

MOVING TOWARD A ZERO INJURY OBJECTIVE

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ABSTRACT: In the past decade the terms “zero accidents” and “zero injuries” have been used a great deal by construction firms espousing their commitment to safety. Studies have shown that many construction firms, especially those in the industrial sector, have enjoyed significant improvements in their safety performances. These performance statistics have been considerably better than those of the overall construction industry and provide clear testimony of the effectiveness of efforts to improve safety. Although safety performances have been impressive among many of these firms, a study was conducted to see if additional improvements could be made. The study was conducted with a selected group of large, primarily industrial, firms to determine if any changes had been made since the Construction Industry Institute publicized its findings on effective means to improve safety performance. Results show that additional changes have been made by many of these firms and that the benefits were also realized. Safety performances have improved since these additional safety practices have been implemented. The implication is that firms with good safety records can still make improvements by implementing specific safety practices.

CONSTRUCTION INDUSTRY INSTITUTE (CII) STUDY ON ZERO ACCIDENTS

In 1993, the CII released its report on zero accidents, called *Zero Injury Techniques* (Zero 1993a). That report presented information on a safety study that was designed to help owners and contractors achieve zero accidents on their construction sites. The goal was to determine the most successful techniques being used to achieve the zero accident objective.

As that research was being refined, a total of 170 key safety techniques were identified. The research team conducted 482 interviews on 25 projects that were being constructed by approximately 15 different firms. The individuals interviewed included primarily owner managers, construction managers, construction supervisors, and construction workers. Each person interviewed was asked questions regarding each of the 170 key safety techniques. While several questions were asked, perhaps the singular most important was “What are the three most effective safety techniques used on this project?” From this evolved the five high-impact zero accident techniques. These can be summarized as follows:

1. Preproject/pretask planning for safety
2. Safety orientation and training
3. Written safety incentive programs
4. Alcohol and substance abuse programs
5. Accident/incident investigations

ZERO ACCIDENTS REVISITED

In February and March of 1998, the National Center for Construction Education and Research and the M. E. Rinker Sr. School of Building Construction at the University of Florida conducted a survey to examine changes made since the zero accidents research was publicized. A simple survey instrument was prepared that asked each firm to provide information on the following:

- Whether the company agreed with the importance played by the five high-impact zero accident techniques

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- What techniques the company had changed in the five high-impact areas as a result of the zero accidents research findings since 1993
- What *other* specific changes the company had implemented to improve project safety
- What specific techniques were felt to be worthy of adoption in the future
- Specific information on company safety performance from 1994 through 1996

The surveys were sent to approximately 40 construction firms, including the CII contractor members and the firms with representation on the National Center for Construction Education and Research Safety Committee.

DESCRIPTION OF RESPONDING FIRMS

Responses were received from 18 different construction firms. Many of these are CII members who participated in the original study, but a few new participants were also involved. No attempt was made to isolate the responses of those firms who had been involved in the original zero accidents study, as anonymity was assured in the earlier CII study.

In general, the responding firms were large. The number of worker hours worked in 1996 ranged from 1,500,000 worker hours in the smallest company to a high of 19,000,000 worker hours (Fig. 1, which documents the performances of the 14 respondents that provided information on the three performance measures provided). The median value for the worker hours was approximately 3,000,000 h and the mean was 6,430,000 h. This size is consistent with the size of firms participating in the original study as they reported project sizes ranging from 200,000 to 6,300,000 worker hours.

Company size, based on worker hours, was assumed to be a good indication of the overall size of the firm. Recognizing that a full-time employee will work about 2,000 h in 1 year, the average number of field employees can be conservatively estimated to range from 750 to nearly 9,500 workers. In addition, the company volumes grew during the 1993–1996 period. It was noted that the average number of worker hours rose from 5,400,000 h in 1993, 5,660,000 h in 1994, 6,330,000 h in 1995 to 6,960,000 h in 1996 (Fig. 2). This constant growth rate is assumed to reflect the vitality of the construction company.

Information was sought on the safety performance of each of the responding firms. Several company safety performance indicators were considered and all showed that the respondents had performed well in the area of safety. The 1996 recordable injury rates for the responding firms ranged from 0.72 to 11.2 injuries per 200,000 h of worker exposure (Fig. 1). Only one

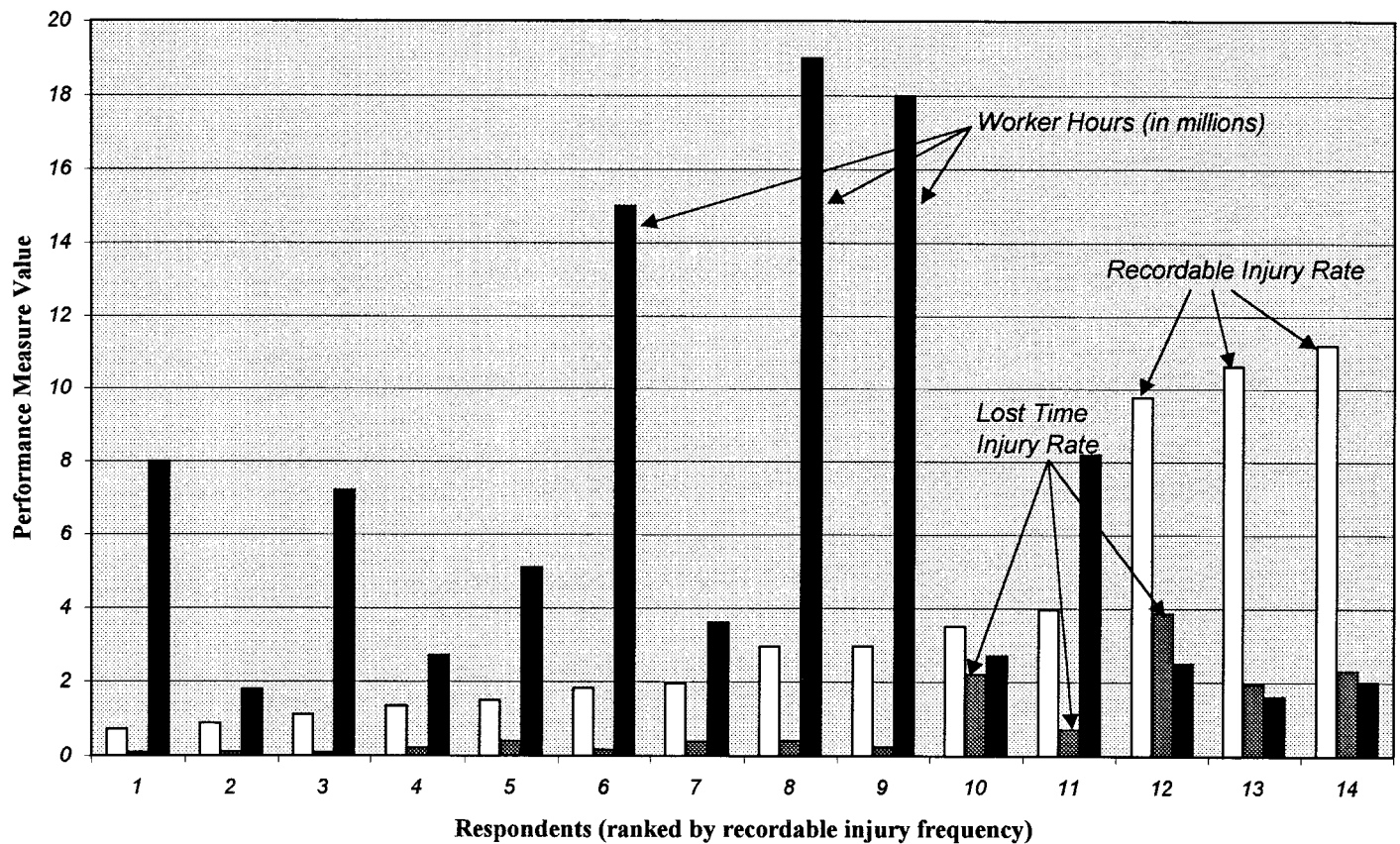


FIG. 1. Performance Measures of Respondents for 1996

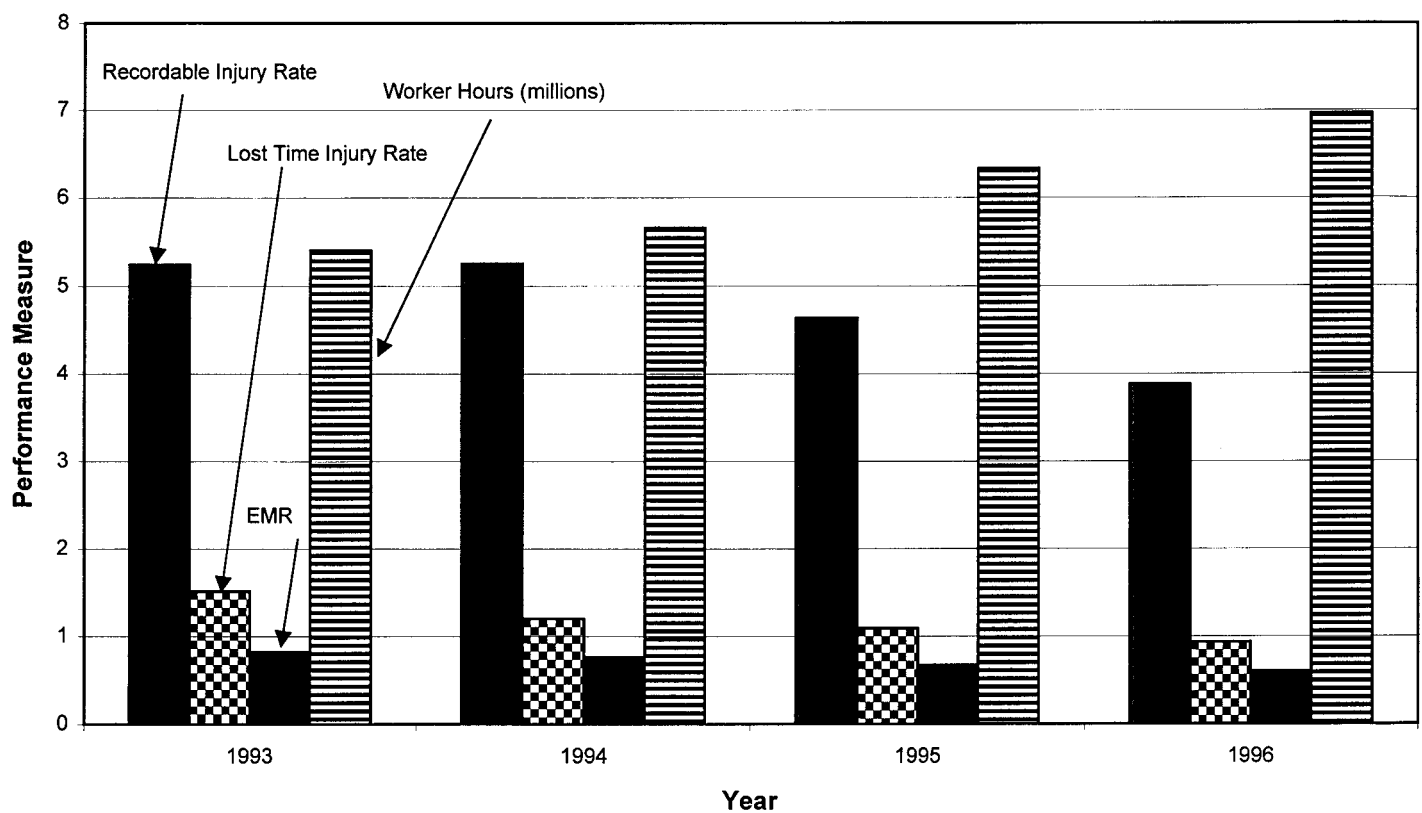


FIG. 2. Improvements in Safety Performance

firm had a recordable injury rate above the industry average of 10.6. The lost time injury rate for responding firms ranged from 0.2 to 3.86, all of which are below the industry average of 4.2 (Fig. 1). The experience modification rates on the work-

ers' compensation insurance for the firms were also quite low with an average of 0.60 (Fig. 2) with a range from 0.19 to 0.88.

Not only were the responding firms enjoying good safety

performances, the performance records showed that improvements were being made in each of the years from 1993 through 1996 (Fig. 2). This is particularly interesting when it is noted that safety performance improved as the number of worker hours increased significantly.

IMPACT OF CII RESEARCH FINDINGS ON COMPANY PRACTICES

The primary objective of this study was to ascertain the extent to which changes were being made since the findings of the CII study were reported in 1993. Further, this study was to obtain information on the nature of the implementation of changes in company safety policies and practices. The focus was on the five high-impact techniques noted earlier, namely: (1) preproject/pretask planning for safety; (2) safety orientation and training; (3) written safety incentive programs; (4) alcohol and substance abuse programs; and (5) accident/incident investigations.

Pretask Planning

All firms agreed that pretask planning is vital to improved safety performance. Only one respondent stated that no changes were made in this area since 1993. The rationalization given by this respondent for the lack of any further implementation was that the company programs were working well and this was supported by a very low injury rate. Of those stating that changes were implemented in the past 3 years, eight stated that pretask planning was instituted to some extent in the firm and three indicated that worker training (including worker orientation) and worker participation were new programs in the company on selected or all projects. Four respondents indicated that job safety analysis was conducted prior to project start. Some of the specific responses given were as follows:

- All new processes were subjected to a full hazard analysis
- Required daily pretask hazard recognition evaluation sheet signed by all crew employees
- Prejob site hazard assessment plan is now in effect. Pretask safety meetings are being tried on specific projects
- We now have the individual craft person do the pretask plan rather than the foreman

Worker Training

There was unanimous agreement with the premise that worker training is vital to improved safety performance. Only one respondent stated that no specific changes had been made in this regard because safety performance measures show "the program is working very well as is." All others acknowledged that some changes had been implemented since 1993. Some firms have adopted formal training programs such as Wheels of Learning, OSHA 10-h, DuPont STOP program, jobsite safety analysis, and driver training. Some training that is implemented was only described in general terms. Furthermore, some firms insist that their subcontractors provide needed training. In addition to the training, some firms have hired personnel to provide the training. Several firms have made changes that include the supervisory and managerial personnel in the training sessions.

- A qualified foreman in a classroom setting on the job after hours can now do craft training. Have implemented boot camp training. More emphasis on crash training throughout the company
- We are in the process of implementing construction site safety training programs on all projects

- We hired a full-time corporate training director
- Formalized supervisory training. Develop/implement safety training manual
- Increased worker training. Perform skill evaluation tests on all new hires. Track staff and worker training on computer

Safety Incentives

Incentives have the objective of providing a positive reinforcement for a desired behavior. Safety incentives are designed to influence worker actions so that safer worker performance is encouraged and rewarded. Four respondents stated they did not agree with the premise that safety incentives are vital to improved safety performance. Comments against incentives included, "Incentives are short term and will not achieve an injury free environment" and "Safety recognition and feedback are more effective than incentives." Of those agreeing with the premise, five stated that they have expanded the list of possible rewards (cash, dinner, plaques, jackets, T-shirts, and others), and four commented that the program has been expanded but no details were given. Two respondents mentioned that the incentives have been broadened to the supervisory ranks. The following are examples of some responses:

- Expanded the list of awards that can be earned. Expanded safety bonuses to craft employees
- Monetary incentives are a part of every project, regardless of cost plus or fixed price/lump sum contract
- Switched from a reward catalog to "cash for performance." Employees can earn up to \$9.50/h for safe, quality, and productive performance
- Supervisory safety incentive plan adopted. Field employee safety incentive plan adopted

Drug Testing

The association between substance abuse and injury occurrence is well understood and widely accepted. All firms agreed that drug testing is vital to improved safety performance. Despite this strong agreement, eight firms stated that they had not made any policy changes on this subject. The following is typical of the comments explaining why no changes have been made: "We already had a comprehensive drug and alcohol testing procedure in place." Of the remaining ten respondents that reported making changes, it was evident that drug testing programs were essentially in place prior to 1993 in all responding firms. The changes being reported were merely modifications to the existing policies and procedures. Three comments were made on emphasizing drug testing after accidents, including mandatory testing of the person causing the accident. Evidently, postaccident testing was not as prevalent in drug testing programs prior to 1993. The following are examples of the changes made in drug testing procedures.

- If a positive test is confirmed, employee is not able to return to work for 60 days. The employee is not paid during this time
- We now have a full drug testing program—prehire, post-accident, random, and reasonable suspicion
- Attempting to implement drug testing on new projects where client and state laws permit
- The entire drug abuse policy of the company has been rewritten and implemented, with several projects having been designated as drug free workplaces
- We have lowered the permissible levels and have included more drugs in our screening

Accident Investigations

The investigation of an accident can provide meaningful information that can be used effectively to reduce or even eliminate foreseeable hazards. All respondents agreed that accident investigations were vital to improved safety performance. Four respondents stated that they had made no changes in their practices regarding accident investigations. One of these respondents justified the lack of making changes on the fact that "Our investigations get the job done and there was no need for change." Of those reporting that changes were made in this area, four firms mentioned conducting "root cause analysis training" and four firms mentioned utilizing user-friendly forms to acquire valuable information. Three firms mentioned conducting training in accident investigations for project supervision and three firms indicated that the accident investigations were conducted by teams, rather than being the sole responsibility of one individual. Upper management was also being involved in accident investigations to a greater extent. A sampling of the responses is as follows:

- Utilization of the team approach to accident investigations to focus on fact-finding, not fault-finding. Integration of root cause analysis techniques in the investigation process
- A formal written procedure is in place. President of the company leads the way on all lost time accident investigations. A review is conducted for every recordable incident
- We investigate all incidents: near miss, workers' compensation, reportable, and lost time. We make a "Big Deal" when an incident occurs and have complete accident investigations
- Increased worker involvement in investigations. Developed a jobsite recommendation tracking system
- We have included incident investigations in our foreman training. We have improved our reports

OTHER CHANGES

Information was requested on other changes that were made in the past 4 years that impacted safety performance. Two respondents stated that no changes were made, with one stating that there has been "continued emphasis on zero accidents. Last year, 75% of all company projects had zero accidents" and the other lamented, "We still continue to use subcontractors with minimum safety experience." While the nature of the changes being made in the remaining 16 firms varied considerably, 10 firms commented on expanding the responsibility for safety to a broader spectrum of individuals. Other comments could not be easily categorized. Examples of the comments are as follows:

- Upper management commitment and we hold managers accountable
- Field superintendents and above are graded and rewarded based on safety performance, and employee involvement via safety committees and teams. We have productive jobsite safety meetings
- Loss control visits from insurance company representative on various jobsites. Trimmed safety directors' responsibilities so more emphasis can be put on safety. More emphasis on craft training
- Safety is managed as part of the job! Renewed emphasis and training on supervisor accountability and responsibility. Cost analysis on accidents along with project manager accountability
- Implementation of a behavior-based program that allows for the creation and possibility of incident/injury free worksites

- Bring job superintendents into the responsibility loop more
- All supervisors (up to and including the CEO) will have any bonus reduced if injuries occur under their supervision
- Zero tolerance on fall protection offenders. Behavior enhancing safety techniques
- Comprehensive safety training required for management to have an opportunity for advancement. Established aggressive 10-year goal focused more on behavior and value-based safety improvements
- Professional safety personnel hired to assist with functions at the corporate and field levels
- Safety has become a value at our firm. It is more than a priority. Priorities change, but values do not
- Strategic risk analysis by executives

RECOMMENDATIONS OF FUTURE CHANGES

Respondents were asked to suggest recommendations for changes in the area of safety that they would like the company to make in the future. Six respondents offered no suggestions. Suggestions ranged from broadening the focus on safety to more levels of management, changing corporate philosophy on safety, increased staffing on safety, focusing on behavioral principles, and implementing flex and stretch programs. Some of the specific comments are as follows:

- Limitations on hours worked for service technicians
- More jobsite visits. System of checks and balances for strengthening existing policy
- Formal structured safety department as a part of operations. Vice president participation in audits
- To view safety as an individual and corporate value rather than a priority, which can be changed. By doing so, working safely is the natural thing to do and is done out of pure motivation for the well being of all employees
- Continue a zero accident/injury posture because it is working for us
- Fully apply behavioral safety principles. Improve "quality of life" on projects. Increase hazard awareness of all workers
- Flex and stretch programs show good benefits
- Would like to see all bid documents to include safety as an individual line item
- Fully implement behavior-based safety improvements

CONCLUSIONS

Results of this study show that construction firms are implementing a variety of programs to improve safety performance. More importantly, these programs have been associated with good safety performance, whether measured in terms of recordable injury incident rates, lost time injury incident rates, or experience modification rates. While there is some concern regarding the merits of safety incentives, there is general agreement that the five high-impact techniques play a vital role in safety performance.

Contractors are continuing to devise means by which safety program enhancements can be made. The techniques employed in industry to enhance safety performance have not stagnated. The five high-impact techniques have been implemented by many firms, and these techniques have been augmented with new approaches to promoting construction safety. The industry is very dynamic in the area of safety, and additional significant advances can be expected. The commitment to safety is clearly sincere and further changes will certainly be made.

APPENDIX I. QUESTIONNAIRE FORM USED TO STUDY ZERO ACCIDENTS

The Zero Accident Techniques (Liska et al. 1993) concluded that the five practices associated with improved safety performance were: pretask planning, drug testing, worker training, accident investigations, and safety incentives.

1. Does your firm agree that pretask planning is vital to improved safety performance? If yes, has your firm made any changes in policy or practice in regard to pretask planning in the past 4 years? yes no

If yes, please describe the changes or if not, please explain why not:

2. Does your firm agree that drug testing is vital to improved safety performance? If yes, has your firm made any changes in policy or practice in regard to drug testing in the past 4 years? yes no

If yes, please describe the changes or if not, please explain why not:

3. Does your firm agree that worker training is vital to improved safety performance? If yes, has your firm made any changes in policy or practice in regard to worker training in the past 4 years? yes no

If yes, please describe the changes if not, please explain why not:

4. Does your firm agree that accident investigations are vital to improved safety performance? If yes, has your firm made any changes in policy or practice in regard to accident investigations in the past 4 years? yes no

If yes, please describe the changes or if not, please explain why not:

5. Does your firm agree that safety incentives are vital to improved safety performance? If yes, has your firm made any changes in policy or practice in regard to safety incentives in the past 4 years? yes no

If yes, please describe the changes or if not, please explain why not:

6. Are there other changes the company has made in the past 4 years that have significantly impacted the safety performance on construction sites? yes no

If yes, please describe them:

7. Do you have recommendations for changes in the area of safety you would like the company to make in the near future? yes no

If yes, please describe them:

8. Please provide the following information:

	1993	1994	1995	1996
Recordable injury rate	_____	_____	_____	_____
Lost time injury rate	_____	_____	_____	_____
Experience modification rate	_____	_____	_____	_____
Worker hours per year	_____	_____	_____	_____

APPENDIX II. REFERENCES

- Liska, R., Goodloe, D., and Sen, R. (1993). "Zero accident techniques." *CII Source Document 86*, Construction Industry Institute, Austin, Tex.
- Zero injury techniques. (1993a). *CII Special Publication 32-1*, Construction Industry Institute, Austin, Tex.