

# Analysis of Biosafety Protocols in the Construction Sector in the Province of Azuay in Ecuador

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**Abstract:-** In Ecuador, construction is considered one of the fundamental pillars of the national economy. Being made up of actors at different economic levels, it involves many people who benefit directly and indirectly from the activity. Currently, due to the COVID-19 virus, this sector has had to suspend its activities. However, biosecurity projects have been implemented to reactivate this activity, considering all the variables present at that time to avoid or minimize the biological risk that in many cases has been lethal for the population. Considering that the purpose of the action research design within a qualitative research is to solve daily problems and improve specific practices, this methodology has been implemented, supported by the participant observation technique and structured interview, the data obtained will be processed by ATLAS.TI. In addition, the risk matrices will be applied, which allows an in-depth analysis of the data obtained and the establishment of pertinent recommendations. Through this research a set of recommendations is obtained that allow to establish improvements in the biosafety protocol in the constructions of Ecuador, guaranteeing the economic reactivation and safety of the workers. When analyzing the international context, in countries such as France, Germany, among others, the restrictions due to the resurgence of COVID-19 have been reconsidered. In the case of Ecuador, if the biosafety protocols were not complied with, the activities of the construction sector would come to a standstill again, possibly generating not only problems in the national economy but also the collapse of the national health system.

**Keywords:-** Corona Virus; Biosecurity Recommendations; Construction; Occupational Safety And Health; Qualitative Research.

## I. INTRODUCTION

Social responsibility in Ecuador since the end of the 19th century has been understood mostly as philanthropic acts carried out by the owners of the companies in favor of their workers and families [1]. In this way, Occupational Safety and Health becomes a major consideration in the development of an economic activity.

However, in Ecuador the Directorate of Safety, Health at Work and Comprehensive Risk Management of the Ministry of Labor has existed since the law determined that "the risks of work are the responsibility of the employer" and that there are obligations, rights and duties of technical-legal compliance in prevention of occupational risks, in order to ensure the physical and mental integrity of workers [2].

At the beginning of this COVID-19 pandemic, Occupational Safety and Health has become one of the fundamental pillars for the return to the new normality of economic activities worldwide.

The Labor Organization, work is defined as "the set of human activities, paid or unpaid, that produce goods or services in an economy, or that meet the needs of a community or provide the necessary means of livelihood for individuals" [3].

That, per Article 33 of the Constitution of the Republic; "Work is a social right and duty, and an economic right, a source of personal fulfillment and the basis of the economy. [4]

In the city of Cuenca, we find one of the most important productive active groups of the local economy: construction. It represented a percentage of 8.4% of the total production of the national economy during the period 2000 - 2018" [5]. indicating the great importance of this economic activity in the country. "Construction is one of the industries that demands the greatest amount of labor" [6]. that is, construction workers, their collaborators. On the other hand, there are also other components involved in the execution of each construction item such as materials, transportation,

equipment and tools that generate both direct and indirect jobs. The construction sector has a great gear with the rest of the productive sectors: communications, food, financial, cement, equipment, materials, etc. [7].

#### A. *The Reality off the Construction Sector in Ecuador*

The construction industry is, without a doubt, one of the main factors for the economic and social development of a country. The construction sector is considered the dynamic engine of the economy, since it generates linkages with most of the commercial and industrial branches of the country [8].

The industry delivers the main material to different traders such as hardware stores, material distributors, among others. In addition, it provides directly to the construction sites, on the other hand, we have the contribution of aggregates, transportation of personnel and machinery. Together with the mentioned activities, the food industry is another sector that is activated in parallel with the construction, since it is indispensable for the personnel of the same.

It is necessary to have housing that is used as camps; adding to this the close relationship that exists between the construction sector with financial institutions, municipal regulatory bodies such as notaries and the Property Registry, and can say that the construction sector is an integral and complete activity in its economic support to various production sectors. It is then that for its economic reactivation the corresponding security measures must be considered for all levels.

Ecuador is one of 187 members of the International Labor Organization (ILO), the only 'tripartite' UN agency that brings together governments, employers and workers to set labor standards, formulate policies and develop programs promoting decent work for all, women and men [3].

It is important to know that "everyday people die due to labor accidents or work-related illnesses - more than 2.78 million deaths per year. In addition, some 374 million non-fatal work-related injuries occur annually, resulting in more than 4 days of absenteeism from work. The cost of this daily adversity is enormous and the economic burden of poor health and safety practices is estimated at 3.94 percent of the global Gross Domestic Product each year [3].

Construction is considered a high-risk job, since in the execution of the daily actions of this activity the employees are constantly exposed to several risk factors, physical, chemical, biological, ergonomic, psychosocial and mechanical. These circumstances can generate professional damages such as work accidents, labor inconformity and occupational diseases, being the most common musculoskeletal and respiratory conditions, among others.

At least 108,000 workers die in the workplace each year, a figure that represents about 30 percent of all fatal injuries on the job. In the developing world, the risks associated with construction work can be 3 to 6 times higher [3].

For this reason, different safety measures are implemented that will not only preserve the health of the workers, but also contribute to the employer's economic side.

#### B. *The construction sector vs. Covid-19*

On March 16, 2020, Ecuador declared a state of emergency due to a public disaster throughout the national territory, while the World Health Organization indicated that COVID-19 represents a high risk of contagion for all citizens. These events brought the country to a standstill at all levels except for the strategic sectors; in this way the construction sector stopped its daily activities, stopping its economic to the country.

According to its "important participation not only because of its productive chain, but also because it employs unskilled and qualified labor linked to the real estate sector, in such a way, that it contributed on average with 8.4% of the total production of the national economy during the period 2000 - 2018 [5].

It is then that the coronavirus COVID-19 is latent in the work environment, so much so that the contagion can be generated in the least expected place, and it is the responsibility of the employer to provide a safe work space, to give the collaborator all the implements and inputs necessary for the safe development of their activities [9]. Due to these obligatory measures, the elaboration of biosecurity protocols was proposed in order to protect the health and occupational safety of each of the people who intervene in the construction process, thus avoiding the greatest possible contamination of this biological risk factor, which constitutes a group of microorganisms, toxins, biological secretions, human and animal body tissues and organs, present in certain work environments [10], [20].

Although it is true, the Ministry of Labor by means of Resolution No. MDT-2020-022 indicates in its Art. 1.- To determine that the coronavirus disease (COVID-19) does not constitute an accident at work or an occupational disease, by virtue of which it was declared on March 11 by the World Health Organization (WHO) as a pandemic [2], [17], but it is left open the possibility of verifying this situation so it is imperative to fully comply with the legislation and measures generated in terms of contributing to the elimination of contagion.

However, in order to correctly determine the possible recommendations of the biosafety protocols, it is necessary to carry out a detailed follow-up, maintaining the corresponding measures and a continuous work with the technical personal of each project, applying the Descriptive and Research.

Considering the above, it is evident that the lack of productivity in the face of the health emergency and state of emergency declared in the country leads to several problems in the companies and builders that do not have sufficient capital to face the payments corresponding to the plant personal and all the actors that directly or indirectly in this sector.

For this reason, we sought ways to reactivate the construction to face the economic crisis that the country is experiencing, always ensuring the health and safety of employees and construction managers. However, for this type of action, the government decided that it would be done according to pilot plans that should have the appropriate and corresponding measures to prevent the spread of the virus through the implementation of biosecurity protocols.

In reference to the resolution of the National COE of April 28, 2020 that establishes "Once the first stage of isolation that began after the declaration of a health emergency by COVID-19 and the state of emergency by Executive Decree No. 1017 of March 16, 2020, as of May 4, 2020, the "Social Distancing" stage will begin, which will be based on a traffic digitization of the national territory taking into account the provisions in the attached annex, With respect to the guidelines for the red light that defines "Additional labor authorization only in pilot projects authorized by the National COE (COMITÉ DE OPERACIONES DE EMERGENCIA)", the applications sent by the municipalities of Guayaquil and Cuenca are authorized and, from now on, the following scheme is established for the cantonal COEs to propose pilot projects during the phase [11].

These biosecurity protocols were developed by experts in the field and later applied to the reality of the Ecuadorian south, taking into account that the country is multicultural and diverse, even within this scenario, considerations applied to the area and the local economy were taken. "SECURITY AND HEALTH PROTOCOL FOR THE ECONOMIC REACTIVATION OF THE CONSTRUCTION AND PUBLIC WORK SECTOR IN THE FACE OF THE EFFECTS OF THE COVID-19", is the document applied in the Azuay.

This is why it proposes to formulate recommendations of the safety and health protocol for the economic reactivation in the construction sector. The objective is to improve the measures used in the face of COVID-19 infection in the activities of the sector through the evaluation of the processes applied in the province of Azuay, Ecuador, and in this way continue with the development of this activity.

In order to carry out these recommendations of this biosafety protocol, it is essential to consider the following aspects, which will be resolved throughout this article define the activities to be evaluated to obtain significant data according to the sample to reduce the contact and stay on site as much as possible according to the provisions and work orders of the builder and thus unify the data obtained; establish the possible complications in the implementation of preventive measures in the construction sector at different levels both administrative and operational and the entry of external persons, to assess more accurately what should be considered through data tabulation and review of processes applied according to the biosafety protocol.

## II. BACKGROUND

### A. Creation of a biosafety protocol

In Ecuador, only 28 public sector projects and 19 private sector works were approved at the national level to form part of the first phase of the Pilot Plan to reactivate the construction sector in the city of Cuenca. Only one work was approved to belong to this pilot project.

"The builders presented a series of requirements including: mechanisms to mobilize their employees, health supervision protocols to identify possible covid-19 symptoms, provision of safety and biosafety equipment. For this pilot, the location of the projects and the percentage of progress on the construction site were also considered. None of the constructions are new works and all of them are about to be finished" [7], Reincorporation of the execution of works and to energize the economy again. Thus, the National COE decided to authorize the request of the Cuenca Cantonal COE, regarding the implementation of pilot plans for the construction sector in Cuenca Canton [12].

The process was arduous and continuous. Projects were presented at a national level for review and only a few were able to enter the group of projects in the country; in the case of Azuay there was only one project. That began with what we now know as the pilot plan project for its reactivation. "For the moment, no other project is authorized to restart work and the supply chains, such as hardware stores or block manufacturers, can only attend through home sales. The hiring of labor is also restricted" [13].

This project had to be submitted to the demands that were necessary to safeguard the life and health of the employees, both technicians and workers, including the administrative staff of the company, and thus prevent in its maximum expression the contagion of the virus COVID-19. However, it was necessary to establish the "PROTOCOL OF SECURITY AND HEALTH FOR THE ECONOMIC REACTIVATION OF THE SECTOR OF CONSTRUCTION AND PUBLIC WORKS FACING THE EFFECTS OF COVID-19".

In the city of Cuenca, province of Azuay, on May 7 of the present year, the work in study began its construction works, with a significant reduction of personnel and applying the established protocols, it is possible to emphasize that the protocol base demanded at national level had modifications for its implementation [13].

It is necessary to clarify that in the work of study there is no camp to stay overnight, but if you comply with the implementation of all spaces, inputs and everything needed to fulfill the protocol of biosafety against the virus COVID-19, with the rules that globally are being applied to this virus that is still unknown.

The next isolation of cases, identification and monitoring of contacts, environmental sanitation and laboratory research. To date, uncertainty remains regarding the new pathogen and the spectrum of manifestations it may

cause, the source of infection, the mode of transmission, the incubation period, the severity of the disease, and specific control measures [14].

Additionally, 60 workers participate, of which 15 are administrative and technical personnel, and 45 are laborers. These positions are considered direct jobs, while generating the commercial dynamic between raw and processed materials [7], for the construction of housing projects that are part of the project under study.

The company under study is currently executing a housing complex in the city of Cuenca through a construction system in which the items with the greatest economic impact and with the greatest participation of personnel are located in:

- Reinforcement steel reinforcement,
- formwork assembly and,
- Casting of housing elements.

Taking these three activities to make the visual assessment of the implementation of each item and to be able to formulate several considerations.

Once determined the activities that are carried out in the work and that have the highest component of risk in its execution, we proceeded to perform the verification of compliance in the implementation of biosafety measures of the protocol for construction that involves in summary the following activities:

- At the entrance of the work: the temperature of all the people is controlled both in the administrative part and in the construction area. It is mandatory to change the masks of the personnel, always maintaining social distance. Regarding disinfection, hands, shoes, jacket pockets and pants areas are included with 70% alcohol concentration. For vehicles and entrance of materials, disinfection with quaternary ammonium is carried out.
- During the execution of the work: we try to maintain distance, disinfection of work areas, hand washing, use of a mask is mandatory. The permanence of the collaborators during the whole working day is a fundamental factor.
- At the end of the work day and after leaving work: there is a change of work clothes in the assigned places, disinfection of hands and shoes; the change of mask for going home.
- Additionally, the company complies with national regulations regarding the implementation of an occupational doctor, a technician who is in charge of occupational safety and health in the company.

All the data described above was taken in a visual way of the daily development of the activities in the company.

#### *B. Piloto plan development*

In Ecuador, only 28 public sector projects and 19 private sector works were approved at the national level to form part of the first phase of the Pilot Plan to reactivate the construction sector in the city of Cuenca. Only one work was approved to belong to this pilot project.

"The builders presented a series of requirements including: mechanisms to mobilize their employees, health supervision protocols to identify possible covid-19 symptoms, provision of safety and biosafety equipment. For this pilot, the location of the projects and the percentage of progress on the construction site were also considered. None of the constructions are new works and all of them are about to be finished" [7].

### **III. METHODOLOGY**

The need to investigate the present issue is imperative since the lack of control and verification of results obtained in the different work fronts can mean a dangerous and high-risk labor reactivation. Therefore, it is intended to monitor and generate possible recommendations for key actions to improve biosafety protocols against COVID-19. Unfortunately, this virus currently corresponds to a biological risk factor to which all employees and managers in both the public and private sectors are exposed, and in the same way the productive sector as the rest of the citizens. That is why, with the collaboration of technical staff and collaborators, this analysis in terms of occupational safety and health will be carried out in the work under study.

In the determination of this vital variable of the generation of recommendations for the protocol of biosecurity that is applied in the construction, the fulfillment of the main objective of the investigation was taken into consideration, with respect to the activities developed in the constructive process of this pilot project, the information present in the company was taken and during the permanence in work, a design of investigation - action was used.

The design in the framework of a qualitative research the general approach used in the research process, is more flexible and open, and the course of actions is governed by the field (the participants and the evolution of events), in this way, the design is adjusted to the conditions of the scenario or environment [15].

While action research design is about solving every day and immediate problems, and improving concrete practices [15]., in this way it is allowed to link us with the reality of the collaborators of the construction and to guarantee that the information that is obtained is reliable, relevant, pertinent and effective for this way to raise the appropriate recommendations to the protocols of biosecurity in the construction.

In order to reach this point, it was very important to consider 53 collaborators out of 60 who work in the company, since this construction company is the one that is in the local reality of Azuay, a reality and different from the big cities that the country has, cities for which the biosecurity protocols were designed.

The application of a survey was carried out in order to measure through the qualitative method the data needed for the formulation of recommendations. This means that no ordinary statistical sampling was applied; the sampling used

is based on data collection to make comparisons between properties and dimensions [18].

Surveys allow us to carry out data collection in a systemic way. Due to its technical design, the survey has become more than a single technical instrument for data collection to become a whole procedure whose application means the monitoring of a research process in its entirety, aimed at the collection of research data, but involving a diverse set of techniques that combined, in a syntax of their own and consistent, which are oriented and aim to build a scientific object of research [19].

Among these techniques present in every practice of research with survey are: the design of the sample, the construction of the questionnaire, the measurement and construction of indexes and scales, the interview, the codification, the organization and monitoring of the field work, the preparation of the data for analysis, the analysis techniques, the recording and analysis software, the presentation of results.

Carrying out surveys implies following a whole research process where each of the aspects mentioned are closely linked to the survey and must be integrated in a coherent way with the objective of producing quality scientific information and in correspondence with the model of analysis built, and where knowledge specialized and application capacity is therefore required [16].

Thus, the survey consists of being able to structure a set of clear questions that allow the extraction of the necessary information to know the effectiveness of the measures applied in the construction company both in the administrative field and in the construction as such of the civil work, while we will obtain the information of the individual perception of each one of the participants of the individual surveys who are the collaborators and directly affected by these actions, we will know their level of education and in this way we will be able to have the information of the social factor of the qualitative variable to be investigated.

The first task corresponds to the codification and introduction of the data in a computer support to generate the original data matrix. Although depending on the technological device it is possible to carry out this task automatically as the answers are entered. Coding is the task of assigning codes to the different answers to the questions of the questionnaire and thus obtaining the different values of the variables with which the data matrix is constructed [16].

Three levels of coding are identified: open, axial, and selective. Thus, in the first instance, the concepts and data of the existing properties and dimensions are identified. In the second instance, the categories and their respective subcategories are related. Finally, the categories are integrated and refined, this respectively with the above-mentioned coding. Currently neither the first nor the second coding was used in this research, but due to the selective coding it was possible to adequately articulate each of the data acquired in the surveys.

Finally, there is the theorization which is the process by which alternative explanations are constructed and assumed, based on the information collected and codified, always seeking a better, and more convenient and simple explanation of such data. In the present research, we use data chaining based on selective coding and the interpretation of constructive and social patterns and biological risk factors. Interpretation of patroness constructivism, socials, y factors of resigns biologics.

**IV. RESULTS**

Once all the basic control measures applied for the prevention of the biological risk that the COVID-19 virus entails were identified, the surveys were carried out on 53 employees from the universe of 60. The biosafety rules were always maintained since they were carried out through telematic means to ensure the least possible contact with the company's employees. In this way, there is an approach to the individual perception of each of the collaborators with respect to the measures applied in the construction company.

To begin this survey, the level of education of the construction company's collaborators was asked, knowing that within the company we have laborers, bricklayers, master builders, civil work technicians, technicians in safety, in this way we can analyze the incidence of this factor in the application and compliance with standards established by the construction company for which we have the following results:

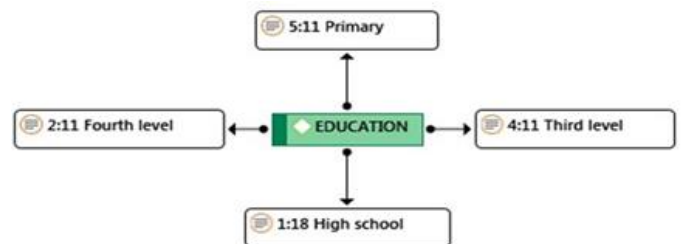


Fig.1. Academic formation of the company's collaborators under study.

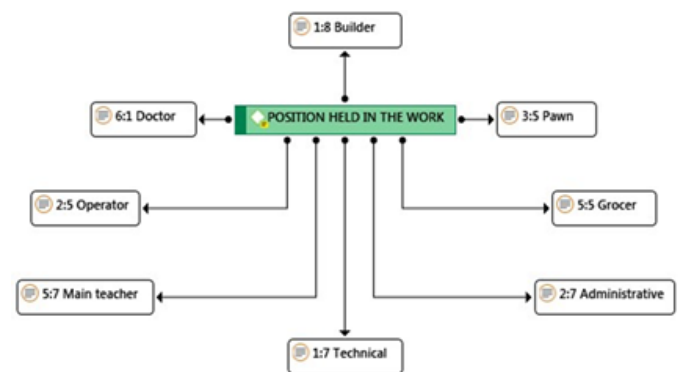


Fig.2. Position held in the work.

It is important to know the perception of each of the collaborators about the measures applied when entering the work site, during the development of activities and at the end of the working day. This is necessary to know the scope of the biosecurity measures applied in the construction site and

the administrative spaces in the company, all this is determined with this question in the following result has been identified:

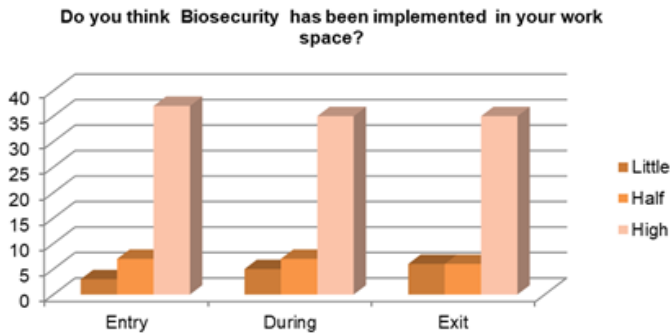


Fig.3. Level of acceptance of biosafety standards applied.

What do you think of the measures implanted ?



Fig.4. Criteria of each collaborator on the measures implemented.

When knowing the protocols applied in the company, it is understood that there is a compliance of all those who work in the company but the following results come from the applied survey are confirmed:

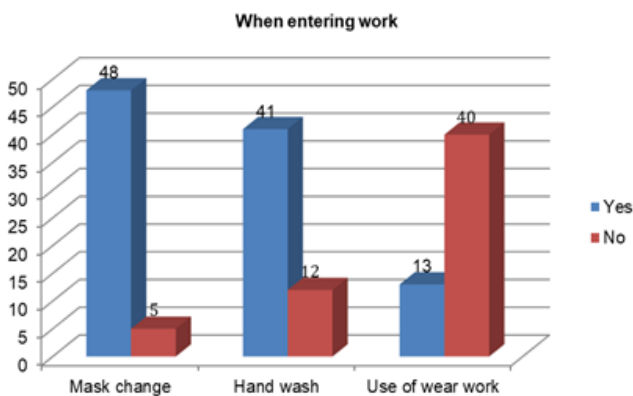


Fig.5. Activities you do when you enter work.

During the execution of the work, the collaborators must take into account the following aspects of hygiene, such as the frequency with which they wash their hands, the correct use of the mask, maintaining the appropriate distance when carrying out their tasks, both in open spaces, in closed spaces with little ventilation with good ventilation, all of which are described according to their perception, since this helps to know the points of reinforcement in the application of the biosafety protocols in construction.

How often do you wash your hands during activities?

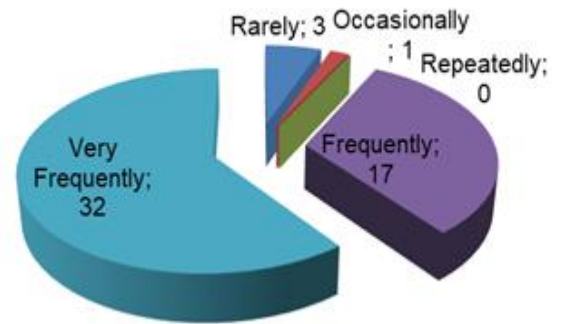


Fig.6. Hand washing during the execution of activities.

Do you know how to use the mask correctly?

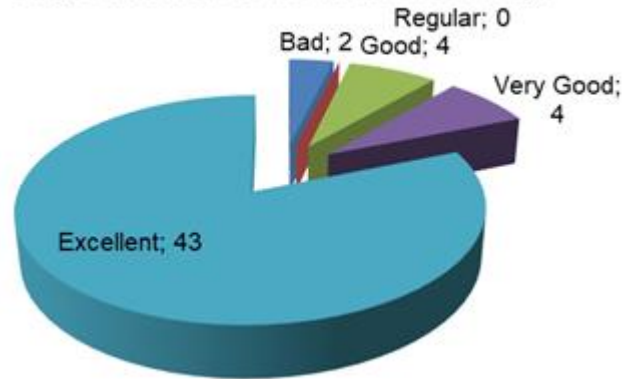


Fig.7. Correct use of the mask during the working day.

Is there distance at work?

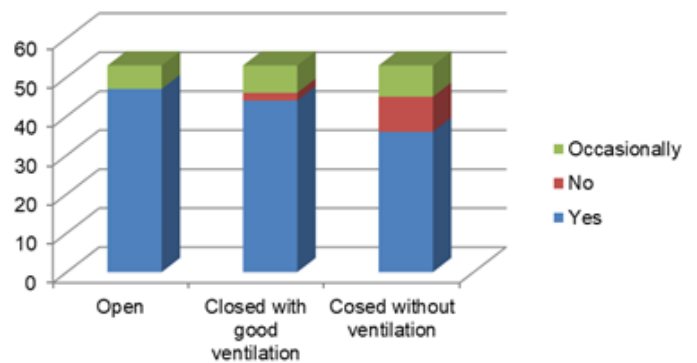


Fig.8. Social distancing in the workplace.

At the end of the work day it is very important to remove the work clothes before the departure of the personal point of contagion to avoid other types of biological risks such as fungi, so in the survey the result being the following:

TABLE. I. FREQUENCY WITH WHICH STAFF CHANGES THEIR CLOTHES AT THE END OF THE WORKING DAY

	Mask	Shirt	Pants	Shoes
Always	46	41	41	38
Sometimes	4	7	6	7
Never	3	5	6	8
Total	53	53	53	53

To conclude the research, both in the visualized survey of activities carried out on the site and additional measures implemented in the construction to prevent the spread of COVID-19 we have the following results:

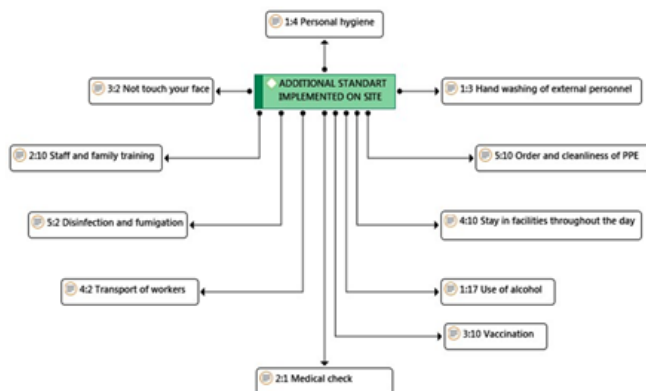


Fig.9. Prevention standards used in construction.

## V. CONCLUSIONS AND RECOMMENDATIONS

Based on all the information gathered and the qualitative analysis performed, the following conclusions and recommendations are reached for the biosafety protocol for COVID-19, in the construction sector - case study Azuay - Ecuador:

- Do not touch your face with dirty hands, should be a mandatory measure implemented as a rule of thumb in the construction sector to make a difference and reduce sources of COVID-19 infection.
- To combat the psychosocial risk that is enhanced by the stress generated by the virus, comprehensive training should be conducted for both staff and family members of workers. In this way it will be possible to generate a wider awareness; as for costs it would not increase, since it would be done by telematic means diminishing the resources spent by space.
- A security measure that, although it seems logical, is not applied in many places, is the prohibition of cell phone use in the facilities. Now it is recommended to implement it as a rule, since it has served in a great way to avoid sources of contagion and it mainly serves to reduce work accidents, although it is true that this conclusion is not visible within the data of the investigation, but information was collected in a face-to-face way in the work of the daily action of the collaborators and it is the result that leads to this conclusion.
- Hydration is very important in a worksite, so it is recommended to have hydration points that can be located in the warehouse, or to implement the use of bottles or thermos for the workers, as for the workers in the administrative sector to have a water dispenser, as the previous recommendation was born from the observation in the worksite.
- In the first case, while wearing the mask at all times during the work, the sneeze must be done with the mask in place. In the second case, when the mask is not in place, the worker must sneeze, covering his mouth with the inside of his elbow, and then disinfect and wash with soap and water.

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