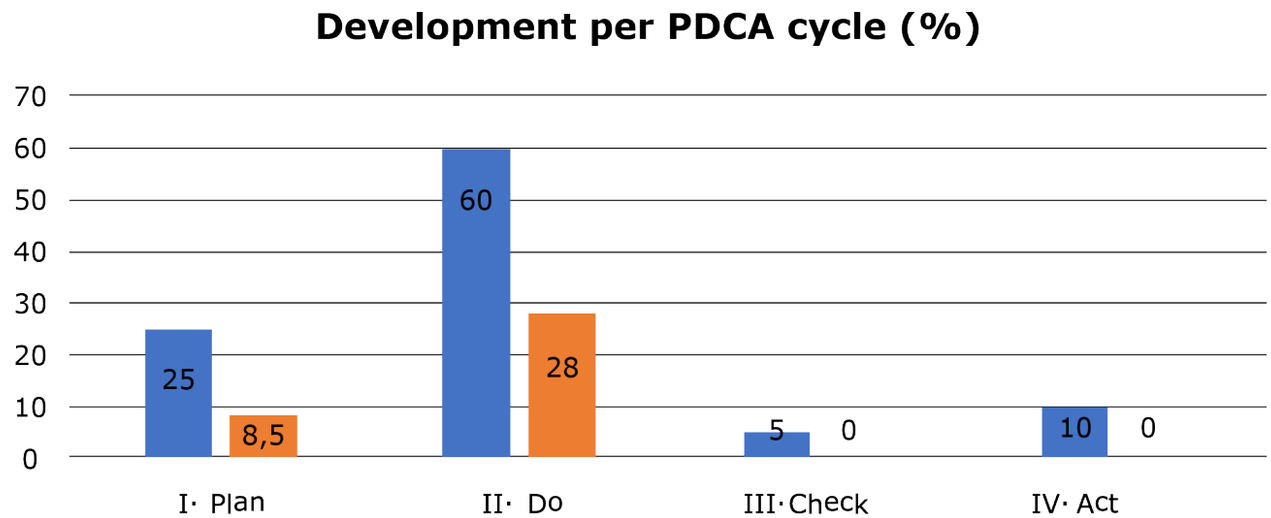
Of the 18 items considered, seven were found to be compliant: 3, 5, 10, 13, 15, and 17; three were not compliant: 2, 9, and 12; and eight were partially compliant: 1, 4, 7, 8, 11, 14, 16, and 18, indicating non-compliance primarily in the organization of induction and training processes, document management, and committee formation. In general, the company complies with the provision of safe workplaces and activities, but does not have documentation to support its management or to organize health promotion and risk prevention activities. Only 39% were fully compliant with developing an appropriate management system prior to this research.

The evaluation matrix of the minimum standards established by the Ministry of Labor was used, considering Resolution 0312 of 2019, where there is evidence of the company's non-compliance by stage of the Plan-Do-Check-Act (PDCA) cycle.

Figure 3 shows that Guachucal does not comply with the development of the PDCA cycle, which is the basis of the OSHMS. In the review of the minimum standards, it obtained a score of 36.5%, which shows a critical level, being a score below 60%; therefore, the standard requires immediate improvement actions to be taken.

Figure 3

PHVA Cycle Compliance



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Identification and assessment of risks

According to the methodology of GTC 45, the risks in the different areas of the company have to be considered, the hazards have to be identified and evaluated. Table 1 shows the results.

Table 1

Summary of Risk identification and assessment

Risk type	Rating		
	Management	**Administrative Area**	**Operational Area**
Mechanical risks	Low	Low	Low
Biological risks	Low	Medium	High
Physical risks	Low	Low	Medium
Ergonomic risks	Medium	Medium	Medium
Chemical risks	Low	Low	High
Psychosocial risks	Medium	High	Low
Environmental risks	Low	Low	Low

Note. Prepared based on the use of the GTC 45 risk matrix.

The highest rated risks are found in the operational area due to their exposure in the field to falls, blows, constant exposure to biological and chemical agents. On the other hand, in the administrative and office areas, employees tend to be more exposed to ergonomic risks due to poor posture and psychosocial risks due to stress.

OSHMS Design

In accordance with Resolution 312 of 2019, there were four programs: plan, do, verify, act, which comply with the minimum standards applicable to the Guachucal Aqueduct and Sewerage System, that is, those contemplated in the Resolution for companies with between 11 and 50 workers for risks I, II, III, IV, and V, and which include the standards and items included in the Resolution. It should be noted that the proposed OSHMS includes the tools for the development of each program.

Thus, the OSH Policy has been formulated, in which the Empresa Municipal de Acueducto, Alcantarillado y Aseo de Guachucal commits itself to provide a safe working environment for its employees, to ensure compliance with current legislation on occupational safety and health, to control risks and minimize the causes of incidents, occupational accidents, and occupational diseases through the implementation, strengthening, evaluation, and continuous improvement of the OSHMS. The complete policy can be found in the proposed system.

In the same way, the legal matrix has been prepared for the company, a tool that allows not only to identify the legal requirements applicable to occupational health and safety, but also to determine the degree of compliance in the performance of its activities. This matrix is a document that contains the current national or local regulations that need to be updated and evaluated.

Table 2 shows the programs and a summary of the activities developed by element for the consolidation of the OSHMS.

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Table 2

Summary of OSHMS programs

Program 1. Plan		
Subprogram 1. OSH Resources		
Numeral	**Item**	**Actions developed**
1.1.1	Assignment of a person to design and implement the OSH Management System	Format designed in the research
1.1.2	Assignment of OSH responsibilities	Format designed in the research
1.1.3	Assignment resources to the OSH management system	Format designed in the research
1.1.4	Affiliation to the Integral Social Security System	The company must submit a form of affiliation to the social security system for health, pension, and labor risks
1.1.5	Identify employees who are constantly engaged in high-risk activities	Not applicable
1.1.6	Joint Committee on Occupational Safety and Health	Format designed in the research
1.1.7	Training of the members of the Joint Committee on Occupational Safety and Health	Format designed in the research
1.1.8	Formation and functioning of the Labor Coexistence Committee	Format designed in the research
Subprogram 2. OSHMS training		
Numeral	**Item**	**Actions to be developed**
1.2.1	Annual training program	Format designed in the research
1.2.2	Induction and re-induction on OSH	Format designed in the research
1.2.3	50-hour OSH virtual training course	The person responsible for the OSH management system completes the 50-hour virtual training course and submits the certificate to be added to the system.
Subprogram 3. Integral management of the OSHMS		
Numeral	**Item**	**Actions to be developed**
2.1.1	Occupational Health and Safety Policy	Policy formulated in the research
2.1.2	OSH Objectives	Objectives formulated in the research
2.1.3	Initial assessment of the Management System	Format designed in the research

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2.1.4	Annual Work Plan	Format designed in the research
2.1.5	OSH Management System archiving and retention of documentation	Format designed in the research
2.1.6	Accountability	Format designed in the research
2.1.7	Legal matrix	Format designed in the research
2.1.8	Communication mechanisms	Format designed in the research
2.1.9	Identification and evaluation for the procurement of goods and services	Format designed in the research
2.1.10	Evaluation and selection of suppliers and contractors	Format designed in the research
2.1.11	Change management	Format designed in the research
Program 2. Do		
Subprogram 1. Health management		
Numeral	**Item**	**Actions to be developed**
3.1.1	Sociodemographic description and diagnosis of health conditions	Format designed in the research
3.1.2	Occupational medicine and health prevention and promotion activities	Format designed in the research
3.1.3	Job profiles	Format designed in the research
3.1.4	Occupational medical evaluations	Format designed in the research
3.1.5	Custody of clinical records	Format designed in the research
3.1.6	Occupational medical restrictions and recommendations	Format designed in the research
3.1.7	Lifestyles and healthy environment	Format designed in the research
3.1.8	Hygiene services	Recommend that the company have a permanent supply of potable water, sanitation, and mechanisms for disposal of excreta and garbage
3.1.9	Waste Management	Advising the company to dispose of its solid, liquid, or gaseous wastes, as well as hazardous wastes, with an authorized company.
Subprogram 2. Recording, reporting, and investigation of occupational diseases, incidents, and accidents at work		
Numeral	**Item**	**Actions to be developed**
3.2.1	Report of work accidents and occupational diseases	Format designed in the research
3.2.2	Investigation of incidents, accidents and illnesses when diagnosed as work-related	Format designed in the research

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3.2.3	Recording and statistical analysis of occupational accidents and diseases	Format designed in the research
3.3.1	Frequency of accidents	Format designed in the research
3.3.2	Accident severity	Format designed in the research
3.3.3	Proportion of fatal occupational accidents	Format designed in the research
3.3.4	Prevalence of occupational disease	Format designed in the research
3.3.5	Incidence of occupational disease	Format designed in the research
3.3.6	Medical absenteeism	Format designed in the research
Subprogram 3. Hazard and risk management		
Numeral	**Item**	**Actions to be developed**
4.1.1	Methodology for hazard identification, evaluation, and risk assessment	Format designed in the research
4.1.2	Hazard identification and risk assessment and evaluation involving all levels of the organization	GTC 45 Hazard identification and risk assessment and evaluation matrix implemented with participation from all levels of the organization
4.1.3	Identification of substances classified as carcinogenic or acutely toxic	Format designed in the research
4.1.4	Environmental measurements	Recommending that the corporation hire a company to perform environmental measurements
4 .2.1	Prevention and control measures for identified hazards/risks	Format designed in the research
4.2.2	Internal occupational health and safety procedures and instructions	Format designed in the research
4.2.3	Inspections of facilities, machinery, or equipment	Format designed in the research
4.2.4	Periodic maintenance of facilities, equipment, machines, and tools	Format designed in the research
4.2.5	Provision of personal protective equipment (PPE) and training in its proper use	Format designed in the research

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Subprogram 4. Threat management		
Numeral	**Item**	**Actions to be developed**
5.1.1	Emergency prevention, preparedness, and response plan	Format designed in the research
5.1.2	Emergency prevention, preparedness, and response brigade	Format designed in the research
Program 3. Check		
Subprogram 1. Verification of the OSHMS		
Numeral	**Item**	**Actions to be developed**
6.1.2	Annual audit	Format designed in the research
6.1.3	Review by top management. Scope of the OSH Management System Audit	Format designed in the research
6.1.4	Audit planning with the Committee on Occupational Safety and Health	Format designed in the research
Program 4. Act		
Subprogram 1. Improvement		
Numeral	**Item**	**Actions to be developed**
7.1.1	Preventive and/or corrective actions	Format designed in the research
7.1.2	Improvement actions according to top management review	Format designed in the research
7.1.3	Improvement actions based on investigations of work accidents and occupational diseases	Format designed in the research
7.1.4	Improvement plan	Recommend to the company to implement the measures and actions compiled according to the case.

Discussion

According to the results, the company has the necessary space to implement areas that guarantee occupational health and safety management. For Peña (2018), this is very important because an optimal physical environment favors the safe performance of work activities, reducing incidents and accidents; in addition, a pleasant space reduces stress levels and promotes the health of workers. However, to reduce occupational risks of a chemical and locational nature, it is necessary to adapt the storage area for the storage of hazardous substances and tools. According to Calera et al. (2006), a rest area should be adapted and preventive and emergency signage should be implemented, always with support and training. Rodríguez (2014) states that, in general, signs are always present in facilities, but personnel are not aware of their importance and even do not know the meaning of some signs.

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Workers have a rural culture with characteristic aspects such as: owning their own home, tendency to marry, and have a family. This is a factor that can lead to absenteeism. In this regard, Benavides et al. (2022) state that, despite the fact that heads of households tend to be more responsible because of their responsibilities, they also tend to request more leave for personal and family reasons, since they have to deal with problems of children or spouses. On the other hand, their educational level is excellent; most of them are professionals, and those with a bachelor's degree have more than ten years of work experience.

Employees take good care of themselves; there are no records of serious accidents at work, and minor accidents are rare. There are also no workers with serious occupational illnesses; therefore, absenteeism is usually limited to factors outside of work, such as personal and family aspects. Barros and Olaya (2017) state that in these cases, workers voluntarily implement self-care in their work, which favors the implementation of the OSHMS, as they may be more receptive to measures to promote occupational health and safety.

The diagnosis of the checklists showed that the company complies with several aspects of occupational health and safety, particularly with regard to the condition of the premises, the provision of PPE, lighting, etc. However, the main shortcoming is the lack of organization and programming of activities, since it does not have an established OSHMS, which means that OSH activities are carried out in an empirical manner and without order; nor does it have an annual work plan; therefore, signage is incomplete, as are introductions and training, and strategies are redundant, with no impact on risk prevention and health promotion.

According to the initial characterization and diagnosis, the company does not comply with the PHVA cycle or with most of the established minimum standards. There is evidence of non-compliance with OSH regulations, as the score obtained is less than 36.5% and less than 60%, which means that it is at a critical level.

For González et al. (2016), serious OSH deficiencies in the company mean a significant increase in the probability of occurrence of occupational accidents in the short, medium, and long term. Mamani et al. (2007) state that without OSHMS, workers are exposed to stress conditions and other factors that can trigger occupational diseases.

In addition, the company is exposed to both economic and legal problems. First, there is the administrative liability, which refers to the imposition of fines and penalties for not having the OSHMS.

According to the provisions of Decree 1072 of 2015, the fines depend on the size of the company; in this case, since it is a small company (11 to 50 workers), the amount of the fines will be calculated according to the following ceilings:

- For failure to comply with occupational health standards: from 552.57 to 2,631.30 TVU.
- For failure to report an occupational accident or illness: from 1,341.96 to 2,631.30 TVU.
- For non-compliance resulting in a fatal accident: from 3,973.26 to 10,525.21 TVU.

Regarding the **closure** of the establishment, the regulation is in accordance with the provisions of Law 1610 of 2013. If the conditions of the company endanger the life, integrity, and/or personal safety of the workers, the labor inspector may determine the closure of the site based on the following criteria:

- Depending on the seriousness of the violation, the closure will be for a period of between three and ten working days (Article 8, Law 1610 of 2013).
- If the company again commits any of the sanctionable acts, the closure will occur for a term between 10 and 30 working days (Article 8, Law 1610 of 2013).
- If the refusal continues, the labor inspector must refer the case to the territorial director. The latter may close the company for up to 120 working days, or order the permanent closure of the establishment (article 13, Law 1512 of 2012) (Mancero, 2015, para. 12).

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It should be emphasized that the measure of closure or suspension of activities must be imposed through a duly motivated order, which must specifically indicate the place where it should be applied, the analysis of facts and evidence, the period of closure and the rules violated; it should also be considered that the suspension or closure does not affect the payment of salaries or social benefits to workers (Mancero, 2015).

However, such non-compliance may trigger other types of liability, such as civil, labor, and even criminal liability for the damage that may be caused; this is a system of strict liability, since the employer, although not the cause of the damage, is liable, generally because there is the possibility of avoiding it. Therefore, the employer has a series of obligations to guarantee safety and health at work and to recognize the worker's right to effective protection in this matter.

In the event of a possible labor problem, the company does not have sufficient legal tools to defend itself; however, Ortega et al. (2020) mention that mistakes should not be made by rushing to implement the system; it must be well formulated, comply with the established minimum standards, and meet the company's own labor needs.

In terms of identifying and assessing occupational risks, in the area of administration and management, the highest rated risks are ergonomic and psychosocial, due to the stress they face in the budgeting and collection of the company, in addition to the fact that they remain seated in office automation tasks throughout the working day. This is a normal behavior in all companies; according to Borja (2017), administrative positions require a greater mental load, since they must be responsible for decision making and problem solving, while the operational part fulfills routine tasks, where the load that weighs the most is the physical one. In the operational area, attention must be paid to hygienic, mechanical and ergonomic risks, since workers are mostly exposed to microorganisms, variability of environmental conditions, noise, vibrations, and chemical agents, as well as handling tools and performing repetitive movements (Castro, 2019).

In this order of ideas, the documentation, resources, and OSH programs designed have been focused on complying with the minimum standards for companies with 11 to 50 workers, for risks I, II, III, IV, V. Considering Resolution 0312 of 2019, the programs are governed by the PHVA cycle, which, according to Cubillos and Rodriguez (2009), is advantageous because it guarantees a process and results based on quality.

The policy establishes objectives and responsibilities focused on mitigating existing risks, and both the legal matrix and the annual work and training plan support the OSHMS policy. The system designed is 100% compliant with the requirements of Resolution 0312 of 2019. The next step is the implementation of the programs, activities, and formats included in the OSHMS; in this way, in the future, the company will move from a critical level (score below 60%) to an optimal level, avoiding accidents, illnesses, and fines or sanctions in this area.

At the beginning of the research, the company under study did not have the OSHMS designed (0%), but it had elements to consolidate it. At the end of the research, the design of the system was completed in its entirety, with the formats ready and the corresponding methodologies, so that the company and the OSH professional can implement it. In this sense, it is expected that in the next audit to be carried out, the company will achieve a minimum compliance of 90%.

Conclusions

The structure of the Occupational Health and Safety Management System is made up of 37 points, according to Resolution 0312 of 2019, in accordance with the mandatory minimum standards of the PDCA cycle, according to the socio-demographic characterization of the participating population group, in addition to the legal regulations in force. Thus, the competencies of prevention, evaluation, and control of risks allow the promotion and improvement of the health of the employees, establishing a better quality of their work in the company.

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This Management and Occupational Health and Safety Plan of the Empresa de Acueducto, Alcantarillado y Aseo de Guachucal complies 100% with the requirements to be applied and used in the company.

Considering the evaluation carried out in accordance with Resolution 0312 of 2019, in which the company obtained a rating of 60%, which indicates a critical risk level, an improvement plan must be implemented to overcome the anomalies detected. Therefore, the following improvement actions, among others, will be carried out, seeing the economic activity and risk level of the company:

a) Select a person in charge with a license in OSH and allocate the human talent, financial, technical, and technological resources necessary for the implementation, maintenance, and continuity of the proposed OSHMS.

b) Establish the OSH Committee and the Labor Coexistence Committee (LCC) to monitor the system and ensure a good working environment.

c) Provide PPE and apply inspection forms in areas, tools, and personnel.

d) Present a documentation matrix and prepare the training program, carrying out all the trainings foreseen in the annual training plan.

e) Define the objectives of the OSHMS in accordance with the OSH policy.

f) Have a checklist of documents for the evaluation of contractors and carry it out.

g) Apply the mechanisms for reporting, measuring, and improving the incidence of occupational accidents and illnesses, subject to continuous improvement processes and external and internal audits.

These actions are primarily the responsibility of the General Manager and the OSH Specialist, and are carried out within a period of no more than three months from the initial assessment and the start of corrective and improvement actions.

This study makes it possible to establish and comply with the design of the occupational health and safety management system through the implementation of this system in the company, to identify the occupational risks to which workers are exposed, and to prevent risks through the successful implementation of the system.

Finally, the design of the Occupational Health and Safety Management is considered relevant for this organization, since the lack of commitment to the welfare of the workers has been demonstrated in the management area, since they do not have the appropriate training and knowledge of occupational health and safety related to the risks to which they are exposed daily in their work activities. Therefore, this design will make it possible to comply with the indicators and standards of the legal regulations in force for their work, in accordance with the norms and laws of the Ministry of Labor.

Conflict of interest

The authors of this article declare that they have no conflict of interest in the work presented.

Ethical responsibilities

The research work was developed with the participation of the workers assigned to the Empresa de Acueducto y Alcantarillado de Guachucal; for this reason it was necessary to have the informed consent, a document that contains explicit and clear information that considers the following aspects: justification and objectives of the research, procedures to be used, purposes, risks and expected benefits, freedom to withdraw consent and not continue the study, confidentiality of information and commitment to the research. If there were additional expenses, they would be covered by the research budget.

This document was prepared by the researchers, reviewed, approved, and signed by the CEO of the company, who authorized the researchers to use the name and access the information necessary for research purposes; however, the name has been omitted for the purposes of publication of this article.

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References

Barros, J. C. & Olaya, M. E. (2017). *Identificación de accidentes y ausentismo laboral como elementos básicos para la propuesta de un modelo educativo de autocuidado en trabajadores de una empresa del sector de la construcción de Barranquilla* [Identification of accidents and absenteeism as basic elements for the proposal of a self-care training model for workers in a construction company in Barranquilla] [Tesis de maestría, Universidad Libre Seccional Barranquilla]. Repositorio Institucional Unilibre. https://repository.unilibre.edu.co/handle/10901/10672

Benavides, P. A., López, J. E., Morales, L. V., & Rodríguez, E. (2022). *Causas de ausentismo laboral del personal de enfermería en la Unidad Cardioquirúrgica de Nariño 2021* [Causes of absenteeism among nursing staff at the Unidad Cardioquirúrgica de Nariño 2021] [Tesis de maestría, Universidad Católica de Manizales]. Repositorio UCM. https://repositorio.ucm.edu.co/handle/10839/3964

Borja, J. (2017). *El estrés y su influencia en el desempeño laboral en los empleados de las oficinas del gobierno autónomo descentralizado de la provincia de Pichincha, en el año 2016* [Stress and its influence on work performance in employees of the offices of the decentralized autonomous government of the province of Pichincha, in 2016] [Tesis de pregrado, Universidad Tecnológica Indoamericana]. Repositorio UTI. https://repositorio.uti.edu.ec/handle/123456789/617

Calera, A., Roel, J. M., Casal, A., Gadea, R., & Cencillo, F. R. (2006). Riesgo químico laboral: elementos para un diagnóstico en España [Chemical occupational hazards: elements for a diagnosis in Spain]. *Revista Especialización Salud Publica, 79*(2), 283-295. https://doi.org/10.1590/S1135-57272005000200014

Castro, F. A. (2019). *Análisis de los riesgos laborales en las áreas administrativas y operativas de la Distribuidora Farmacéutica Nutrimed S.A.* [Analysis of occupational hazards in the administrative and operational areas of the Distribuidora Farmacéutica Nutrimed S.A.] [Tesis de pregrado, Universidad de Guayaquil]. Semisud. https://biblioteca.semisud.org/opac_css/index.php?lvl=author_see&id=303629

Chavarría, O. W., Lara, C. L., & Reyes, C. M. (2006). *Propuesta de diseño de un sistema de gestión en seguridad y salud ocupacional en la Universidad de El Salvador basado en las Normas Oshas 18000* [Proposal for the design of an occupational health and safety management system at the Universidad de El Salvador based on the Oshas 18000 Standards] [Tesis de pregrado, Universidad de El Salvador]. Repositorio UES. https://repositorio.ues.edu.sv/items/a11a5285-d990-4464-832a-249f7b1d2106

Cubillos, M. C. & Rodríguez, D. (2009). El concepto de calidad: Historia, evolución e importancia para la competitividad [The concept of quality: History, evolution, and importance for competitiveness]. *Revista de la Universidad de la Salle,* (48), 80-99.

Decreto 1072 de 2015. (2015, May 26). Presidencia de la República de Colombia. https://www.funcionpublica.gov.co/eva/gestornormativo/norma_pdf.php?i=72173

Decreto 768 de 2022. (2022, May 16). Presidencia de la República de Colombia. https://www.funcionpublica.gov.co/eva/gestornormativo/norma_pdf.php?i=186926

Gómez, M. F., Medina, D., & Montoya, J. P. (2021). *Diseño de un sistema de gestión de seguridad y salud en el trabajo para la empresa PSE LTDA.* [Design of an occupational health and safety management system for the company PSE LTD.] [Trabajo de pregrado, Universidad ECCI]. Repositorio Digital ECCI. https://repositorio.ecci.edu.co/handle/001/896

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Rev. Criterios ISSN: 0121-8670, e-ISSN: 2256-1161
https://doi.org/10.31948/rev.criterios

González, A., Bonilla, J., Quintero, M., Reyes, C., & Chavarro, A. (2016). Análisis de las causas y consecuencias de los accidentes laborales ocurridos en dos proyectos de construcción [Analysis of the causes and consequences of occupational accidents that occurred in two construction projects]. *Revista Ingeniería de Construcción, 31*(1), 5-16. https://doi.org/10.4067/S0718-50732016000100001

Ley 1610 de 2013. (2013, January 2). Congreso de Colombia. https://www.funcionpublica.gov.co/eva/gestornormativo/norma_pdf.php?i=51147

Mamani, A., Obando, R., Uribe, A. M., & Vivanco, M. (2007). Factores que desencadenan el estrés y sus consecuencias en el desempeño laboral en emergencia [Factors that trigger stress and its consequences on emergency work performance]. *Revista Peruana de Obstetricia y Enfermería, 3*(1), 50-57.

Mancero, G. (2015). Cambios en multas y sanciones para quienes incumplan la normativa en seguridad y salud en el trabajo [Changes in fines and penalties for those who fail to comply with occupational health and safety regulations]. https://www.pmabogados.co/pm-legal-news/cambios-en-multas-y-sanciones-para-quienes-incumplan-la-normativa-en-seguridad-y-salud-en-el-trabajo/

Moreno, F. & Godoy, E. (2012). Riesgos laborales, un nuevo desafío para la gerencia [Occupational risks, a new challenge for management]. *Daena, International Journal of Good Conscience, 7*(1), 38-56.

Ortega, I. H., Ortega, E., & Hernández, A. (2020). Desventajas del sistema de salud mexicano: elementos para el análisis [Disadvantages of the Mexican health care system: elements for análisis]. *Universita Ciencia, 9*(26), 50-63. https://doi.org/10.5281/zenodo.6599771

Peña, I. (2018). *La importancia de la seguridad y salud en el trabajo como factor de la responsabilidad social en las empresas* [The importance of occupational safety and health as a factor in corporate social responsibility] [Trabajo de diplomado, Universidad Militar Nueva Granda]. Repositorio UMNG. https://repository.unimilitar.edu.co/handle/10654/18111?show=full

Ramírez, R. (2021). *Implementación de Sistema de Gestión de Riesgos a Empresa MAN-SER S.R.L.* [Implementation of Risk Management System to MAN-SER S.R.L. Company] [Tesis de pregrado, Universidad Empresarial Siglo 21]. Repositorio digital 21. https://repositorio.21.edu.ar/handle/ues21/25326

Resolución 0312 de 2019. (2019, February 13). Ministerio del Trabajo. https://www.mintrabajo.gov.co/documents/20147/59995826/Resolucion+0312-2019-+Estandares+minimos+del+Sistema+de+la+Seguridad+y+Salud.pdf

Rodríguez, J. C. (2014). *Importancia de la señalización de seguridad para la prevención de riesgos en el colegio Fiscal Mixto Nocturno Ana Villamil Icaza* [Importance of safety signage for risk prevention in school Fiscal Mixto Nocturno Ana Villamil Icaza] [Tesis de pregrado, Universidad de Guayaquil]. Archivo digital. https://es.scribd.com/document/410912991/TESIS-FINAL-JULIO-RODRIGUEZ-pdf

Contribution

Ana Sofía Aguirre Paredes: Main researcher. Preparation of the introduction, general description of the project, statement of objectives, and recommendations.

Damaris Díaz Nova: Main researcher. Development of the frame of reference through a thorough review of the background and state of the art. Methodological framework that defines the nature, approach, and scope of the research, as well as the determinants of the research phases, conflicts of interest, ethical responsibilities, and conclusions.

Samuel Alejandro Rodríguez Beltrán: Main researcher. General description of the project, methodological framework with the procedure and techniques for data collection; analysis and interpretation of results, elaboration of the discussion of results.

All authors participated in the preparation of the manuscript, read and approved it.