ASSE Foundation Research

Safety Incentives

A study of their effectiveness in construction

By Paul M. Goodrum and Manish Gangwar

A GREAT DEAL OF UNCERTAINTY exists regarding the effectiveness of safety incentive programs in construction. Most research on incentives involves case studies and theoretical analyses of their advantages and disadvantages. Using primary survey data from construction firms and craftworkers, this article examines the impact of incentives on the safety performance of U.S. construction firms. The study found that incentives are effective at improving many of the safety performance metrics used in construction. However, differences exist within the industry regarding perceptions of their effectiveness.

The performance of the construction industry has a tremendous effect on the U.S. economy. According to the U.S. Bureau of Economic Analysis, when one includes construction-related business involving design, equipment and materials manufacturing and supply, the construction industry accounts for 13 percent of the nation's gross domestic product (GDP), making it the largest manufacturing industry in the U.S. Unfortunately, the construction industry does not achieve this performance without significant cost to the safety and health of the workforce. According to NIOSH, 13.3 workers per 100,000 in construction were injured in 2001. Furthermore, the total number of U.S. fatalities in private construction in 2001 was 1,225—one-fifth of all workplace fatalities in the U.S.

Since the inception of OSHA in 1971, the safety performance of all U.S. industries has improved. According to the Bureau of Labor Statistics, the number of fatalities in construction alone has been reduced by half. This improvement is attributed to many industry efforts, such as adopting safer technologies, improved work methods, better training and more thorough accident investigations.

Another measure some construction firms take to improve safety is the use of safety incentives. However, a great deal of debate surrounds the ability of incentives to improve not only safety but also other construction performance measures. In particular, there is concern about the viability of incentives as a provider of substantial long-term improvements (Prichard).

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Literature Review

Much has been written about the advantages and disadvantages of safety incentive programs. Proponents claim that worker behavior is affected by prevailing conditions and events. Behavior can be reinforced by positive feedback and discouraged by negative consequences (Geller 35). Furthermore, it is believed that incentives in the form of reward encourage and promote safe behavior and eventually improve safety performance (Geller 34; Sims).

Skeptics argue that safety incentive programs do not provide long-term improvement of safety (AFL-CIO). They question the motivation provided by these programs, since working safely already delivers significant intrinsic benefits to workers. Critics believe that attributing improved safety performance to incentives is misleading, since anecdotal evidence suggests these improvements diminish or even fall below original levels once the incentive programs end (Geller 34).

Another major concern is that these programs do not actually improve the safety behavior targeted, but merely change the reporting of incidents; incentive programs may cause employees to not report accidents so that they can qualify for awards. Indeed, OSHA has addressed the concern of inaccurate accident reporting due to incentives in its Voluntary Protection Programs (VPP) policies and procedures manual. "The on-site evaluation [of a company's safety incentive program] will focus on the incentive program's potential impact on the accuracy of reporting injury and illnesses data" [OSHA(b)].

In 1998, OSHA worked with Dennison Associates, an independent agency, to review the performance of safety incentive programs across multiple industries. This study examined the results of 27 different research projects on safety incentive programs that existed from 1971 to 1987 among U.S. companies [OSHA(a) 10-15]. Incentive programs were divided into two main categories: 1) programs that reward improved safe work practices; and 2) programs that reward reductions in the number of injuries and illnesses reported [OSHA(a) 4-6]. The report found that all programs reviewed under these categories shared some improvement in safe work practices but not all safety-related work practices improved in all studies [OSHA(a) 7]. The study found no direct link between safety incentive programs and the reported number of injuries.

Forms of Safety Incentive Programs

Safety incentive programs can be divided into two categories: 1) injury/illness-based incentive programs; and 2) behavior-based incentive programs.

Injury/Illness-Based Programs

Injury/illness-based safety incentive programs are based on the number of injuries and/or illnesses as a criterion to reward workers and crews. Individuals or groups are rewarded for avoiding or lowering accidents during predefined periods. These programs work on the underlying assumptions that: 1) facilities and equipment are safe and do not cause any accidents; 2) workers have proper training and knowledge to use equipment; and 3) accidents are primarily the result of worker negligence or compromise on safety (Smith 44).

One problem with this approach is that it directly equates prizes with a number of injuries (Krause 28). Injury/illness-based programs present the temptation for workers to not report an injury so they will not lose individual incentives or be the reason that the whole group does not receive an award (Geller 37; Flanders and Lawrence). Another concern is that these programs may become trivial and hard to discontinue in the long-run because workers can view incentives as an entitlement; discontinuation may cause significant negative impact (Smith 44).

Injury/illness-based incentive programs may also provide false feedback and cause mistrust between workers and management (Krause and McCorquodale 34; Prichard; Smith 44). For example, suppose a crew makes a substantial effort to avoid injuries, yet unfortunately experiences an accident. As a result, this crew will not receive an incentive. Meanwhile, another crew that makes no effort to avoid injury may manage to do so and, thus, may still receive a reward.

Behavior-Based Programs

Behavior-based safety incentive programs observe worker behavior as a criterion for awarding incentives. Examples of rewarded behavior include participating in safety meetings and training; offering suggestions about how to improve jobsite safety; and other behavior that can help prevent accidents. Although such programs solve the problem of erroneous feedback and improve attendance in meetings and training, their effectiveness is still questioned. To address this problem, some sites gauge program effectiveness through regular tests and by providing two-way feedback.

These programs also help eliminate injury hiding by removing a direct link between an award and the number of accidents reported. Behavior-based observation can also provide data about equipment and facilities that put workers at risk for injury.

A downside of behavior-based incentive programs is that they are comparatively difficult to measure and monitor because employee behavior is inherently more complex and difficult to gauge (Geller 39). In addition, employee behavior changes constantly in reaction to external factors such as new facilities, new equipment and new workgroups.

Other Issues with Safety Incentive Programs

In both types of incentive programs, motivation is a critical factor. Positive reinforcement, feedback, and recognition and reward are considered the four major components for motivation in an incentive program (Daniels). Positive reinforcement, which means anything that increases the desired behavior, is considered the weakest and most misunderstood link (Geller 37; Daniels). Positive reinforcement can be a small gift or simple praise. Everyone has different likes and dislikes, which change over time, making reinforcement even harder to identify (Daniels). Another important point about effective positive rein-

Statistics Terms

Pearson Correlation

The correlation between two variables shows the degree to which the variables are related. Pearson correlation ranges from +1 to -1, where +1 represents a perfect linear correlation between the variables and -1 represents a perfectly inverse linear relationship between the variables. Zero denotes there is absolutely no linear relationship between two variables.

P-Value/Significance Value

P-value—sometimes called the significance value—represents the probability of getting something as rare or extreme as the given result. Therefore, the lower the probability, the less chance there is that two samples are from the same population. Statistically, a P-value of less than 0.05, which is five percent, is considered acceptable to reason that the discrepancy between two samples is assumed to be a result of two different populations, or, in other words, that two samples represent two different population groups with different measured characteristics.

ANOVA

Analysis of variance (ANOVA) determines the probability that two or more samples were drawn from the same parent population. The purpose of an ANOVA is to verify that the means of a measured variable for two or more samples are different enough to not have occurred by chance. In other words, if the group means do not differ significantly, it is inferred that the independent variable(s) did not have an effect on the dependent variable. The key statistics in ANOVA are the degrees of freedom (df) and the F-value that are used to identify the significance value.

Chi-Square analysis

Chi-square is a non-parametric test of statistical significance for cross-tabular or discontinuous data. Like the F statistics in ANOVA, the chi-square indicates the degree of confidence one can have in accepting or rejecting a hypothesis. Chi-square statistics, along with the degree of freedom, provide similar information about nominal data—whether they belong to one group or to two different groups of dissimilar characteristics.

Table 1

Breakdown by State

State	Total Responses	Percentage
Kentucky	35	21.21
North Carolina	25	15.15
Tennessee	20	12.12
Ohio	16	9.70
Georgia	16	9.70
Virginia	16	9.70
Indiana	15	9.09
Florida	11	6.67
Alabama	7	4.24
Others	4	2.42

Figure 1

Breakdown by Work Type

Table 2

Differences in Annual Volume of Work, 2001

	Number of Companies	Mean Volume	F-Value	Significance	Pearson Correlation
With SIP	85	$101 mil	4.82	0.03	-0.18
Without SIP	54	$21 mil			

Note: SIP denotes safety incentive program.

forcement is that it should immediately follow the desired behavior, which is why positive reinforcement should be a daily affair (Daniels; Geller 38; Hinze 84). Ideally, peers are in the best position to deliver positive reinforcement.

To provide positive reinforcement, incentives can be awarded in different forms. Efficient incentives need to have more personal value than a significant dollar value. The dollar value of incentives is unimportant as long as the incentive is meaningful and a positive reinforcer to the worker (Toft). In addition, incentives should be distributed separately from normal compensation (Opfer). Many successful programs rely on low-cost gifts with high perceived value for this very reason. Leboeuf identified 10 categories of incentives: 1) recognition; 2) time off; 3) stock ownership; 4) special assignments; 5) advancement; 6) increased autonomy; 7) training and education; 8) social gatherings; 9) prizes; and 10) money (Sims; Toft). Some experts suggest that an incentive preceded by a celebration gives worker the opportunity to relive the event and further reinforce the behavior (Geller 37). Incentives and rewards should be specified and should be perceived as achievable (Geller 39). Finally, incentives should be based on long-term progress rather than on short-term achievement (Opfer).

Who will be rewarded is also an important consideration. Some have found that everyone who meets the criteria should be rewarded (Geller 39; Opfer). This gives workers a sense of belonging and makes them feel they are part of the safety initiative. Furthermore, incentives should be based on absolute criterion rather than competition to avoid unnecessary rifts among workers and crews (Opfer). It is also believed that it is better to reward many participants rather than an individual (Geller 38; Opfer). Likewise, a group should not be penalized for the failure of an individual's action (Geller 38). This is reflective of the belief that safety is a team effort and individuals do not cause accidents. Rather, accidents are the collective failure of the group. Most importantly, safety incentives are not a panacea to improve safety. Others have found that incentives cannot work without a comprehensive safety program that addresses training, culture, drug testing and other critical elements (Opfer; Hinze 82; Trahan).

Study Methodology

Clearly, significant differences of opinion exist on the effectiveness of safety incentives. The quantified effect of incentive programs on construction safety performance remains uncertain. Also, little is known about how different implementation schemes of safety incentives affect their performance. Furthermore, little is known about the effectiveness of safety incentives based on the perceptions and experiences of construction craftworkers. This article examines the effects of safety incentive programs on construction safety performance using industry data. First, differences in safety performance data between construction firms with safety incentive programs and those without are analyzed. Then, the impact of different implementation schemes is assessed. Finally, craftworkers' experiences with these programs are examined.

Table 3

Objectives Behind Implementing an SIP

Objective	Primary (3)	Secondary (2)	Tertiary (1)	Total Weight
To change workers' behavior	37	26	15	178
To improve workers' awareness	29	37	9	170
To reduce recordable accidents	21	11	21	106
To minimize losses	4	5	20	42
To minimize safety-related claims	1	7	9	26
To maintain good safety records	3	2	12	25

Data Collection

A great deal of previous research on safety incentives is based on anecdotal evidence. To collect empirical data on the use of safety incentives and company safety performance, two surveys were developed: a managers' survey and a craftworkers' survey. The managers' survey was designed for company safety directors and other SH&E professionals in charge of their company's programs. This survey examined how companies administered their safety incentive program, safety performance data, and the perceptions and experiences that each company had with its incentive program. The craftworkers' survey was administered only to workers who were currently employed by a construction firm that used safety incentives. This survey examined their personal experiences and perceptions of participating in a safety incentive program.

Table 4

Safety Performance Based on 2001 SIP

	With SIP		Without SIP				
	Mean	N	Mean	N	df	F-Value	Sig.
Lost-time workday incidence rates	1.45	81	4.99	56	136	9.35	0.00
Restricted workday incidence rates	1.26	74	2.53	54	127	3.65	0.06
OSHA recordable incidence rates	4.20	79	5.46	54	132	1.68	0.20

Note: Sample size does not equal 165 due to nonresponse.

Research Sample for Managers' Survey

In the process of creating the managers' survey, an extensive literature review was performed. Based on previous findings and the research objectives, a pilot survey was created and administered to three general contractors in Kentucky and Tennessee. Their comments and suggestions were incorporated into the actual survey. Next, the managers' survey was administered by mail to several construction firms in the Midwest and southeastern U.S. Of the 165 surveys received, 22 percent were collected from contractors in Kentucky; 14 percent from North Carolina; 12 percent from Tennessee; 10 percent each from Ohio, Georgia and Virginia; and the remaining 22 percent from Indiana, Florida, Alabama, Illinois, West Virginia, Michigan, Missouri and Texas (Table 1).

In 2001, the average number of workers for the sampled companies was 199. Fifty percent of the companies had less than 67 workers in 2001, and 10 percent had more than 368 workers. Of the 165 sampled companies, 42 percent were engaged in only building construction, 29 percent were involved in heavy construction, 14 percent were involved in both heavy and building construction, and 12 percent were specialty contractors (Figure 1).

Survey results were coded into SPSS (statistical analysis software) for detailed statistical analysis. Frequency tables, box plot, chi-square and analysis of variances (ANOVA) were used to analyze the survey results (see sidebar on pg. 25).

Research Sample for Craftworkers' Survey

The second survey was a one-page survey for construction craftworkers of companies with safety incentive programs. The researchers contacted six construction firms in Kentucky, Ohio and Tennessee who agreed to administer and return the completed survey. To help protect respondent anonymity, the survey requested no information regarding the respondent or his/her employer. The total sample size for this survey was 252 workers. The mean years of experience in the construction industry of all workers surveyed was 16.14. Fifty percent of the workers had less than 15 years of construction experience, and 10 percent had more than 31 years of construction experience.

Measures of Safety Performance

To quantify the effectiveness of safety incentive programs, four different measures of safety performance were collected in the managers' survey:

1) **OSHA recordable cases.** Cases when workers, due to an injury/illness sustained at work, must visit a doctor for more than first aid.

2) **Lost-time workday cases.** Cases when workers, due to an injury/illness sustained at work, are

Table 5

Differences in Performance Change Based on 2000 SIP

	With SIP Mean	N	Without SIP Mean	N	df	F-Value	Sig.
Lost-time workday incidence difference between 2001 and 1999	-1.02	60	1.41	55	114	4.82	0.03
Restricted workday incidence difference between 2001 and 1999	0.53	57	0.80	54	110	0.15	0.70
OSHA recordable incidence difference between 2001 and 1999	-0.92	61	-0.18	53	113	0.74	0.39

Table 6

EMR for Different Years Based on SIP

	With SIP Mean	N	Without SIP Mean	N	df	F-Value	Sig.
2001 EMR with SIP implemented in 1999	0.773	53	0.849	62	114	6.05	0.02
2001 EMR with SIP implemented in 1998	0.760	41	0.844	74	114	6.69	0.01
2001 EMR with SIP implemented in 1997	0.734	36	0.851	79	114	12.74	0.00
2000 EMR with SIP implemented in 1998	0.763	40	0.861	72	111	6.25	0.01
2000 EMR with SIP implemented in 1997	0.730	35	0.870	77	111	10.53	0.00
1999 EMR with SIP implemented in 1997	0.764	34	0.890	69	102	3.81	0.00

Table 7

Differences in Change of EMR Based on Various Timeframes for SIP

	With SIP Mean	N	Without SIP Mean	N	df	F-Value	Sig.
Difference in EMR between 2001 and 1997 with SIP 1997	-0.039	29	-0.008	56	84	0.04	0.50
Difference in EMR between 2001 and 1998 with SIP 1998	-0.022	34	-0.047	56	89	0.41	0.52
Difference in EMR between 2001 and 1999 with SIP 1999	-0.025	48	-0.043	54	101	0.34	0.56

not able to perform work fully or partly; this is a subset of total OSHA recordable cases.

3) **Restricted workday cases.** Cases when workers are not able to work to their full capacity due to an injury/illness sustained at work, and are assigned a lower workload; these cases are part of lost-time workday cases.

4) **Experience modification rate (EMR).** EMR is primarily used to establish workers' compensation (WC) insurance premium rates. EMR calculations are based on each employer's compensation claim experience over its last three years as compared to the average of the industry. EMR takes into account the number of accidents as well as the severity of cases. The managers' survey also collected total employee hours from each company; this allowed recordable, lost-time and restricted incidence rates to be calculated for each company using the following equation:

Incidence rate =

$$\frac{\text{Number of cases x 200,000}}{\text{Total employee hours per year}} \quad (1)$$

Data Analysis

Breakdown of Companies With & Without Safety Incentive Programs

Of the 165 companies sampled, 59 percent had a safety incentive program in 2001 and 41 percent did not. The mean safety incentive program was 5.87 years old. Fifty percent of the companies that had an incentive program had the program for less than four years, while 10 percent of the companies with a safety incentive program had used the program for more than 12 years. Significant correlation was found between the annual volume of work and safety incentive programs. Companies with a safety incentive program also had a substantial and statistically significant larger mean volume of work compared to those with no incentive program. Those with an incentive program had a mean volume of work of $101 million compared to $21 million for companies without a safety incentive program (Table 2). An F-value of 4.82 shows the difference in work volume to be statistically significant.

To begin to understand the motivation of why construction companies implement a safety incentive program, the managers' survey asked each respondent whose company had such a program to rate six objectives, in order of preference, for implementing the program. The objectives were to: 1) reduce recordable accidents; 2) improve safety awareness among workers; 3) change workers' behavior to adopt safer work practices; 4) maintain good safety records; 5) minimize safety-related claims; and 6) minimize losses. Table 3 shows the number of companies rating each objective as primary, secondary and tertiary.

To identify the three most preferred objectives for implementing a safety incentive program, different weights (3 for primary, 2 for secondary and 1 for tertiary) were assigned to the number of responses for each objective. For example, 21 companies weighted "to reduce recordable accidents" as their primary objective; 11 companies weighted the same as their secondary objective; and 21 companies weighted the same as their tertiary objective. Therefore, the total weight for this criterion was (21 x 3) + (11 x 2) + (21 x 1)=106 (Table 3). Based on this calculation, the top three objectives for implementing a safety incentive program were to:

1) change worker behavior to adopt safer work practices;

2) improve safety awareness among workers;

3) reduce recordable accidents.

As seen, many companies use a safety incentive program not only to reduce accident rates but also to have an impact on worker behavior. By changing worker behavior and safety awareness, safety performance should improve. The next section of the analysis examined whether this expectation is actually being achieved.

Effectiveness of Safety Incentive Program in Terms of Various Safety Performance Indicators

To estimate the impact of incentives on safety performance, the lost-time, restricted and recordable rates were compared between companies that did and did not have a safety incentive program in 2001 (Table 4). Among the 137 companies that indicated their lost-time workday incidence rates, a significant difference was seen in the mean lost-time workday incidence rates between companies with and without a safety incentive program in 2001. Companies with a program had a mean lost-time incidence rate of 1.45 compared to 4.99 for those without a program, which was statistically significant with an F-value of 9.35 (Table 4).

Of the 128 companies that indicated their restricted workday incidence rates, there was also a difference in mean restricted workday incidence rates between companies with and without a safety incentive program in 2001. The mean restricted workday incidence rate in 2001 for companies with a safety incentive program was 1.26 compared to 2.53 for those without such a program. The difference was statistically significant at the 94 percent confidence interval with an F-value of 3.65 (Table 4).

Finally, of the 133 companies that indicated their OSHA recordable incidence rates, a difference was found in mean OSHA recordable incidence rates.

Table 8

Differences Due to Crew or Worker Performance

Performance	Worker Only Mean	N	Crew* Mean	N	df	F-Value	Sig.
Lost-time workday incidence 2001	1.27	35	1.68	38	72	0.31	0.58
Restricted workday incidence 2001	1.09	31	1.34	35	65	0.32	0.58
OSHA recordable incidence 2001	4.08	33	4.14	38	70	0.00	0.96
EMR 2001	0.79	32	0.81	32	63	0.20	0.66

**Workers and supervisors*

Table 9

Differences Due to Measuring Criteria

	Injuries Mean	N	Behavior Mean	N	Both Mean	N	Sig.
Lost-time workday incidence 2001	1.24	30	1.57	25	1.77	18	0.84
Restricted workday incidence 2001	1.39	27	0.80	21	1.74	18	0.27
OSHA recordable incidence 2001	5.06	29	4.06	24	3.88	18	0.63
EMR 2001	0.84	27	0.79	22	0.78	15	0.51

Table 10

Differences Due to Incentive Period

	Less than One Month Mean	N	Monthly to Quarterly Mean	N	More than Six Months Mean	N	Sig.
Lost-time workday incidence 2001	1.07	26	1.34	21	1.99	30	0.52
Restricted workday incidence 2001	1.07	22	1.68	19	1.04	29	0.43
OSHA recordable incidence 2001	3.81	25	5.51	21	3.66	29	0.32
EMR 2001	0.796	22	0.829	18	0.813	28	0.85

The mean rate of companies with a safety incentive program was 4.20 compared to 5.46 for companies without a program. However, the difference was only statistically significant at the 80 percent confidence interval with an F-value of 1.68 (Table 4).

Safety incentives cannot work without a safety program that addresses training, culture and other critical elements.

Change in Safety Performance from 1999 to 2001

To identify whether safety performance changed differently over time as a result of safety incentive programs, differences in the change of various incidence rates from 1999 to 2001 were compared between companies with and without a safety incentive program in 2000. (Year 2001 was the latest incidence rates available for the study. Year 2000 was chosen to ensure that affects of a safety incentive program were reasonably reflected in the 2001 data.)

For companies that had such a program in 2000, the mean lost-time workday incidence rate from 1999 to 2001 decreased by 1.02, representing a decline of 44.16 percent from the 1999 mean lost-time workday incidence rate of 2.31. In comparison, for companies without a safety incentive program in 2000, the mean lost-time workday incidence rate from 1999 to 2001 increased by 1.41, representing an increase of 41.84 percent from the 1999 lost-time workday incidence rate of 3.37. The differences were statistically significant with an F-value of 4.82 (Table 5).

However, the mean restricted workday incidence rate from 1999 to 2001 increased for both categories of companies. For companies that had a safety incentive program in 2000, the increase was 0.53, representing an increase of 29.43 percent from the 1999 mean restricted workday incidence rate of 1.80.

For companies with no safety incentive program in 2000, the increase was 0.80, representing an increase of 55.96 percent from the 1999 mean restricted workday incidence rate of 1.43. However, the differences in incidence rates were not statistically significant with an F-value of only 0.15 (Table 5).

Furthermore, the mean OSHA recordable incidence rates for companies with a safety incentive program from 1999 to 2001 reduced by 0.92, representing a decline of 15.78 percent from the 1999 mean OSHA recordable incidence rate of 5.83. In comparison, the mean OSHA recordable incidence rate for companies with no safety incentive program from 1999 to 2001 reduced by 0.18, a decline of 3.08 percent from the 1999 mean OSHA recordable incidence rate of 5.84. The differences in OSHA recordable incidence rates were also not statistically significant with a F-value of 0.74 (Table 5).

Next, the research examined differences in EMR. Since EMR reflects a three-year average of a company's safety performance, EMR for particular years was compared with respect to when each company's safety incentive program was implemented in previous years (Table 6). The mean 2001 EMR for companies that implemented a safety incentive program in 1999 was 0.773 compared to 0.849 for companies with no incentive program in 1999, a difference of 0.076. This difference was statistically significant with an F-value of 6.05.

The difference in EMR between companies with and without a safety incentive program increased with the age of the program. The 2001 EMR for companies that implemented a safety incentive program

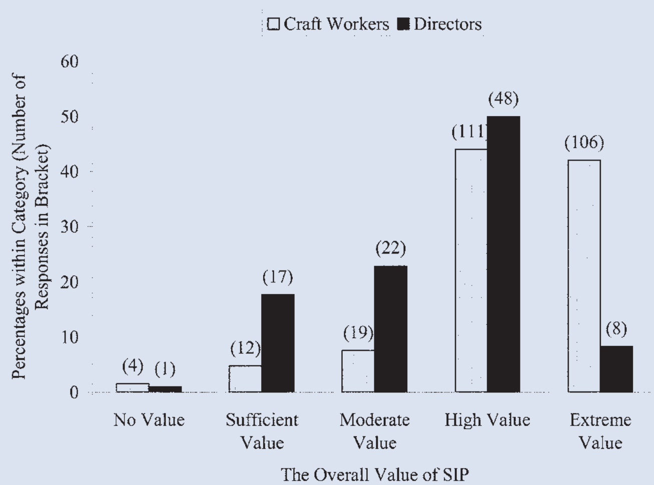
Table 11

Differences Due to Award Type

Award Type	Tangible Mean	N	Both Mean	N	df	F-Value	Sig.
Lost-time workday incidence 2001	1.13	54	2.35	24	77	2.73	0.10
Restricted workday incidence 2001	1.04	50	1.87	21	70	2.94	0.09
OSHA recordable incidence 2001	3.93	53	5.24	23	75	1.30	0.26
EMR 2001	0.82	46	0.78	24	69	1.04	0.31

Figure 2

Perceptions about SIPs: Overall Value

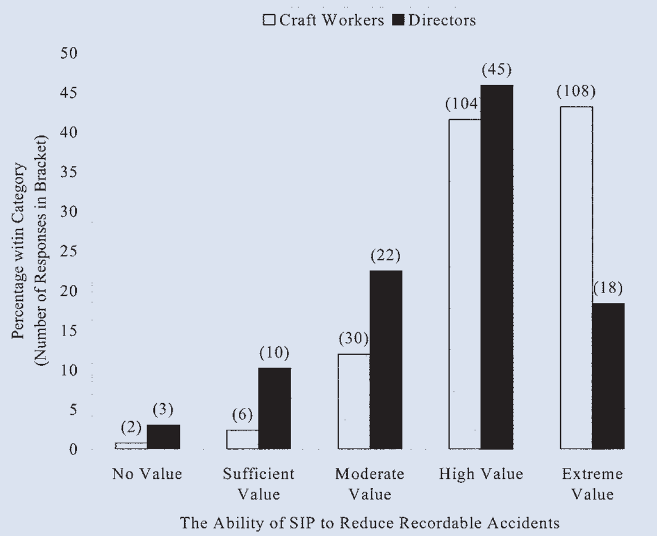


Note: Chi-square value of difference is 52.75 with 4 df and a P-value of 0.00.

in 1997 was 0.734 compared to 0.851 for companies that had not implemented a safety incentive program in 1997, a difference of 0.117. In fact, firms with a safety incentive program consistently had a lower and statistically significant different EMR for all other time periods examined in the study (Table 6). The study then examined whether changes in EMR were related to the use of a safety incentive program. As Table 7 shows, there was no statistically significant difference in EMR changes between 1997 and 2001 for the companies studied. For example, the mean EMR decreased by 0.039 for those with a safety incentive program as compared to a decrease of 0.008 for those without such a program. This difference was not statistically significant with an F-value of 0.04.

Figure 3

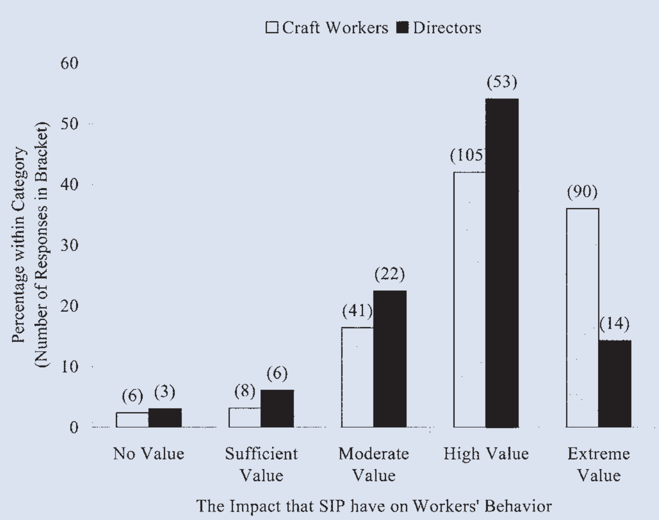
Perceptions about SIPs: Reducing Accidents



Note: Chi-square value of difference is 29.27 with 4 df and a P-value of 0.00.

Figure 4

Perceptions about SIPs: Impact on Worker Behavior



Note: Chi-square value of difference is 16.41 with 4 df and a P-value of 0.00.

Descriptive Statistics of Companies with a Safety Incentive Program

To assess whether differences existed regarding how safety incentives are implemented, the research examined differences in safety performance among just those companies that had a safety incentive program in 2001. The research examined several factors to determine whether they made any difference in safety measures among those companies with a safety incentive program: 1) who received incentives; 2) which type of incentives (injury- or behavior-based) were used; 3) the time period for awarding incentives; and 4) the type of award presented.

Forty-six companies—46.9 percent of those with a safety incentive program—evaluated only individual worker performance as an award criterion for the program. However, 44 companies—45 percent—evaluated whole-crew performance to award safety incentives. Meanwhile, eight companies—8.2 percent—did not respond to this question. The research examined whether differences existed based on who received incentives. Although companies that awarded incentives to workers only had slightly lower ratings, none of the differences were statistically significant (Table 8).

Thirty-eight companies—38.8 percent of those with a safety incentive program—based their program on injuries only, while 28 companies—28.6 percent of those with an incentive program—based their safety incentive program on behavior only. Twenty-three companies (23.5 percent) based their program on both injuries and behavior. However, nine companies, 9.2 percent of the companies with a safety incentive program, did not respond to this question (Table 9). There appeared to be little to no relation in accident rates and whether award criterion was based on injuries or behavior. Various incidence rates and EMR for 2001 were not statistically different for companies that measured injuries, behavior or both (Table 9).

Next, the research examined whether the time period during which incentives were awarded made any difference. Of 98 companies reported to have a safety incentive program in 2001, 30.6 percent awarded incentives each month; 26.5 percent rewarded employees quarterly to bi-annually; and 36.7 percent rewarded employees bi-annually or less often. Furthermore, 6.1 percent of the participants did not respond to this question. Again, various incidence rates and EMR for 2001 were not statistically different among companies with different timeframes for awarding safety incentives (Table 10).

Craft workers have a more favorable opinion regarding the effectiveness of safety incentives than do safety directors.

The research also examined whether the type of award—tangible versus intangible—made any difference. Sixty-six companies (67.3 percent of those with an incentive program) awarded tangible items such as cash, lottery, gifts and prizes. No company reported to award only intangible items such as trophies, certificates, time off and parties. However, 29 companies (39.6 percent) awarded both tangible and intangible awards (Table 11).

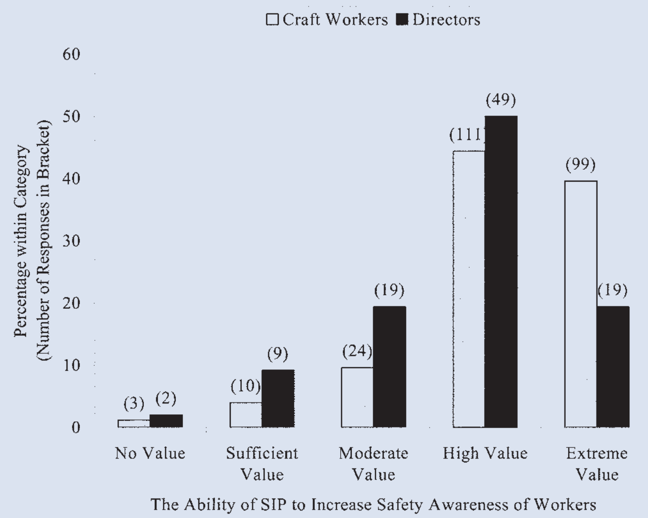
Companies that distributed only tangible awards had lower lost-time and restricted workday incidence rates than those which distributed both tangible and intangible awards. Firms that gave only tangible awards had a mean lost-time incidence rate of 1.13 and a restricted incidence rate of 1.04 compared to 2.35 and 1.87, respectively, for companies that also gave intangible awards. The statistical significance for both these differences was at or above the 90 percent confidence level (Table 11). Although companies that gave only tangible awards also had lower recordables and EMR, these differences were not statistically significant.

The managers' survey collected additional data about whether companies had other incentive programs (outside of safety); whether safety performance evaluation of supervisors was linked to safety incentives; whether a safety incentive program was changed after its inception; who attended award ceremonies; and who received incentives. For companies that had a safety incentive program in 2001, 49 percent had other incentive programs, compared to 43.9 percent with no other incentive program (7.1 percent did not respond to the question). In addition, 72.4 percent of companies with a safety incentive program in 2001 linked supervisor's performance to safety incentives, compared to 22.4 percent that did not (5.2 percent of companies with a safety incentive program did not respond).

In addition, 61.2 percent had changed their safety incentive program since it started, in comparison to 35.7 percent that had not altered their program since its inception (3.1 percent of companies with a safety incentive program in 2001 did not respond to this question). The study also examined whether the size of the incentive—as measured by its cost—had an impact on its effectiveness. In this sample of safety incentive programs, no such relation was found.

Figure 5

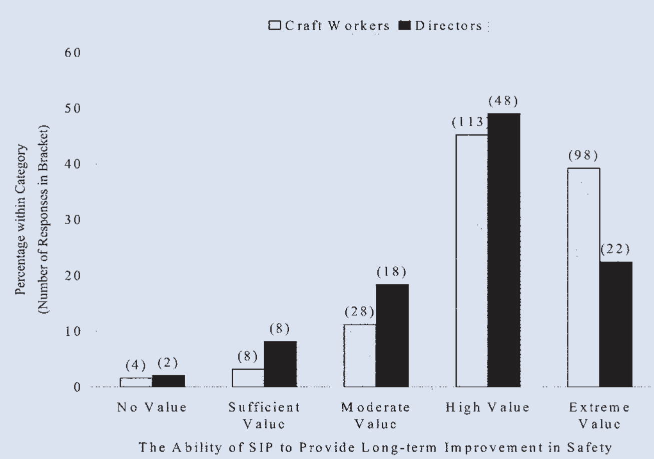
Perceptions about SIPs: Increasing Safety Awareness



Note: Chi-square value of difference is 18.13 with 4 df and a P-value of 0.00.

Figure 6

Perceptions about SIPs: Long-Term Improvement



Note: Chi-square value of difference is 12.55 with 4 df and a P-value of 0.01.

Of those with a safety incentive program in 2001, 10.2 percent awarded safety incentives to their workers only; 11.2 percent awarded safety incentives to everyone but workers; 13.3 percent awarded safety incentives to workers and foremen only; 62.2 percent awarded safety incentives to everyone—workers, foremen, superintendents, safety personnel, field engineers and even managers in some cases. None of the cited factors influenced safety performance, which was measured in terms of OSHA recordable cases, lost-time workday cases, restricted workday cases and EMR, of the companies surveyed in a statistically significant way.

Management & Craftworker Perceptions

The study also examined differences in opinion between management and workers about various issues regarding safety incentive programs. The surveys asked 165 company safety directors and other management personnel, as well as 252 craftworkers, their opinions on: 1) the overall value of a safety incentive program; 2) its ability to reduce recordable accidents; 3) its impact on worker behavior; 4) the program's ability to increase safety awareness among workers; and 5) its ability to provide long-term improvements in safety (Figures 2-6).

Figure 7

Craftworkers' Perspective of SIPs: Advantages

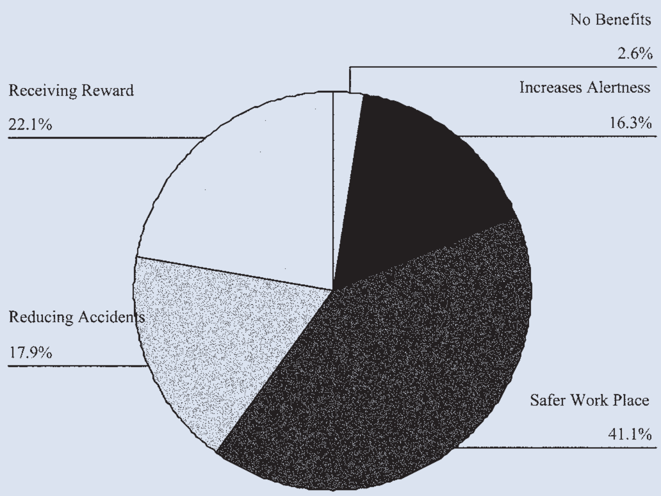
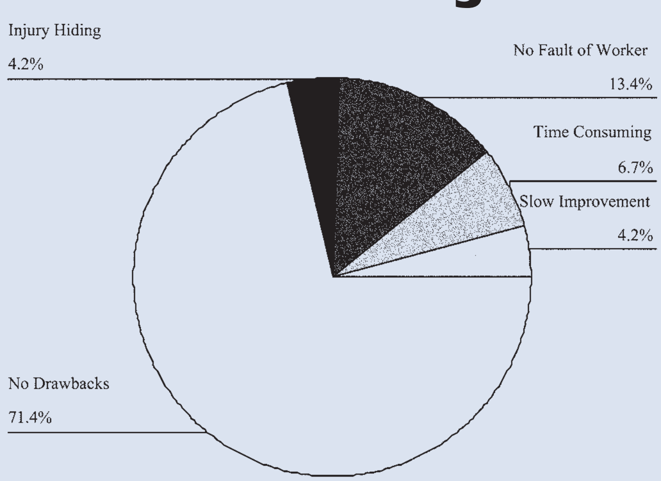


Figure 8

Craftworkers' Perspective of SIPs: Disadvantages



Overall, craftworkers have a more favorable opinion regarding the effectiveness of safety incentives than do safety directors and other managers who oversee the programs. For example, 42 percent of surveyed craftworkers indicated there was an extreme overall value in safety incentive programs compared to five percent of surveyed SH&E managers. Craftworkers had a greater overall value of safety incentive programs than was perceived by management in charge of the programs. The difference was significantly different with a chi-square value of 52.76 with 4 degrees of freedom and a P-value of 0.00.

Likewise, workers' perception about the ability of safety incentive program to reduce recordable incidence rates was more positive than that of management. The difference was significantly different with a chi-square value of 29.27 with 4 degrees of freedom and a P-value of 0.00. Workers' perception about a program's ability to change their safety behavior was also more positive than management's perception. This difference was significantly different with a chi-square value of 16.41 with 4 degrees of freedom and a P-value of 0.00.

Employees' perception about the programs' ability to increase safety awareness among workers was more positive than management's. The difference was significantly different with a chi-square value of 18.13 with 4 degrees of freedom and a P-value of 0.00. Finally, workers' perception about the ability of safety incentives to improve long-term safety performance was more positive than was management's perception. Again, this difference was significantly different with a chi-square value of 12.55 with 4 degrees of freedom and a P-value of 0.01.

Advantages & Disadvantages of Safety Incentive Programs: Worker Perceptions

To further examine the experience that workers have with safety incentive programs, craftworkers were asked to identify both advantages and disadvantages of working under a safety incentive program. The most popular advantage was making the workplace safer—indicated in 41.1 percent of total responses. This was followed by receiving the award as a benefit in and of itself (22.1 percent); reduction in accidents (17.9 percent); and increase in safety alertness (16.3 percent) (Figure 7).

Meanwhile, workers identified the most popular disadvantage as the fact that many accidents—and the resulting loss of incentive—are not the fault of workers themselves, but are the result of factors beyond their control. In addition, 6.7 percent believed safety incentive programs consume too much of a worker's time and slow production; 4.2 percent believed the programs are a slow way to improve safety; and 4.2 percent believed that these programs increase nonreporting of accidents (Figure 8). Meanwhile, 71.4 percent of surveyed craftworkers said that the use of safety incentive programs posed no disadvantages.

Conclusions

As a result of these findings, the following conclusions can be drawn.

1) Among the companies surveyed, those that have a safety incentive program have lower lost-time incidence rates, restricted incidence rates and EMRs compared to companies that do not.

2) There is some indication, as measured by differences in lost-time incidence rates, that the companies with a safety incentive program experienced a greater improvement in safety between the studied periods 1997 and 2001 compared to the companies with no safety incentive program.

3) Rewards based on crew versus individual performance, injury versus behavior performance and different time periods for giving the awards made no difference in effectiveness of the programs among the sampled companies. However, companies that used only tangible awards versus those that used both tangible and intangible awards had slightly better safety performance measures.

4) Craftworkers have a more favorable opinion of the effectiveness of safety incentive program than do company mangers.

5) While craftworkers recognize that safety incentive programs have some disadvantages, most feel there are no drawbacks and believe their greatest advantage is improving jobsite safety.

While these findings support the use of safety incentive programs to improve jobsite safety, such a program should not exist by itself. Instead, it should be part of an overall comprehensive SH&E program that not only involves workforce training but also engineers safety into the construction process. The study found that safety is improved by the use of incentives based on traditional outcome measures. The study did not examine the impact of safety incentives on worker behavior during the construction process. This is worthy of future research and could be accomplished by incorporating behavior-based safety measures. ■

Practical Applications

It is evident that companies which want to reduce their experience modification rates, lost-time workday incidences and restricted workday incidences can use safety incentive programs successfully. The study also found that various other factors, such as injury- or behavior-based incentive programs, period of incentives and kind of awards, do not change the effectiveness of safety incentive programs in a significant way. It was also found that craftworkers have a much more positive reaction to incentives than do their managers. While safety incentive programs do lead to awards being given to craftworkers, most craftworkers think that the greatest advantage of these programs is the improvement in jobsite safety.

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