

Obligations and Responsibilities of Civil Engineers for the Prevention of Labor Risks: References to European Regulations

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Introduction

Occupational accidents that take place in construction constitute an economic and social problem of the first magnitude. It is difficult to quantify the labor accidents on a world scale, as many countries provide no information to this regard. However, an estimated 350,000 workers die every year in labor accidents. Of these accidents, 60,000 occur in construction—that is, every 10 min a construction worker dies somewhere in the world (López-Valcárcel 1994). Each accident is a tragedy that affects not only the worker but also his or her surroundings—family, friends, coworkers, etc. To these social costs, the following economic costs must be added (Niosh 2002):

1. Costs to the worker
 - Lower income (for not being insured, for the loss of other income beyond normal job),
 - Greater expenses (expenses for other family members to help the victim's family, uninsured medical, rehabilitation, assistance expenses, etc.), and
 - Lower quality of living (relapses, permanent disorders, complications).
2. Costs to the company
 - Costs from lower production, or from taking special compensation measures,
 - Costs from material damages,
 - Costs from guaranteeing the safety of the production system,
 - Costs of accident-insurance premium and compounded rates based on the number of accidents,
 - Variable costs of accident-prevention measures, and
 - Costs caused by personal injury: medical aid, sick pay, administrative consequences, salaries of the injured and

others affected during the accident or temporarily stopped, interference from accident investigation, etc.

3. Costs to the state
 - Lower income from taxes as a consequence of lower production,
 - Lower income from taxes from companies (lower GNP),
 - Greater expenses (medical coverage, rehabilitation, disability pay, etc.).

A study on the quality, working conditions, and economic performance of the European Construction Industry (Lorent 1991) estimates that the total cost of labor accidents in construction represents 3% of the cost of the finished work. The report evaluates the cost of prevention of labor risks at 1.5% of the cost of the finished work, equivalent to half the cost of the accidents. In addition to the economic costs of occupational accidents, the social cost imposed by the death of a worker should not be overlooked: such costs are inadmissible for a society of the 21st century equipped with the most advanced technologies of construction for the execution of vast works of civil engineering.

The European Community—sensitized to this situation and aware of the need to improve safety and health conditions for workers in this sector—adopted Directive 92/57/EEC (June 24, 1992), which is related to the implementation of minimum safety and health requirements at temporary or mobile construction sites (hereinafter referred to as “construction sites”). This directive, specific to construction, forms part of a package of legal guidelines related to labor-risk prevention in the workplace, and, in accord with its final provisions (Article 14), member states of the (now) European Union (EU) have brought the related laws, regulations, and administrative provisions into compliance.

The directive, recognizing that construction sites involve subjects that are not common in other sectors, seeks to establish the obligations and responsibilities of these subjects. It establishes the definition of “temporary or mobile construction works” in order to delineate the sphere of application of the regulations and to designate the agents involved: client, project supervisor, engineering company, contractor, subcontractors, coordinator for safety and health matters at the project-preparation stage, and the coordinator for safety and health matters at the project-execution stage. In accordance with these regulations, the activities undertaken by civil engineers exercising their profession (whether construction manager, project supervisor, self-employed person, coordinators for safety and health matters, or other staff personnel belonging to site organization) imply serious civil and administrative responsibilities as well as serious penal liabilities.

Despite the importance of these regulations, for the obligations and responsibilities that civil engineers must assume in their daily activity, the necessary training is not always provided (in accord with the course requirements for the title “Ingeniero de Caminos, Canales y Puertos” [similar to “civil engineer”] in the different Spanish Universities). Consequently, a large percentage of engineers are unaware of their professional obligations and responsi-

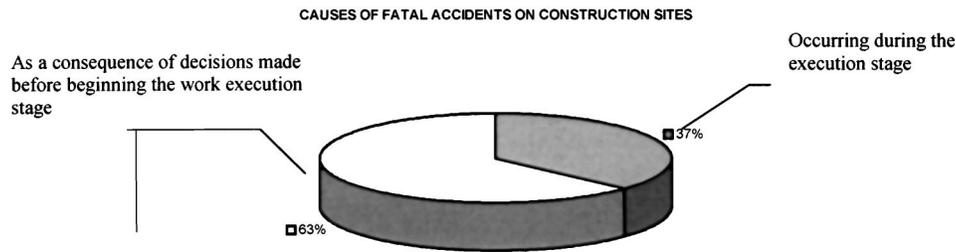


Fig. 1. Causes of fatal accidents on construction sites (Lorent 1991)

bilities related to safety and health requirements for construction sites.

The present form is structured to cover the following:

- Regulations concerning the prevention of labor risks in construction,
- Obligations and responsibilities of civil engineers,
- Expectations and results in applying the regulations of Spain (using Spain as an example), and
- Training needs for civil engineers.

In closing a series of conclusions and recommendations are then provided on the topics covered.

Regulations Concerning the Prevention of Labor Risks in Construction: Obligations and Responsibilities of Civil Engineers

With regard to preventing accidents and occupational health hazards at work, Framework Directive 89/391/EEC (June 12, 1989)—related to the application of measures for improving safety and health of workers—constitutes the general regulation framework that serves as the basis for specific directives in order to cover each and every risk within the sphere of health and safety at construction sites. The directive takes into consideration the fact that EU member states have legislative systems governing safety and health at work that are widely different, and in any case, should be improved. Therefore, this framework directive includes general principles related to the prevention of professional risks, the protection of health and safety, the elimination of risk factors, information, consultation, and balanced participation by workers and their representatives, as well as general guidelines for applying these principles. In turn, it requires that each EU member state adopt the ordinances necessary to ensure that clients, parties, and workers are subject to the jurisdiction necessary for the application of this directive. Similarly, it provides that the member states guarantee, in particular, proper control and enforcement.

At present, EU legislation relating to health and safety at work falls into three groups:

- Measures taken in pursuance of the Framework Directive 89/391/EEC, which contains basic provisions for health and safety organization in the workplace (outlines the responsibilities of employers and workers, and is supplemented by individual directives for specific groups of workers, workplaces, or substances),
- Measures taken in pursuance of the Framework Directive 80/1107/EEC, which is designed to protect the health and safety of workers against the risks arising from exposure to chemical,

physical, and biological agents in the workplace, supplemented by individual directives dealing with specific agents, and

- Measures stemming from directives that contain exhaustive provisions unconnected to the framework directives, with respect to occupational activities or specific groups at risk.

Although Directive 89/391/EEC provides the general regulations for application to all sectors of economic activity, Directive 92/57/EEC is the specific guideline upon which to establish the minimum safety and health requirements that should be applied in temporary or mobile construction sites. In the preparatory phase of Directive 92/57/EEC, the EU conducted prior studies to ascertain the causes of labor accidents in construction work. Among other data, it was noteworthy that 60% of the fatal accidents in construction were caused by decisions made before beginning the work-execution stage (Fig. 1).

The directive takes into account the different stages of a construction process, clearly differentiating the phases illustrated in (Fig. 2).

One of the most novel elements included in these regulations is the figure of the “Coordinator for Safety and Health Matters” (Council Directive 92/57/EEC, Articles 2 and 3), whose involvement is expected from the planning to the execution of the work. In addition, directive 92/57/EEC establishes the obligations and responsibilities of all the agents involved in the work, particularly the client, contractor, subcontractors, project supervisor, and the coordinator for safety and health matters. Therefore, it establishes the obligations and responsibilities of the civil engineers who by their involvement in the work can be placed in any of these categories.

Obligations and Responsibilities of Directive 92/57/EEC

1. Considerations during the project preparation stage
 - Application of the general prevention principles of health and safety risks mentioned in Directive 89/391/EEC (these should be considered by the project supervisor or by the client in making technical and/or organizational decisions to plan different tasks or work phases and to estimate the duration of each.



Fig. 2. Different stages of a construction process

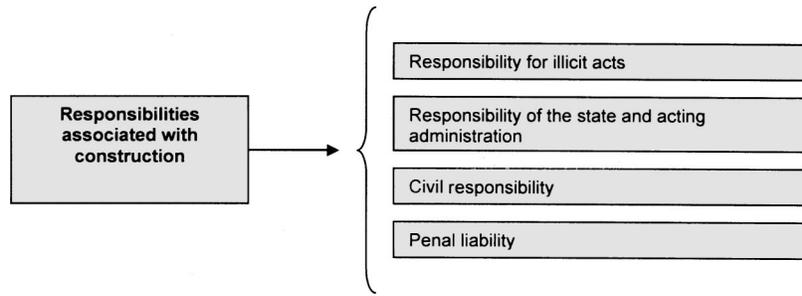


Fig. 3. Responsibilities associated with the construction process

- The coordinator for safety and health matters during this stage of the work will draw up, or cause to be drawn up, a safety and health plan, specifying the rules applicable to the construction sites, and will prepare a file appropriate to the characteristics of the work, indicating the useful elements related to health and safety to be taken into account in case of performing subsequent work.
2. Considerations during the project execution stage
The coordinator for safety and health matters at the project execution stage will have the following duties:
 - Coordinate implementation of the general principles of prevention and safety, both in technical decision making as well as in estimating the time required to execute the work.
 - Coordinate the pertinent devices needed for contractors and workers to comply with the preventive principles and follow the safety and health plan.
 - Provide for modifications of the safety and health plan when necessary.
 - Organize and coordinate the activities of the contractors involved in the work to guarantee the protection of the workers against accidents and professional risks.
 - Coordinate arrangements to check that the working procedures are being implemented correctly.
 - Adopt the measures necessary to ensure that only authorized persons are allowed onto the construction site.
 3. Responsibilities of clients and project supervisors
 - The client or project supervisor is not exempt from responsibilities even in the case of having named a coordinator for safety and health matters.
 - All the responsibilities assigned by Framework Directive 89/391/EEC.
 4. Obligations of contractors and subcontractors
 - Apply the principles of preventive action, particularly with respect to:
 - Maintaining the construction site in good order and in a healthy state,
 - Choosing the appropriate sites for the different jobs,
 - Conditions of handling different materials,
 - Technical maintenance, precommissioning checks, and regular checks on installations and equipment,
 - Designating and preparing storage zones,
 - Conditions of receiving dangerous materials,
 - Storing and evacuating wastes and rubble,
 - Cooperating between contractors, and
 - Coordinating with other activities.
 - Take into account the instructions of the coordinator for safety and health matters.

In examining the regulations applying to construction sites, we should bear in mind that a project in itself is a rather complex

undertaking, and, with respect to the legalities and the responsibilities involved, we find on the one hand the contract governing the work (subject to specific regulations, where we must moreover differentiate between public and private works) together with any regulation that affects the construction process, and, on the other hand, regulations concerning the prevention of occupational health hazards (Toba 2003).

Responsibilities that may involve action carried out during the construction process are highlighted in Fig. 3.

Expectations and Results in the Application of the Regulations

The coming into effect of new regulations concerning safety and health at construction sites had stirred grand expectations for reducing occupational accident rates in this sector. In countries such as Spain, Directive 92/57/EEC did not become national law until 1997. Fig. 4 shows the accident incidence rate from 1993 to 2002. The incidence of accidents has remained at around the same level from 1999 to 2001, slightly declining in the year 2002. It can be deduced that the results were not the ones hoped for; that is, the new regulations did not effectively improve safety conditions for construction workers. At this point, we might ask how the regulation failed, or what difficulties arose in its application. Most safety and health specialists in construction agree on the following problems in applying the regulation:

- Specific characteristics of construction works, which do not take place in other sectors of economic activity.
- The differences in labor regulations, which in each EU member state have determined the drafting of the regulations and delayed adoption.
- The lack of a preventive tradition, which exists in a large number of the member states.
- The lack of foresight, in that the necessary mechanisms have not been established (prior to the regulations taking effect) for compliance with the new regulations.

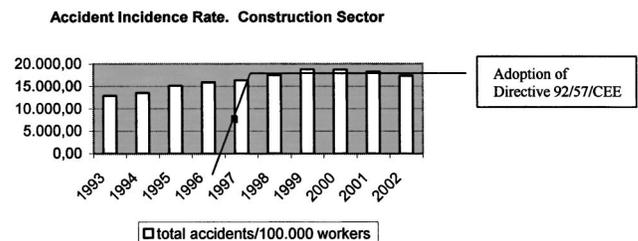


Fig. 4. Construction sector accident incidence rate, Spain

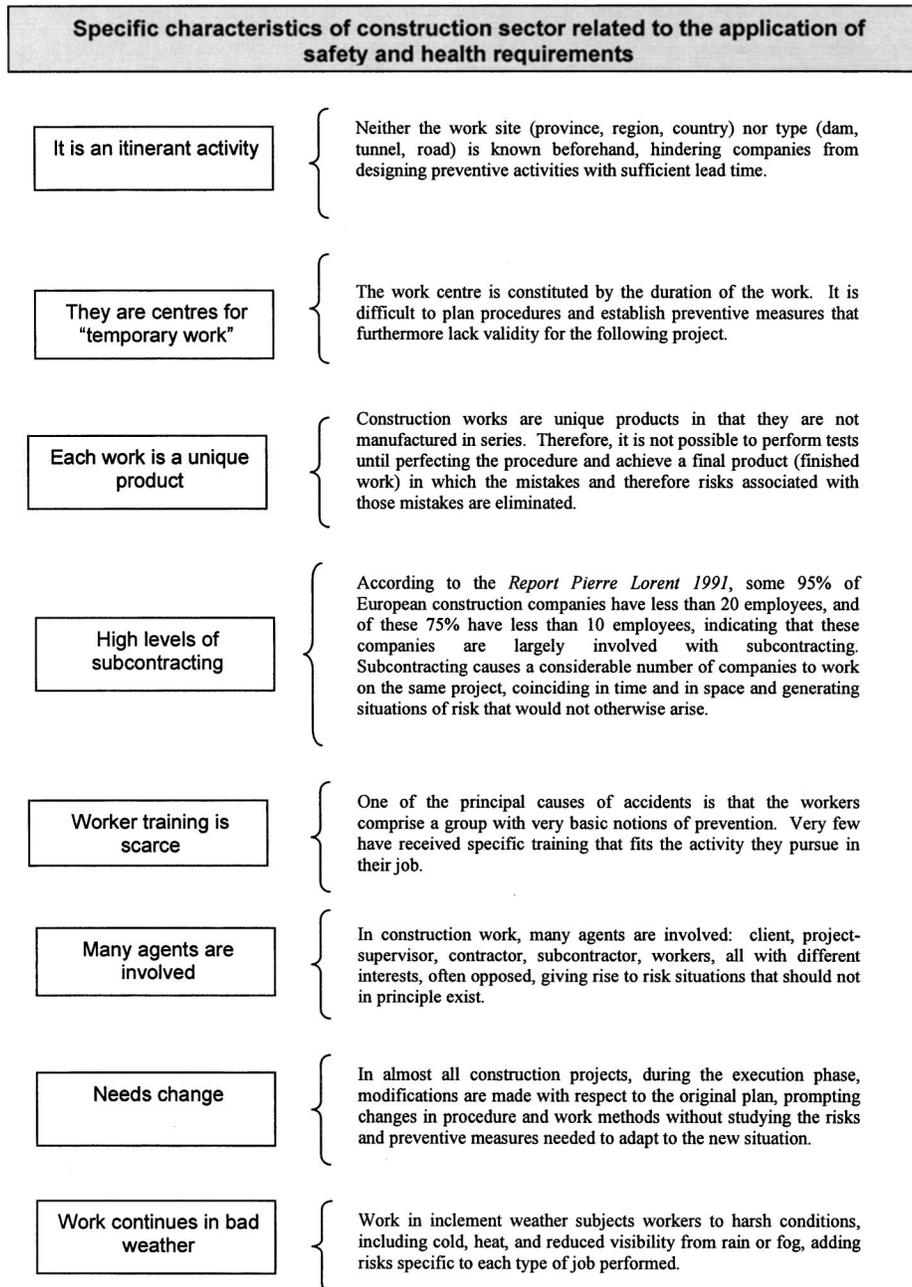


Fig. 5. Specific characteristics of construction sector related to the application of safety and health requirements

It is important to reflect on the above points, especially the specific characteristics of construction sites, given the influence they have in applying the regulations (Fig. 5).

Research performed in the civil engineering department of the University of Granada, in Spain (Rubio 2001), reveals that the problem is rooted in the application of the regulation in safety and health in construction work. Noteworthy among the results are:

Aspects Where the Regulations Were Not Fulfilled

- Concerning the coordinator for safety and health matters:
 - In the drawing up of the project no coordinator for safety and health matters was named.
 - During the execution of the work, the coordinator was not named within the deadline stipulated in the regulations,

his/her title did not fit the requirement, he/she was not always present at the workplace, the book of accidents was not used properly, and he/she did not participate in the decision making of the construction.

- Safety and health plan:
 - A safety and health plan was not approved by the coordinator before the commencement of the work.
 - Content of the safety and health plan did not satisfy the regulations, either in preventive measures (overall and individual protection) or in action/procedure.
 - The subcontractors were not familiar with the plan, nor were the worker representatives.
- Training, information, consultation, and participation of the workers:
 - This is one of the points that registered the highest levels of failure of compliance. The training and information

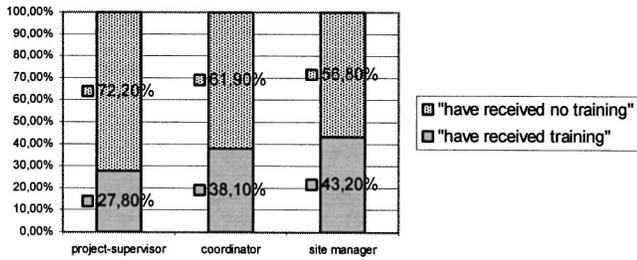


Fig. 6. Training received by staff personnel belonging to site organization

received by the workers is not specific to the activity performed in their job. Consultation and participation did not always take place, the main cause being the low levels of union representation within this group.

The situation in other EU countries is quite similar and has been thus stated at the XXVII International Symposium ISSA-Construction held in Lisbon, Portugal, in October 2003. Countries such as Finland, concerned by the increase in labor accidents in construction, have launched programs specifically to improve job safety in construction (Lappalainen and Seppänen 2003).

Training Needs for Civil Engineers

As previously indicated, civil engineers assume a heavy responsibility in their profession, regardless of their roles within a project, and for this reason we inquire into their training in labor-risk prevention.

In the case of Spain, the title of “Ingeniero de Caminos, Canales y Puertos” can be studied at eight universities. We have analyzed the course requirements in each case, and have found no course specifically devoted to safety and health. Usually, within a course on procedures of construction and machinery, a chapter is dedicated to safety and health matters, but no minimum is established regarding content, and it is not taught in all the universities.

During October, November, and December of 2002, as part of a research project underwritten by the Ministerio de Fomento of Spain (the ministry that develops public works), we sought the opinion of currently employed civil engineers concerning the safety and health training they had received (Rubio et al. 2003). A total of 96 staff personnel belonging to site organization (19 project supervisor, 21 coordinators, and 56 site managers) were interviewed, all being civil engineers. Results of these interviews are highlighted in Figs. 6 and 7.

In addition to the results of the surveys, the interviews held with the above groups clearly brought out the general opinion that it would be appropriate to include health and safety training in technical degrees related to civil engineering, as there is great concern among professionals regarding the responsibilities that this group must assume after the regulations take effect. The failure to comply with the regulations will bring heavy economic and legal sanctions.

Conclusions and Recommendations

Directive 89/391/EEC has an eminently preventive character and is to be applied to all sectors of economic activity. As commented above, this engenders the development of other specific directives that establish ordinances of minimum safety for certain activities,

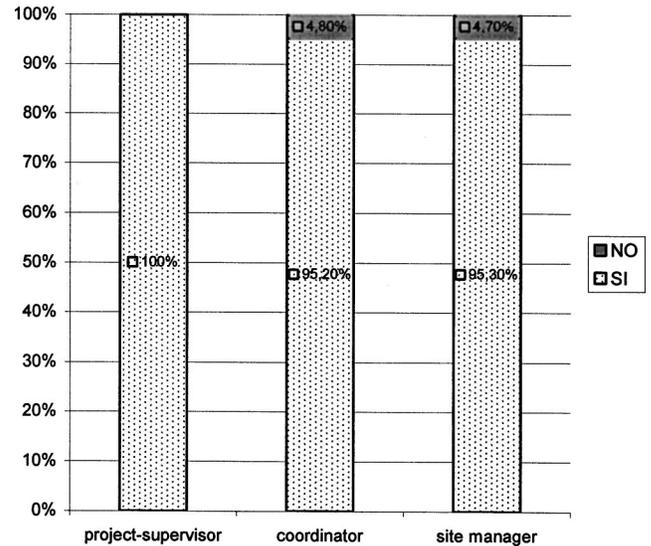


Fig. 7. Opinion of civil engineers on the appropriateness of including course material specific to health and safety in the requirements for technical degrees related to civil engineering

as in the case of Directive 92/57/EEC (taking effect as national Spanish law through the law RD 1627/97) applying to construction sites. In light of the results of previous research (Rubio 2001; Rubio et al. 2003), it can be stated that the application of the directive in the different countries of the EU has not had a satisfactory result, for different reasons, as noted in this paper. A long road still lies ahead before success is achieved in minimizing the daily risks confronting construction workers.

The role of civil engineers related to safety and health matters is of great importance, given that, in exercising their profession, whether in projecting, supervising, executing the work, or coordinating safety and health matters, they will have to make decisions with direct implications for safety in the workplace.

In concluding, we wish to reflect on the training that civil engineers receive in relation to the responsibilities linked to their daily activity. Is it truly adequate in terms of content and importance within studies adopted in each university? Do civil engineers receive the training in the prevention of labor risks in construction? The opinion of the current authors indicates that substantial effort must be devoted to match civil engineers' training to the current needs of society.

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