

ANALYSIS OF THE ECONOMIC IMPACT OF ACCIDENTS IN CONSTRUCTION WORKS

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The construction sector represents worldwide a benchmark for the development of the scales of the economy. In Mexico, despite the boom in housing construction, many construction companies are bankrupt. This situation is worrisome because, in addition, thousands of jobs are generated in this sector, but at the same time, it is here where many accidents occur that immediately result in social and economic effects. For this reason, and despite the advances that have been shown in Mexico, it is necessary to continue working on the analysis of the situation, since, even today, there are businessmen and engineers at all levels who consider that the prevention of occupational risks is an unnecessary expense, the level of awareness has not yet been reached, much less cultural that safety in the works must be an essential part of the quality of the product. In this same sense, construction companies, clients and society itself must be aware of the degree of economic impact caused by accidents and the urgency of carrying out strategic and preventive actions from the moment the activities are planned.

Keywords: Accidents; impact; economic; plays; construction

INTRODUCTION

Occupational safety is an issue receiving increasing attention in industrial sectors where there are significant occupational hazards. However, in the construction sector there are negative statistics regarding the severity and number of accidents, as a consequence, the Mexican Institute of Social Security (IMSS) applies the highest quotas for the sector in the risk insurance of the work compared to other sectors.

In addition to this, many businessmen and managers continue to consider that implementing actions for occupational safety is an unnecessary expense, for this reason they skimp on the necessary resources at all times

to carry out the investment in Occupational Risk Prevention, putting themselves at risk of suffering accidents. To their workers.

For this reason, it is urgent in construction businessmen, a change of traditional vision that investment in risk prevention is not an expense and even more so when the Federal Labor Law (LFT) in its Article 132 establishes as an obligation of employers:

- Section I, comply with the provisions of the work regulations applicable to their companies or establishments;
- Section III, opportunely provide the workers with the tools, instruments and materials necessary for the execution of the work, having to give them of good quality and in good condition;
- Section XV, provide training and training to its workers;
- Section XVI; Install factories, workshops, offices and other places where work must be carried out, in accordance with the principles of safety and hygiene, to prevent work risks and damages to the worker;
- Section XVII, comply with the safety and hygiene provisions established by the laws and regulations to prevent accidents and illnesses in the workplace;
- Fraction XVIII, visibly fix and disseminate in the places where the work is provided, the provisions leading to the safety and hygiene regulations and instructions.
- Certainly, all companies have as their main objective to generate profits for the owners

In the same way, we must recognize that Occupational Safety is intangible in many aspects and in a matter of seconds in unfortunate events, such as the case of reckless behavior of workers, where they put their own

physical integrity and that of their colleagues at risk. companions. It is worth mentioning that these anomalies can only be avoided with staff training, and this is what employers still show negativity to. Indeed, it implies that workers dedicate time to this part and that there is no productivity during said time, but, as mentioned above, this item is considered in the Federal Labor Law in its section XV.

It is important to mention that it is not enough simply to allocate economic resources to “comply with the requirements” of safety in the workplace. It is even more necessary to “convince the workers” that they must carry out all their tasks in compliance with the safety instructions previously established by the person in charge of said area.

For this reason, to advance positively on the issue of Occupational Safety, the participation by conviction of all of us who participate in the construction is required, but it is essential that this start from the management side.

OBJECTIVE

Show those involved in the construction sector that Occupational Risk Prevention is necessary by law and that it can also lead to financial savings.

PREMISE

The best way to avoid the costs of accidents is precisely to avoid them.

METHODOLOGY

This article begins with a qualitative description of the background of the prevention of occupational hazards in Mexico and also worldwide, in this sense, reference is made to the main governmental entities that are directly involved in the issue of occupational safety. Likewise, it is shown how even when strict control measures on safety and hygiene issues are carried out in construction sites, workers still obstinately continue to perform

their tasks under unsafe conditions and acts, in such a way that they risk their own physical integrity and that of their co-workers, which implies and still requires greater commitment and attention in these areas. Subsequently, the economic repercussions that occupational accidents have on construction companies are analyzed.

BACKGROUND

According to statistical data and studies carried out by Almodóvar (2001), the construction labor sector is the one with the highest accident rate. The incidence rates of accidents during the workday with sick leave place this sector in the top positions, not only in terms of quantity, but also in terms of the severity of the injuries produced.

The main causes of this situation are:

- Lack of qualified personnel
- Constant eventuality in the way workers are hired
- High workplace turnover for workers
- Adverse workplace conditions
- Lack of prevention measures in workplaces
- Lack of commitment and training regarding prevention measures

Accidents at work and occupational diseases are too frequent. In this regard, the ILO (2011) has calculated that every year more than 2 million people die worldwide due to occupational accidents or occupational diseases.

Similarly, in a study carried out over fifteen years by the National Institute for Occupational Safety and Health, it was shown that 88,622 deaths were related to work and that 23% of deaths were due to traffic accidents.

The cost of work-related injuries and illnesses to businesses for truck drivers, laborers, machine operators, carpenters,

janitors, and assemblers exceeds \$1.75 billion per year.

Due to this situation, in Mexico the shares to insure workers in the construction sector before the IMSS turn out to be the highest. For this reason, perhaps it is that many entrepreneurs decide to choose and risk “lowering costs” and “reducing execution times” at the expense of security (see fig. 1).

Every businessman must be aware that there is currently great competition in the market to be able to win a project and that society in general is more critical in terms of mistakes that can be made and even more so when people’s lives are put at risk. Therefore, in order to maintain a construction company in the market (according to the expectations of the managers), it must start by worrying about its personnel (an essential part of the organization), attend to their demands and seek a Plan of Risk Prevention that adapts to the characteristics and needs of the company, as recommended by Gil (1999).



Figure 1: Excavation without guardrail and general disorder. Own source.

It is also true and we must recognize that, as Pruneda (2001) mentions, in first world countries, where “there are greater economic resources, awareness, respect, capacity and possibility to ensure the physical integrity of people”; There are more employers who are committed to the safety of their workers,

providing them with personal protective equipment, machinery and quality tools, in good condition and adequate for the functions that the worker performs.

But, even when it is considered that companies are making great efforts, this will never be enough, since accidents continue to occur in construction. This is an indication that “something still needs to be done”, and that “something” is precisely the human question, culture, values, training, as Jiménez (2005) mentions.

Therefore, to reduce the accident rate, it is not enough to attack only the technical aspect (providing equipment, tools and machinery), but also and decisively, the workers themselves must be involved, since there are statistics that indicate that around 80% of accidents that occur are due to human factors.

COMPLIANCE WITH REGULATIONS

Labor legislation indicates the employer’s obligation to pay workers wages and compensation (Art. 132-II, Federal Labor Law), and in its Art. 487 LFT states: Workers who suffer a work risk will have the right to:

- Medical and surgical assistance.
- Rehabilitation.
- Hospitalization, when the case requires it.
- Medicines and healing material.
- The necessary prosthetic and orthopedic devices.

On the other hand, Article 53 of the Social Security Law (LSS) establishes that: “The employer who has insured the workers at his service against work risks, will be relieved, in the terms established by this law, of compliance with the obligations that the Federal Labor Law establishes regarding responsibility for this type of risk”.

In Articles 56 and 58 of the LSS, the rights

of insured workers who suffer a work risk are indicated to receive from this institution, benefits in kind and money respectively.

Art. 71 LSS mentions that: The quotas that employers must pay for occupational risk insurance will be determined in relation to the amount of the contribution base salary, and with the risks inherent to the negotiation activity that in question, in the terms established by the relative regulation.

Art. 72 of the LSS indicates the procedure to determine the premiums to be covered by occupational risk insurance, and Art. 73 indicates the premiums that companies must consider when they register for Social Security for the first time. As a consequence of the foregoing, Article 74 indicates the characteristics that must be covered by the company to review its accident rate annually and through it, determine the premium to be paid the following year.

The cost of professional risk insurance is covered by Social Security with the amounts of the fees that it receives from its insured for this concept, and which is initially determined with a value indicated by the IMSS and is adjusted annually, depending on the accident rate obtained. in the preceding year.

OVERCOSTS PRODUCED FROM ACCIDENTS

Uninsured costs constitute an additional cost in production and according to Abravanel (1992), they have historically been overlooked, they are generated by damage to goods, lost work time and many others, which are undoubtedly accounted for in the work, but they are not separated in the concept “uninsured costs of accidents” and for that reason, they are lost as inefficiency to obtain a greater utility.

The prevention of accidents, in general, has been promoted by the highest principles that have driven man (humanitarian, social,

legal, religious, psychological, commercial, political, moral, supportive, etc.), and now we consider that it is This position has been overturned, especially by globalization, which is why the driving vision of well-being is based on “Competitiveness”, the cornerstone for having work, resources, progress, social security, peace, etc., and paradoxically, the Industry of Construction, which generates infrastructure for social welfare, is at the same time the one that represents the highest rates of accident occurrence.

The area of accident prevention within a construction company, can be the generator of the change of the administration towards competitiveness, contrary to what has frequently happened before the economic difficulties that arise in the market, and that has caused the elimination or reduction of the areas of technical or administrative services.

The CRAOSS (1999), indicates that the prevention and control of accidents in the productive activity, reduces the waste of resources, because it implies greater planning in quantity and quality. The area of industrial safety, as seen in the analysis of the costs for work risk, can generate a dynamic of demand and change to technically achieve the possible benefits, contemplated in the IMSS regulations, and that offers a reduction in payment premium as a reward for improving behavior in accident prevention.

Bestraten (2001), mentions that the benefits that can be derived from adequate planning and comprehensive management of the actions to be implemented for Occupational Risk Prevention can be grouped as follows:

- Increase in company profits;
- Reduce the cost of sale of the work;
- Avoid financial reprimands by the client;
- Avoid costs before the authorities for establishing responsibilities;

- Financing part of the efforts developed for security, which would generate greater competitiveness due to the increase in the amount of work and in the efficiency to achieve profits (another plus in the globalized market).

A good technique to demonstrate the benefit of service areas is to show their value as income generators (sales) or expense reducers (expenses), and it is in the latter where we are interested in insisting on the analysis of “non-profit costs”. insured as a consequence of accidents”, Ortega (2006).

RESULTS

In the analysis of the costs resulting from accidents, the CRAOSS (1999), mentions that insured costs and uninsured costs can be differentiated:

a) **Insured costs.** They are those that are carried out by legal order, derived from the payment to workers or their families, these being the most common and representative: emergencies, hospitalization, interventions, compensation, rehabilitation, prostheses and the general expenses of the insurer for these concepts.

b) **Uninsured costs.** These costs are due to damage to property or losses derived from the accident and are fully covered by the company, in addition, they are traditionally charged at the cost of the good or service provided by the company. Uninsured costs also bring as a consequence other negative effects, which are subjective and intangible and cannot be measured, for example, the decrease in morale and motivation of workers.

b.1) Cost of wages paid for lost time to workers who were not injured.

This is because the non-injured workers

stop or reduce their activity as a consequence of participating in or commenting on the event or because they require the material, equipment or person damaged in the accident.

b.2) The net cost necessary to repair, replace, and order the materials and equipment that were damaged in the accident.

This is because the damage to property caused by a work accident constitutes an obvious cost, which must be determined by the value of the replacement of the good, less the salvage value of the damaged good, or just the repair. Fiscal or accounting criteria do not indicate the cost of lost utility.

b.3) Costs of wages paid for time lost by injured workers.

This represents workers’ compensation payments, which are generated for the time that work was stopped on the day of the accident, or in the following days, when the worker needs to leave his job for treatment or post-discharge review.

b.4) Costs caused by the extra work necessary due to an accident.

When the reduction in production is compensated with extra work time, the uninsured cost of the accident increases, in addition, the injured workers will require time for their reinstatement/adaptation, continuing their normal pay on the payroll.

b.5) The cost of salaries paid to supervisors, as long as their time is necessary for activities that are a consequence of the injury.

Supervisors are paid for planning, organizing, instructing personnel and other important control tasks for the administration, and they stop doing this work to the detriment of the company, when they are required to act due to the situation created by the accident.

b.6) Cost in wages due to decreased production by the injured worker after

his return to duty.

Given the frequency with which an injured worker is discharged even though they are still in discomfort as a result of the injury, which prevents them from producing at their normal speed, the injury must carry this decrease, although it is generally difficult to measure with precision.

b.7) Cost corresponding to the learning period of the new worker.

When it is necessary to hire a substitute worker, the cost of learning and the difference in production with the experienced worker, as well as the corresponding time invested by supervisors, constitute the uninsured cost.

b.8) Uninsured medical costs absorbed by the company.

Corresponding to the medical services provided by the company complementary to those of a mandatory nature indicated by law.

b.9) Cost of time for superior supervision and for administrative workers, investigating or processing the forms of application corresponding to compensations.

They do not include the time spent by the immediate supervisor (considered in subsection e), nor the time spent for accident prevention, which is part of the normal production cost.

b.10) Unusual sundry costs. It includes the less common costs that arise, such as public claims, rental of equipment to replace the damaged one, loss of benefits due to canceled contracts or lost orders, if as a consequence of the accident there are reductions in sales, loss of bonuses, cost of hiring new staff, excessive waste, and delays.

In addition to the above, the principles of occupational safety that over time have been increasingly based on statistical data:

a) Work accidents are foreseeable. 98%

of accidents are foreseeable, while the remaining 2% considered unforeseeable, would be those that occur due to uncontrollable forces of nature.

b) The causes of accidents are classified into two large groups:

- Dangerous acts: carried out by the individual and are contrary to common sense, knowledge and risk prevention experience. In this regard, the theories of security based on behavior have also been increasingly strengthened.

- Dangerous conditions: that are considered to exist in the place, machine, tool, object or substance with which the individual comes into contact, or that are in their environment, constituting a risk if analyzed by common sense, knowledge or experience in prevention of accidents (see fig. 2).



Figure 2: Unsafe scaffolding conditions.

Source: Own author.

c) The consequences of a potential risk can be:

- That 1 accident with serious injury occurs.

- let them happen 29 accidents with minor injuries.

- That 300 accidents occur without

injury.

d) The relation of the costs of the accidents, integrated by the direct cost, which represents the payment of the work risk insurance premiums, and the indirect cost, which results from the damages in the production and other assets of the company, are from 4 to 1, resulting in four times the uninsured cost, which the company absorbs as damage to its assets.

e) Impact of the total cost of accidents on the profits of the work. The uninsured cost of accidents is 65% of the payment of the premium that must be paid, and that during the first year corresponds to risk class V in which the construction industry is located, for this purpose, the impact of the total costs due to accidents, it is determined as follows:

1st year:

Insured cost = scheduled cost.

Considering as an example an amount of the premium for work risk equal to \$158,689.

Uninsured cost (65% of the premium for work risk four times) = $0.65 \times \$158,689 \times 4 = \$412,591$.

The following year, if a reduction in accidents is demonstrated, the amount of the work risk premium could be reduced by 1%, and an economic reduction would be achieved as shown below:

2nd year:

Insured cost: $\$178,100 - \$158,689 = \$19,410$

Uninsured Cost: $0.65 \times \$158,689 \times 4 = \$412,591$

TOTAL: $\$432,002$

Next, Table 1 shows the economic benefit that the company could receive in its profits, in case of achieving a reduction in its work risk premiums by 1% each year, starting from a premium of 7.58875.

Economic benefit	Work risk premium 7.58875	Work risk premium 6.58875	Work risk premium 5.58875
	1st year.	2nd. Year	3rd. Year
insured cost	\$0	\$19,410	\$44,244
uninsured cost	\$463,060	\$463,060	\$463,060
Cost per accident occurrence	\$412,591	\$348,024	\$348,024
Benefit	\$50,469	\$134,446	\$159,280

Table 1: Calculation of economic benefits by reducing the risk premium

Using the example that has served us to determine the costs of accidents, if the company proposed to only reduce the accident rate by 2% of what was theoretically possible, that is, to locate itself with a premium for work risk of 5.58875, feasible up to the In the third year of operations, its profits would be increased with respect to the programmed ones, in the amount corresponding to the sum of the totals of the three years, which is \$344,195, compared to the annual programmed profit of \$1,800,000 (\$5,400,000 in the three years), represents a benefit of 6.5%, noting that this amount would represent the losses recorded in its accounting but not classified as “uninsured costs of accidents”, being reflected as increases in the costs of labor, materials and machinery or indirect, and in the following years it will increase profits by 8.8%.

f) Equivalent work amount to compensate for accident losses.

In these times when it is difficult to have enough remunerative work, and the competition presents offers with low profit margins, which we have to face to continue in the market, it seems impossible for us to see how opportunities are lost by not taking novel and necessary decisions in these times so different from those we have recently experienced. It is for this reason that we want to motivate and draw the attention of the businessmen of the Mexican Construction

Industry, so that they know, analyze and decide as a priority policy of their company, to execute the works under strict control of accident prevention, following an Occupational Health and Safety Administration System and not miss the opportunity to stop earning what can be obtained, as indicated in the previous paragraph.

In the work of the example that we are using, to be carried out in 10 years, with a programmed profit of 9% (18,000,000) and a contract price of \$200 million pesos at current value, the profits would be increased in that time, preserving the premium of work risk of 5.58875 in \$1,452,995, that is, 8.1% more than what was programmed (gained by greater efficiency in the entire work process).

The utility not perceived by the work, we would have to recover it with another similar job with a duration of just under a year of work.

g) Record of accident data.

It is recommended that the following types of events be recorded and evaluated:

In the same way, you must register and notify the lost time, both for the injured worker, as well as for other workers in your area who have been involved in the accident.

In addition, he must be the one to report material damage, if any and if the production process has been affected as a result of the accident.

A very important aspect is that you must analyze the preventive measures so that the accident does not happen again, or if it does happen again, its consequences are minimized.

h) Contributions before Social Security

The quotas that are paid to the IMSS for Occupational Risk Insurance are determined in relation to the risk premium applied to contribution wages and are calculated based on the Accident rate registered in the analyzed year.

The Accident rate is defined as the set of

finished work risks expressed in subsidized days and percentages due to temporary disabilities, permanent disabilities and death. In accordance with article 34 of the Regulations of the Social Security Law on Affiliation, Classification of Companies, Collection and Inspection, the employer must keep a record of each of the cases that arise in the year, as well as the days subsidized for temporary disabilities and percentages for permanent disabilities and deaths, in such a way that it is possible to determine your Accident Rate.

Once the Claims Rate is obtained, the Claims Rate is obtained by multiplying the same Claims Rate by a Premium Factor (F) and a Work Risk premium equivalent to 2.3. Finally, the Risk Premium that will be applied to the contribution base salaries is obtained by adding the Accident Rate and the minimum risk premium (M), with a current value of 0.005 indicated in the same regulation.

According to CRAOSS (1999), the calculated Premium will be compared with the Risk Premium obtained for the immediately preceding year. The previous premium may increase or decrease by a maximum of 1% according to the new calculation and must always be within the following percentage limits:

$$0.5 \leq \text{Premium} \leq 15.0$$

The following table 2 shows an example of the variables and their values to be considered for the Calculation of the Risk Insurance Premium, for which they were taken into account the new reforms of the LSS and its Regulations.

VARIABLE	CONCEPT	FIGURES
S	Total subsidized days due to temporary disability.	465
Yo	Sum of the percentages of permanent, partial and totals, divided by 100.	0.08
D.	Number of deaths in the period.	0
No.	Average number of workers exposed to risk	437

Table 2. Company with a Risk Premium in the immediately preceding year of 3.85027%

$$\text{Premium} = [(S/365) + V \times (L + R)] \times (F/N) + M$$

$$\text{Prime} = [(465/365) + 28 \times (0.08 + 0)] \times (2.3/437) + 0.005 = 0.0234945926 = 2.34946\%$$

Comparing with the immediate previous premium, that is, 3.85027, it can be seen that the new premium applicable to contribution base salaries will be 2.85027% (in addition, the result is within the percentage limits).

CONCLUSIONS

Occupational risk prevention is a topical issue that must be present from the very moment of planning in each and every one of the companies. Each work center is obliged to have Plans that consider the procedures to

be followed in each of the tasks, regardless of the specialty in question, all with the aim of minimizing the presence of risks to workers and to the facilities themselves.

The reality is that many businessmen continue to consider risk prevention as a simple requirement to be met and even worse when they consider it to be an unnecessary expense. This investigation shows how accidents directly and indirectly affect costs in construction works, which leads to a decrease in final profits.

Mention is also made of the economic compensation that social security in Mexico offers freely and voluntarily to companies that make an effort and demonstrate a reduction in occupational risks and accidents, which must be considered by managers, since this will avoid cost overruns during the execution of construction works.

The bankruptcy situation that many construction companies in Mexico are going through, including the largest construction company in the country, is a reflection of the unwise decisions that have been taken, including, although minimal, the lack of commitment to occupational risk prevention.

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