



INDIRECT COSTS OF CONSTRUCTION ACCIDENTS

by

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The University of Texas at Austin

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PREFACE

Worker injuries have an adverse impact on productivity in any work setting. The construction industry has an injury frequency rate among the highest of all U.S. industries. The most recent statistics indicate that 190,000 U.S. construction workers were disabled and 2,100 construction workers died as a result of work-related accidents during 1989. The fatality rate of construction workers is the highest of all industries. Estimates of the costs of these injuries and fatalities indicate that the magnitude of the direct costs is approximately 2 billion dollars (National Safety Council, 1990). Estimates are much higher if it is assumed that the direct costs are approximated by the total sum of money collected by insurance companies for worker's compensation insurance premiums. Note that these estimates do not account for or even attempt to quantify in any monetary sense the pain and suffering that accompanies worker injuries.

Objective

It is generally understood that the total costs of accidents, including the indirect costs, are considerably higher than the direct costs alone. The CII Safety Task Force feels that in the absence of well-documented data on the actual total costs of worker injuries, the construction executive is naturally reluctant to spend money on a sophisticated injury prevention program. Without good information on these costs, money spent on safety might be regarded as an effort that erodes profits rather than one that contributes to them.

Scope

What is needed is solid, quantifiable information that conclusively shows the true costs of accidents. This has been the objective of a study recently completed by the CII Safety Task Force. The study has been conducted through participation received from 185 projects under construction by more than 100 contractor firms. Participants were asked to document all known costs associated with each worker injury that occurred during a specified period of time. This effort has resulted in the first broad documentation of the indirect costs of worker injuries in the U.S. construction industry.

Results

The results provide a clear indication of the magnitude of the true costs of injuries. As detailed in this report, it is shown conclusively that the true costs of accidents exceed, by a large margin, the direct costs. The study shows the following relationship between the direct costs and the indirect costs of construction accidents.

Type of Injury	Ratio of Indirect Costs to Direct Costs*
Restricted Activity/Lost Workday Cases	20.3
Medical Cases	4.2

From the indirect to direct cost relationship (the cost ratio), it is clear that the indirect costs of injuries are sufficiently large enough so that the prudent construction manager must make aggressive plans to reduce the occurrences of worker injuries.

* The term "Ratio of Indirect Costs to Direct Costs" will be shortened to "Cost Ratio" or "Cost Ratios" in the remainder of this publication.

INTRODUCTION

Construction worker injuries adversely impact construction productivity. An injury to a worker invariably leaves that worker's crew short-handed. Crew production is generally brought to a complete halt when an injury occurs. Even after the injured worker is removed from the site to receive medical treatment, the crew's productivity level will generally suffer as a direct result of the accident. This reduction in productivity may continue even after the worker resumes work. This loss in productivity is generally recognized in the construction industry. The magnitude of the loss, however, has been quantified only by rough estimates. By quantifying these total costs of injuries with greater accuracy, construction managers can make better decisions concerning efforts to improve construction safety performance.

INDIRECT COSTS

The direct costs of accidents are staggering. What is the magnitude of the indirect costs? Indirect costs have been estimated in rough terms, with the most popular estimate placing the magnitude at four times the direct costs. However, this estimate is based on assumptions that were made by H.W. Heinrich nearly 50 years ago (Heinrich, 1941). The National Safety Council estimates that the indirect costs range from 3 to 10 times the direct costs of injuries (National Safety Council, 1985). Similar estimates were made in The Business Roundtable A-3 report (1982). The sample size, however, of only 49 injuries on which the information is based, is relatively small. To assume that indirect costs are four times the direct costs may be an oversimplification of the true costs of accidents. What is the relationship between indirect costs and the direct costs? The answer to this question has been sought by the CII Safety Task Force in its latest study.

Cost Components

An examination of the components of the indirect costs of accidents should help to clarify the various sources contributing to the total costs of accidents. It will also reveal why these component costs are difficult to quantify. Different definitions might exist for the indirect costs of accidents, but in general they are regarded as consisting of all the costs that are not covered by worker's compensation insurance. Many of the indirect costs are those incurred as a result of productive efforts being lost or hampered by the accident. Examples of indirect costs associated with construction worker injuries include the following:

Costs of Injured Worker

- Productive time lost at the time of the injury
- Productive time lost when follow-up treatment is obtained
- Reduced capacity of the worker upon returning to work

Costs of Injured Worker's Crew

- Productive time lost at the time of the injury
- Reduced capacity due to being short-handed
- Reduced capacity due to a less experienced replacement worker
- Reduced capacity due to equipment or material damage

Costs Associated with Obtaining Medical Help

Wages of the driver

Costs associated with transportation

Costs of Other Crews

Productive time lost when watching injury-related activities

Productive time lost when talking about the injury

Costs of Equipment and Material Damage

Costs of Supervisory Staff

Productive time lost investigating the accident

Productive time lost preparing accident reports

Productive time lost accompanying regulatory personnel

Productive time lost addressing media personnel

Other Costs

Damage to company image

Reduced company competitiveness

Reduced worker morale

Pain and suffering of injured worker

Loss in pay of injured worker

Adverse impact on family members of injured worker

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THE STUDY

Questionnaire

The CII Safety Task Force has devised a survey questionnaire that focuses on obtaining information on various types of indirect costs as outlined above. Each four-page questionnaire has been designed to collect indirect cost information on a single injury. The questionnaire is designed to be completed over a period of time as information on the indirect costs becomes available. The actual accuracy of these indirect costs varies for different cost items. Because of the nature of the indirect costs, the party completing the form will occasionally be expected to make projections. For example, if the injured worker returns to work at a reduced capacity, a projection is made as to the extent and duration of this reduced capacity.

In addition to the indirect costs associated with an injury, information regarding the direct costs has also been requested by the task force in order to establish the relationship, or ratio, between the indirect and direct costs of the accidents. These direct costs of each injury were to be provided to the survey participants by the insurers.

Data Acquisition

After the development of the survey form was completed, data acquisition began. As the success of the study was contingent upon the participation of many construction firms, several large, U.S.-based construction firms, contractor associations, and owner groups, including CII members, were invited to participate. Each participant was asked to follow the same procedure in documenting information related to the costs incurred for each worker injury.

A total of 103 construction firms have participated in the task force survey with information provided from 185 participating construction projects located in 34 states. This effort has netted a total of 834 injury reports, of which 261 lacked sufficient information on incurred direct costs to facilitate calculations (and meaningful analysis). Thus, a total of 573 injury reports have been actually found to be useful for this study.

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THE RESULTS

The essence of the research effort is to calculate the "ratios of indirect costs to the direct costs" (cost ratios) of accidents. Since these ratios are affected by the severity of the injuries, the analysis segregates the information into medical case injuries (requiring less treatment and resulting in no lost time) and restricted activity/lost workday cases. The rationale for this is evident when the average direct cost of each type of injury is examined: the average direct cost for medical case injuries is \$519.15 and the average direct cost of the restricted activity/lost workday cases is \$6,909.98.

Although this study is extensive, requiring the compilation of much data through the cooperation of many firms, some indirect cost components cannot be readily quantified by the study. One of these cost components is the actual cost incurred as a result of damage to materials or equipment. Based on the findings of a prior study involving more than 11,000 construction-related injuries (Brown, 1988), the average cost of the damage to materials and equipment is approximately \$100 per injury.

Another indirect cost of accidents not quantified in this study concerns the impact costs, also known as ripple effect costs. Impact costs are difficult to identify, let alone quantify. In many cases, the impact costs are not known or may not even be attributed to an injury. For example, what are the impact costs of an injury if an activity is delayed by one day? The severity may be greater if the activity is a critical one. Consider a situation where the supervisor on a project is diverted from other tasks while addressing various concerns related to an injury. After the occurrence of several injuries on the project, the cumulative effect on the supervisor's time is such that significant productivity, quality and safety losses have been incurred and eventually days could be added to the project duration. The increase in duration will probably never be attributed to any of the injuries, but a careful analysis would reveal that the injuries are the specific source of the increased duration. These costs are real and are conservatively estimated as amounting to 20 percent of the indirect labor costs associated with each injury. This value is based on predicted costs as estimated by several industry experts. These include all jobsite costs that could be attributed to injuries, but they have not been obtained directly through the survey responses, e.g., costs of long-distance telephone calls, site visits by home office personnel, added work for payroll personnel, consumption of first aid supplies, etc. Most likely, the actual costs are considerably larger. No known study has documented these costs.

Claims

Up to this point, all indirect costs have been those which are typically incurred at the project level and at the approximate time of the injury or shortly thereafter. Claims associated with injuries are another type of indirect cost which must be considered. Since worker's compensation laws preclude most direct suits against employers, claims could result from third-party liability suits. These claims are generally filed months or even years after an injury occurs. For this reason, no claims information has been obtained through the surveys. The CII Safety Task Force has decided that a conservative estimate should be made of the costs of these claims. Understandably, this is an extremely difficult value to

quantify. A claim could result in a \$100,000 settlement for one company while, in another company, a seemingly similar scenario could result in a settlement of more than \$1,000,000.

The frequency of claims varies considerably between different regions of the country. Historical information provided by several insurance companies shows that the number of restricted activity or lost workday cases per claim ranges from eight to 20. The Safety Task Force has concluded that a conservative estimate of claims can be made by assuming that one claim will arise for each 20 restricted activity/lost workday cases and that the settlement value per claim, plus the attorney and court costs, will be in considerable excess of \$100,000. Rather than assigning a fixed claim cost to each injury, a more appropriate apportionment of the claims costs would be on the basis of the sum total of the indirect costs (excluding impact costs and material damage costs), with the indirect cost being an indicator of the injury severity. For the injury data received, this apportionment has been accomplished by setting the claims costs at 10 times the indirect costs. For medical case injuries, it is assumed that the probability of a claim is much less (1 in 100 cases) and that the settlement value will average \$20,000. This is equivalent to expressing the claims costs of medical case injuries as being 60 percent of the indirect costs (excluding impact costs and material damage costs).

Results - Overall

Including claims costs and decreased productivity, the average cost ratios of injuries are shown in Table 1. For the medical case injuries, the ratio is 4.2. For the restricted activity/lost workday cases, the ratio is 20.3.

**TABLE 1
COST RATIOS OF CONSTRUCTION WORKER INJURIES**

	Medical Cases	Restricted Activity/Lost Workday Cases
Average of All Ratios of Indirect to Direct Costs When Claims Are Excluded	1.62	1.79
Average of All Ratios of Indirect to Direct Costs When Claims Are Included	4.2	20.3

It is apparent from Table 1 that the costs of claims have a significant impact on the cost ratios. Even so, the ratios are still quite high for those injuries in which claims costs are excluded. If no claims are encountered, the indirect costs still exceed the direct costs. The magnitude of the direct costs of injuries is staggering in itself. These ratios indicate that the direct costs are only a small component of the average costs actually incurred. Note that the ratios presented in Table 1 represent the average of all the ratio values for the 574 injuries included in the study (not to be confused with ratios that represent the quotient of the average indirect costs to the average direct costs, as this type of quotient is distorted or biased by extreme values or outliers. Refer to Appendix B). The various indirect cost components associated with worker injuries are graphically depicted in Figure 1 and quantified in Table 2.