

Safety in Roofing

Practices of Contractors That Employ Hispanic Workers

By Svetlana Olbina, Jimmie Hinze and Matt Ruben

IN BRIEF

- **Small construction firms, especially specialty contractors, face challenges in providing their employees with a safe work environment.**
- **One challenge relates to Hispanic workers, a population that is associated with a disproportionate number of injuries.**
- **This study focused on safety practices implemented by roofing contractors in Florida. Findings show that significant safety benefits are realized when more training is offered in Spanish to the Hispanic workers.**

Subcontractors perform 80% to 90% of the work on many construction projects, yet little research has examined subcontractor best practices in safety. Instead, most construction safety studies have focused on the general contractor level. For example, Construction Industry Institute (CII, 2010) has conducted 10 major research studies on construction safety, but only one focused on subcontractors.

Worker safety has become a subject of considerable interest in the construction industry, where many firms no longer accept injuries as being a normal part of the construction process. Many general contractors now demand that subcontractors work safely. Employees of subcontractors are

placed at risk when good safety practices are lacking, thus it is each subcontractor's responsibility to mitigate these risks.

The changing composition of the U.S. construction workforce creates unique challenges. The number of Hispanic construction workers has increased substantially in the past decade; however, little research has been conducted to identify the most effective safety practices when Hispanic workers are employed. Although fatality rates in the construction industry have declined in recent years, decreasing by 10% from 2007 to 2008 (BLS, 2010), the distribution of injuries and fatalities is not uniform among all construction workers.

For example, in 2001 (the most recent year measured), the rate of Hispanic work-related deaths from construction accidents was 62.5% higher than the rate for non-Hispanic workers (NIOSH, 2004). Understanding the cause of the disproportionate number of Hispanic construction worker injuries as well as addressing this trend is an important research goal. Construction companies must increase their efforts to provide a safe workplace for all construction employees.

The study's objectives were twofold:

- 1) Examine the safety practices of Florida roofing contractors to identify their best practices in safety.
- 2) Investigate the specific safety efforts of Florida roofing contractors to protect Hispanic employees from injury.

The research team systematically explored the current safety practices of roofing contractors, fo-

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cusing primarily on those related to the Hispanic workforce. The results could be used by roofing contractors and perhaps other subcontractors to improve their safety programs and safety performance.

Literature Review: Safety in Small Construction Firms

While subcontractors often perform 80% to 90% of the work on building construction projects, little research has been conducted concerning the best practices in safety of subcontractors in the construction industry (Hinze & Tracey, 1994). General contractors who strive to attain the goal of zero injuries must encourage their subcontractors to pursue the same objective.

Many general contractors do not provide safety training for their subcontractors but expect their subcontractors to provide their own safety training (Smith, Perry & Moyer, 2006). A study of 45 open-shop (labor organization affiliation not a factor in the employer-employee relationship) construction contractors showed that 78% of these contractors did not provide safety and health training for their subcontractors (Goldenhar, Kohler Moran & Coligan, 2001).

Roofing work is responsible for a high rate of injuries in the construction industry (Fredericks, Abudayyeh, Choi, et al., 2005; CPWR, 2006). According to Bureau of Labor Statistics (BLS, 2010) data, roofing workers are more than three times more likely to experience fatal occupational injuries when compared to typical construction workers. The primary cause of serious injuries of roofers is falls (Mundy, 2005), accounting for 26% of all cases and 75% of the fatal cases (Fredericks, et al., 2005).

A survey of Michigan roofing contractors showed that only 28% of the responding companies had established safety programs (Fredericks, et al., 2005). Programs included written policies, toolbox talks, videotapes and monthly safety meetings. The results of this study indicate that larger companies were more likely to maintain safety programs (Fredericks, et al.).

Although differences exist between the resources that a large general contractor can dedicate to safety as compared to small subcontractors, research has found that economic resources are not a barrier to making small businesses safe (Hinze & Gambatese, 2003). OSHA and NIOSH, for example, have developed a set of best safety practices that can be implemented at little cost by any size firm.

The NIOSH safety program for small companies requires a time and effort commitment rather than a monetary cost to employers. NIOSH's Fatality Assessment and Control Evaluation (FACE) Program report 98-16 recommends that employers take the following steps:

- Ensure that appropriate PPE is available and properly used.
- Develop and enforce the implementation of a comprehensive written safety program that addresses training, drug testing, emergency procedures, competent persons, hazard communications and the procedures for correcting unsafe behaviors.
- Conduct regular workplace safety inspections.

- Encourage workers to actively participate in workplace safety.

Hispanic Workers

The Hispanic population in the U.S. is increasing at the fastest rate compared to other ethnic groups (Brunette, 2004; Brunette, 2005). According to the U.S. Census Bureau (2010), people of Hispanic origin accounted for 21% of Florida residents in 2008. Hispanics constitute the largest source of labor among minority groups in 8 of 13 industry divisions (Jaselskis, 2005).

Besides agriculture, construction is the industry sector with the highest proportion of Hispanic workers (Brunette, 2004; O'Connor, Loomis, Runyan, et al., 2005; Smith, et al., 2006). In 2003, construction accounted for more than 50% of the total increase in the employment of Hispanic workers (Tinajero, 2005), with 38% of the construction laborers being Hispanic (Jaselskis, 2005).

In the early 1990s less than 10% of worker deaths in the U.S. were attributed to Hispanic workers, while in the past 5 years they have accounted for more than 16% of the fatalities (BLS, 2010). Although overall injury rates have been declining in the construction industry, injury rates among Hispanic construction workers have increased (Barnes, 2005; Minette, 2005; Smith, et al., 2006).

Dong and Platner (2004) showed that in 2000 Hispanic deaths accounted for 23.5% of the deaths in construction, while in the same year Hispanic workers constituted less than 16% of the construction workforce. From 1996 to 2001, more than 30% of the Mexican-born worker fatalities were construction-related (Loh & Richardson, 2004).

Hispanic construction workers experience a disproportionate number of injuries and fatalities compared to non-Hispanic workers (Brunette, 2004; 2005; Goodrum & Dai, 2005, O'Connor, et al., 2005). In 2001 the rate of Hispanic construction worker deaths was 19.5 per 100,000 full-time workers—62.5% higher than the rate of 12.0 for non-Hispanic construction workers (NIOSH, 2004). Roofing is one area in which many Hispanic workers have found employment (Brunette, 2004; O'Connor, et al.).

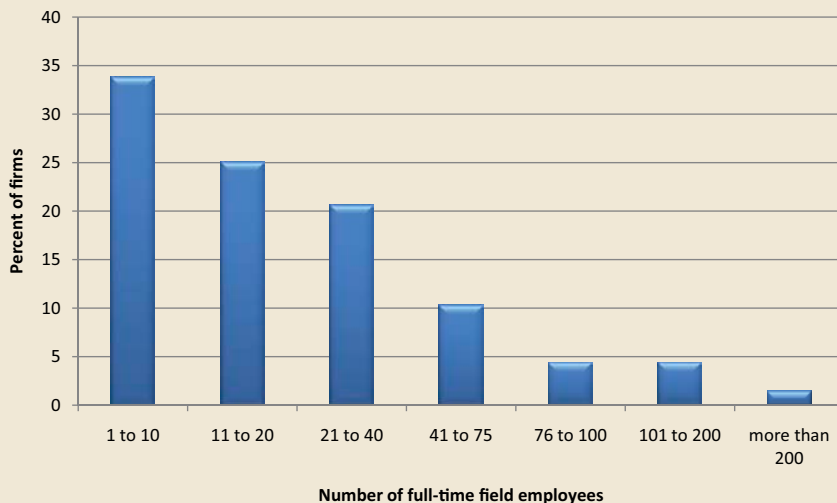
One possible reason for high injury rates among Hispanic workers is their lack of proficiency in English (Pierce, 2003; Brunette, 2004; Goodrum & Dai, 2005; O'Connor, et al., 2005; Minette, 2005; Mullen, 2006; Smith, et al., 2006). About 25% of the fatalities OSHA investigated were in some way related to language or cultural barriers (Henshaw, 2004).

In 2000, one-third of Hispanic construction workers spoke only Spanish (Dong & Platner, 2004). If workers cannot understand instructions in English, the conditions in the workplace can become unsafe (Goodrum & Dai, 2005). For example, in 2002, 25% of fatal workplace incidents involved either workers who did not speak English or a supervisor who was not able to communicate with workers in their language (Tinajero, 2005).

Approaches to overcome the language barriers in construction include:

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Figure 1
Size Distribution of Responding Roofing Contractors



Note. N = 68

Nearly 80% of the respondents to this survey can be described as small firms, meaning those with 40 or fewer employees.

- Provide bilingual training programs for supervisors and workers (Smith, et al., 2006).
- Hire Hispanic safety trainers who are native speakers (Vazquez & Stalnaker, 2004; Brunette, 2005; O'Connor, et al., 2005; Smith, et al., 2006).
- Employ bilingual supervisors for Hispanic crews (Sanders-Smith, 2007; Quackenbush, 2007).
- Provide voluntary English classes for Hispanic construction workers (BLR, 2002).
- Translate safety training materials into Spanish. Provide dual-language (English/Spanish) training materials (Barnes, 2005; Brunette, 2004; Brunette, 2005; Minette, 2005; Smith, et al., 2006).
- Provide training materials that include graphics, photographs, illustrations and videos (Brunette, 2005; Smith, et al., 2006; Mullen, 2006).
- Provide training in a language and at a literacy level that can be understood (Brunette, 2004; 2005; Smith, et al., 2006; Mullen, 2006; Sanders-Smith, 2007).
- Involve Hispanic workers in the development of safety training materials (Brunette, 2004; 2005).
- Mentor new Hispanic employees with experienced, bilingual, well-trained coworkers (O'Connor, 2005; Goodrum & Dai 2005).
- Implement aggressive construction safety training programs among Hispanic workers (O'Connor, 2005).

Language barriers affect not only communication but also safety training, because most training is typically provided in English, without translation (Goodrum & Dai 2005). Nissen's (2004) study shows that 50% of responding workers stated that their employers conducted weekly safety meetings; 80% of those meetings were delivered in English while 20% were delivered in the workers' native language.

O'Connor, et al. (2005), found that workers with little or no knowledge of English were less likely to receive any safety training and less likely to receive more than 1 hour of training compared to the workers with basic or better knowledge of English.

Significant numbers of Hispanic workers are illiterate, even in their own language (Brunette, 2004). Often, Hispanic workers are routinely injured by construction hazards for which simple control strategies could be employed. More emphasis should be given to research that would improve the understanding of language barriers and develop a safety training approach based on the complex context rather than providing simple translations to Spanish (Dong & Platner, 2004; Brunette, 2004).

To effectively address the safety of Hispanic employees, construction companies must consider the work environment that existed in the native countries of those employees (Brunette, 2005). Many countries have no powerful safety regulatory agency such as OSHA, and workers were provided little or no safety training. These experiences can negatively affect the safety culture of Hispanic workers in the U.S. construction environment.

Study Methodology

A survey was developed to investigate the safety practices of Florida roofing contractors to examine their experiences with Hispanic employees. The survey was primarily based on the literature review and on information obtained through prior studies conducted with the Florida Roofing, Sheet Metal and Air Conditioning Contractors Association (FRSA). FRSA represents a large number of roofing contractors in Florida, including both large and small enterprises throughout its eight districts. Firms that are not FRSA members tend to be small roofing firms.

Two local roofing contractors helped develop the survey, and their feedback was incorporated into the final version. The survey instrument consisted of 36 questions. It requested demographic information about each responding company; safety practices implemented by the respondents; information on company experiences with Hispanic employees; and information on the safety performance of each responding firm.

Since Fredericks, et al. (2005), conclude that small firms were less likely to spend funds on safety, questions about safety program components emphasized those that were not costly. Information from which the OSHA recordable injury rate (RIR) could be computed was also requested. Once the survey was completed, formal approval to conduct the study was obtained from the University of Florida Institutional Review Board.

FRSA agreed to distribute the survey via fax to all of its roofing contractor members. The organization

indicated that it had approximately 500 contractor members. Seventy-one survey responses were received, of which three did not provide sufficient information to be included. This yielded a response rate of 13.6%. The data were analyzed with Statistical Package for the Social Sciences (SPSS), v. 17.

In a few instances, respondents did not answer specific questions. These surveys were not used when certain responses were summarized. Because of the lack of information, some RIR calculations were computed for only those respondents that provided adequate information. The number of valid responses is shown for each unique finding.

Survey Results

A total of 68 completed surveys were included in the final analysis. Nearly 80% of the respondents can be described as small firms, herein defined as firms with 40 or fewer employees (Figure 1). Large roofing contractors were defined as those with more than 40 employees.

These employers self-performed most of the work on their projects, with 75% of the respondents indicating that they performed more than 95% of the work (i.e., little work subcontracted). Some respondents employed no Hispanic workers and some employed only (100%) Hispanic workers. In addition, half of the respondents stated that more than 25% of their employees were Hispanic, with 10% stating that more than 75% of their employees were Hispanic. The average percentage of Hispanic workers was 31.8%, with 20.9% of those workers speaking no English.

As noted, the RIR was computed from information provided by the respondents, namely the number of employees and the number of injuries sustained that required treatment by a physician. RIR is a ratio that represents the number of injuries sustained in 1 year by 100 employees.

Among respondents, the average RIR was 9.44 with a low of 0 and a high of 50. It was determined that the size of the firm was related to the resultant RIR, namely, large firms tended to have better safety records. For small firms (40 employees or fewer), RIR was 10.76, while large firms reported an average RIR of 5.11.

Survey responses provided information on typical safety practices being implemented. These practices are among the more basic strategies implemented in the U.S. construction industry. The extent of implementation varies, but it is evident that the practices are not uniformly or universally adopted.

Of the various practices, drug test-

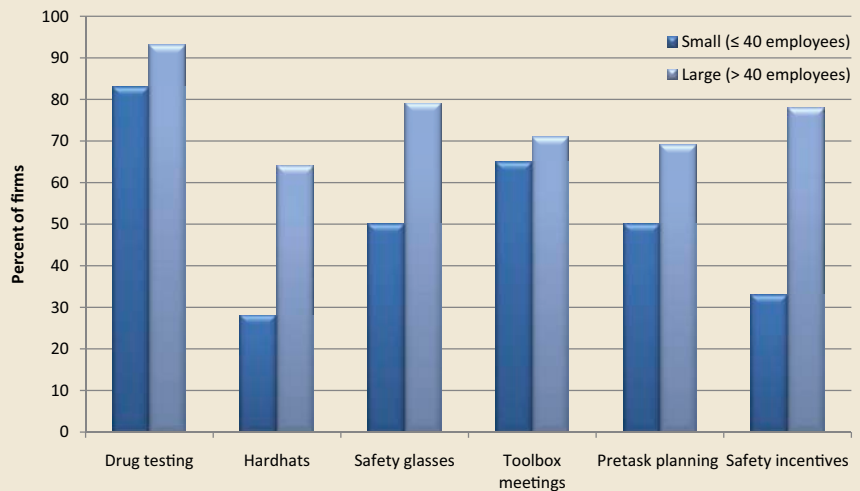
ing was the most widely (85.3% of respondents) implemented among the roofing contractors. Of the various safety practices examined, the least implemented practice (35.8%) was requiring all field employees to wear hardhats. Approximately half of the roofing contractors employed full-time safety directors, prepared project-specific safety plans for every project, and provided orientation training to all new employees.

More than 80% of respondents had implement-

More large firms implemented safety practices. Firms with better safety records had safety directors who spent more time in the field.

Figure 2

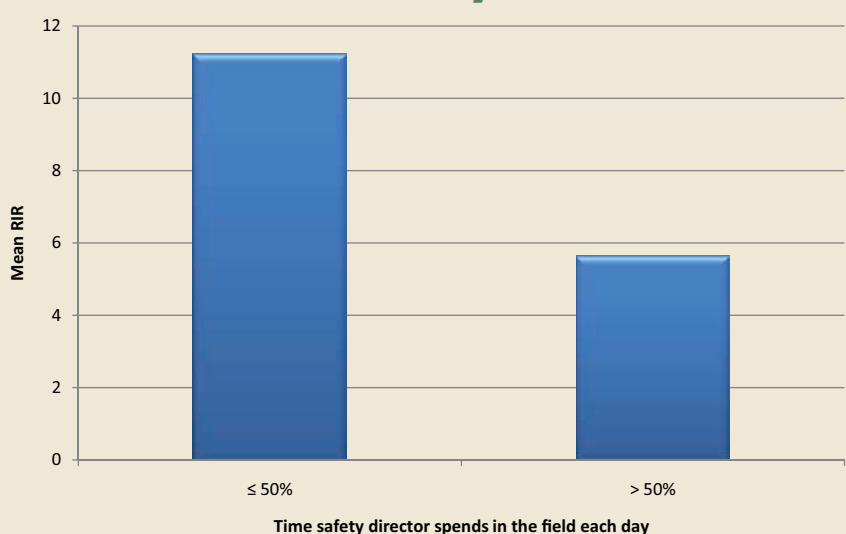
Differences in Implementation of Safety Practices by Size of Firm



Note. N = 65

Figure 3

Time Safety Director Spends in the Field & Safety Performance



Note. N = 32

Four practices were found to have a significant effect on safety performance. The cumulative effect of these four elements were further analyzed.

ed drug testing and nearly 70% conducted toolbox meetings, and these practices did not vary appreciably between firms of different sizes. It was noted that a larger proportion of the large firms implemented select safety practices, including the requirements to wear hardhats, wear safety glasses, conduct pretask planning meetings and use safety incentives (Figure 2, p. 47).

It was especially true for the requirement to wear hardhats and the use of incentives that more than twice the percentage of the large firms implement-

ed these practices than the small firms. As noted, the large firms surveyed had better safety records.

While only half of the responding firms employed full-time safety directors, information was obtained on the amount of time they spent in the field. Nearly 75% of the safety directors spent less than 50% of their time in the field. The firms with the better safety records had safety directors who spent more than 50% of their time in the field (Figure 3, p. 47). A test of the means of RIR values showed that the differences in these injury rates are statistically significant at the level of $p < 0.05$.

Various safety practices were examined to identify those that had a strong influence on safety performance. Four practices were found to have a significant effect on the safety performance of all respondents, namely the requirement to wear hardhats, conducting toolbox meetings, conducting pretask planning meetings and preparing project specific safety plans (Figure 4). Results showed that firms which implemented these practices had statistically significant better safety performances than those that did not.

The four safety program elements (Figure 4) were considered for further analysis. Since the information was a binary variable (the practice either was or was not implemented), the research team evaluated the cumulative effect of these practices. A scoring system was developed that utilized the four practices.

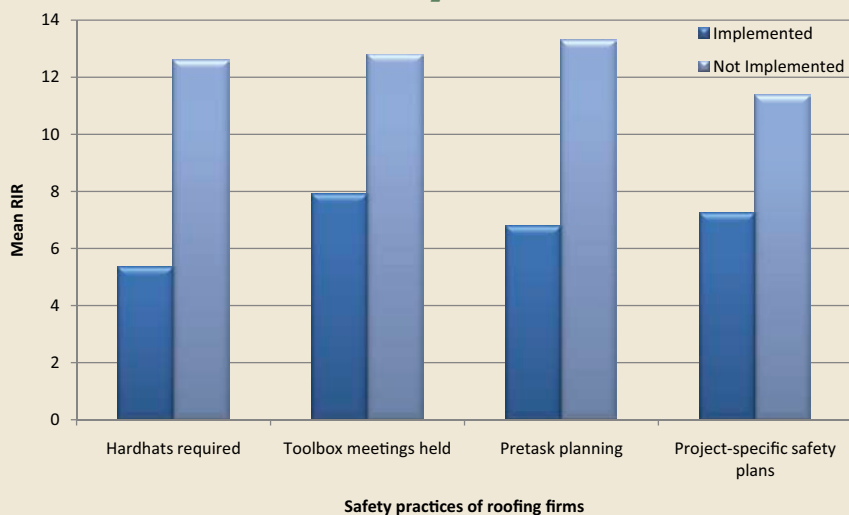
To derive a score, a value of 1 was assigned for each practice implemented, while a value of 0 was assigned for each practice not implemented. Thus, a firm that implemented all four select practices would receive a score of 4, and a firm that implemented none of these practices would receive a score of 0. A higher score would be inferred as meaning that a firm was more aggressive about safety, on the basis of the implementation of these practices.

The score was then compared to the associated safety performances (Figure 5). An analysis of the score values and the OSHA recordable injury rates showed that the Kendall's correlation coefficient of -0.305 was statistically significant at the level of $p < 0.01$.

Further analysis focused exclusively on small firms. Previous studies have consistently found that safety training is an important component of an effective safety program. While the measures of training quality are difficult to assess, the survey questionnaire asked about the duration of the training offered, including both orientation training and specialized training that was provided each month (beyond orientation).

Figure 4

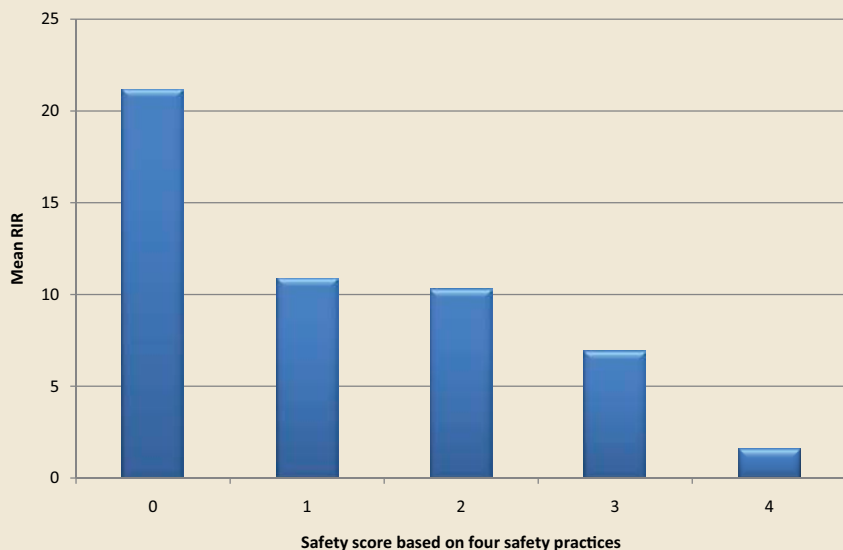
Implementation of Select Safety Practices & Safety Performance



Note. $N = 62$

Figure 5

Safety Scores & Safety Performance



Note. $N = 58$

Results show that the duration of training ranged from 30 minutes to 40 hours, with a median of 2 hours. Findings show that injury rates improved (declined) as the number of hours of training were increased (Figure 6). The differences between the average RIR values of firms that conducted orientation for more than 2 hours and those that conducted orientation for up to 2 hours were found to be statistically significant at the level of $p < 0.001$.

Respondents were asked about the makeup of their employee workforce, namely the percentage of the workforce that consisted of Hispanic workers. Respondents provided information by which the RIR of Hispanic workers could be determined. It was determined that the average RIR of Hispanic workers was 18.05 while the average RIR of non-Hispanic workers was 10.20 (Figure 7). The differences in these values are statistically significant at the level of $p < 0.001$. That is, the injury rate of Hispanic workers was higher than for non-Hispanic workers among the surveyed contractors.

Since a significant difference existed between the safety performances of Hispanic workers and non-Hispanic workers, the data were examined to try to isolate contributing factors. Since respondents were asked to provide information on the percentage of the workforce that was Hispanic, this variable was considered; however, a correlation test between the RIR and the percent of the workforce that was Hispanic did not reveal any significant association.

It was noted that 21% of the 51 small firms that employed at least one Hispanic worker had a requirement that every employee must understand English. Further consideration was given to the workforce competency in English. Since the percentage of workers who spoke no English was provided by the respondents, the data were examined to determine whether English competency was related to safety performance.

A simple assessment was made by comparing the injury rates of firms that employed no workers who spoke no English, with those that employed up to and including 50% non-English-speaking workers, and those that had a workforce where more than 50% spoke no English (Figure 8, p. 50). The differences between the average injury rates were statistically significant at a level of $p < 0.001$. That is, English competency appears to be related to safety performance.

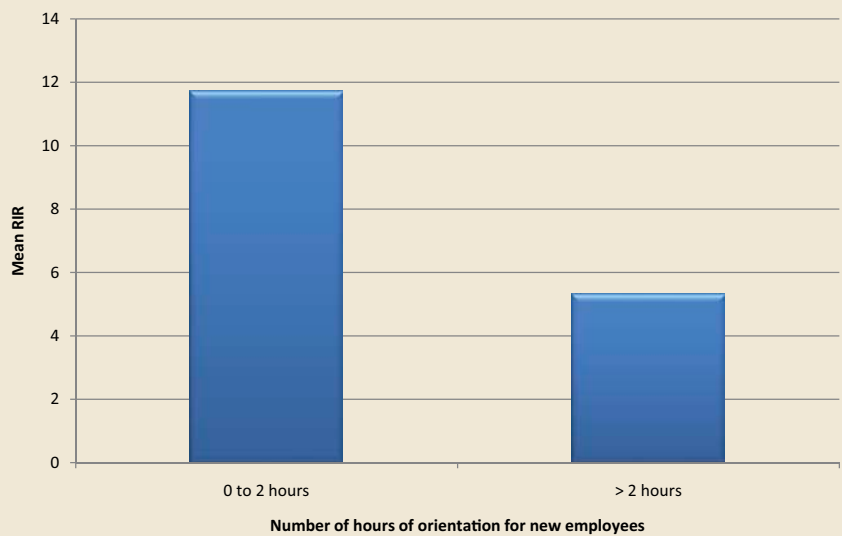
A general observation was that the large firms implemented more programs to accommodate Hispanic workers than did the small firms. In this study, large firms were more likely to offer employee

training in Spanish; have a larger proportion of bilingual managers; and employ more workers who could not understand English. The only practice adopted by some small firms, but few large firms, was the requirement for employees to understand English as a condition of employment. Note that these practices were not found to be associated with differing safety performances.

More than 80% of respondents employed His-

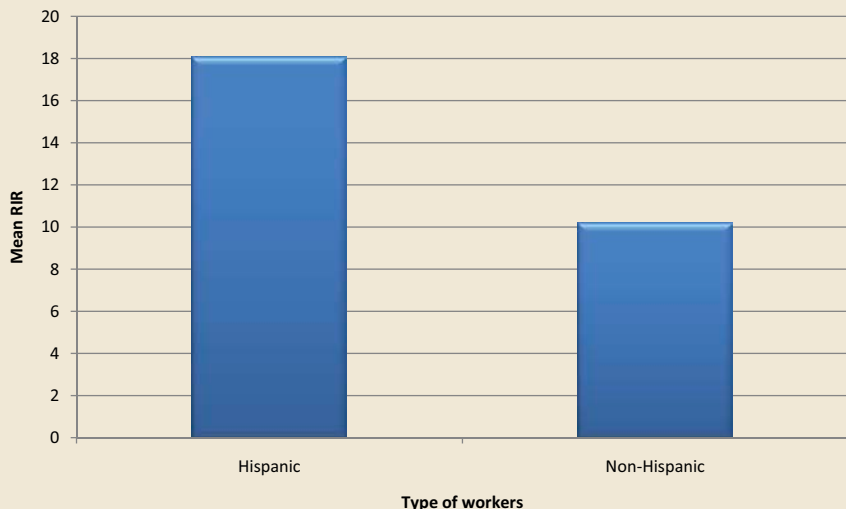
Injury rates improved as the number of hours of training increased. The team also found that the injury rate was higher among Hispanic workers.

Figure 6
Hours of Training & Safety Performance



Note. $N = 47$

Figure 7
Injury Rates of Hispanic & Non-Hispanic Workers

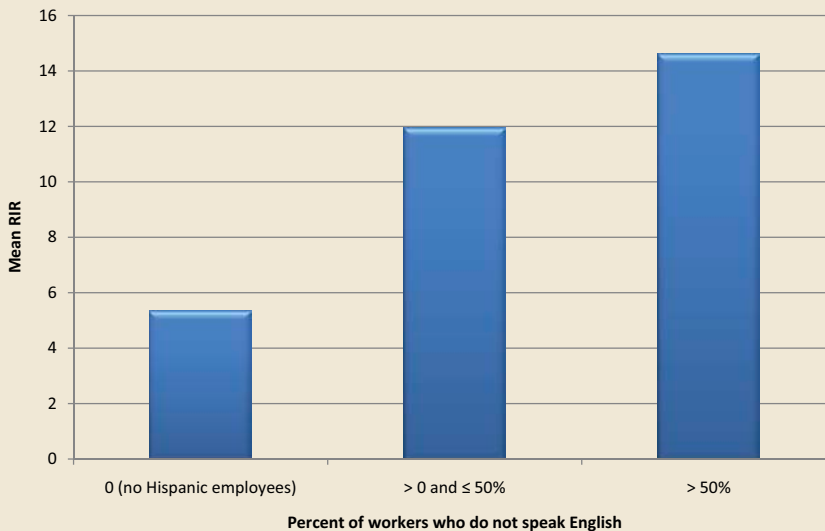


Note. $N = 49$

Injury rates were compared based on the language skills of the contractors' workers.

Figure 8

Percentage of Workers Who Speak No English & Safety Performance



Note. N = 51

panic workers. Since it is generally accepted that training is important to ensuring good safety performance, the contractors were asked about the amount of training offered in Spanish, recognizing that some employees speak no English. Results showed that more than half of the firms offered all training materials in both English and Spanish.

On the other hand, some firms with employees who spoke no English provided little or no training in Spanish. The practice of providing training in Spanish was related to safety performance; namely, the firms that offered most of their training in both English and Spanish had better safety performances than firms that delivered less than half of their training in Spanish (Figure 9). The differences of RIR values of firms that offered all training in Spanish and those that offered no training in Spanish were statistically significant at the level of $p < 0.001$.

Respondents were asked about the amount of funds they expended on safety training. Thirteen respondents did not provide any estimate of training costs. A few respondents commented that these expenditures could not be estimated with accuracy, especially when in-house training was provided.

Nonetheless, rough estimates were requested and, to make comparisons between the different firms, the monetary amounts were represented in annual costs of training per employee. Most firms (74.5%) spent \$300 or less per employee annually on training. Firms that spent more than \$300 per employee on safety training included half of the firms with no Hispanic employees and 22.5% of the firms with Hispanic workers (i.e., firms with Hispanic employees spend less on safety training).

As noted, a major component of this study was related to the experiences that firms had with

Hispanic workers. Contractor opinions were solicited through Likert-type responses to several questions. The topics included the productivity of Hispanic workers; whether these workers could be accommodated without learning any English; problems encountered because of language barriers; and whether Hispanic workers take more risks than non-Hispanic workers.

In general, few of the respondents strongly agreed or strongly disagreed with any of the statements. A considerable number of respondents dis-

agreed with the statement that Hispanic workers could be accommodated without learning English and the statement that Hispanic workers are more likely to view injuries as a natural part of their job.

Respondents were asked about their Hispanic workers and their level of compliance with company safety practices. While most respondents stated that they complied at the same level as non-Hispanic workers, one-fourth of respondents expressed some concern about this issue.

For example, when asked whether their Hispanic workers more regularly followed the company safety practices than non-Hispanic workers, 5% said yes; 68.3% said they follow procedures equally; and 26.7% said no. These responses imply that there is at least some concern about the level of compliance which some contractors observe among their Hispanic employees.

Since many Hispanic workers do not speak English, the survey inquired about the proportion of managerial personnel in the firm who spoke Spanish. The results show that more than half of the respondents with Hispanic employees had no more than 10% of their managers who spoke Spanish, while 10% indicated that more than half of their managers were bilingual.

Conclusion

This study investigated safety practices of small roofing contractors and their efforts to protect Hispanic construction workers from injury. Better safety performances were recorded when implementing such safety practices as requiring workers to wear hardhats, conducting pretask planning meetings, preparing project-specific safety plans and conducting regular toolbox safety meetings.

Large firms reported better safety performances and these firms also implemented more safety programs. Lower injury rates were also noted in firms where the safety directors spent most of their time on the jobsites.

Confirming the findings of other research, this study showed that Hispanic construction workers have poorer safety performances than non-Hispanic workers. Language barriers are among the possible reasons for these higher injury rates. Many Hispanic workers speak little or no English.

In addition, most supervisors on construction sites do not speak Spanish. This creates a communication problem resulting in little, inadequate or no safety training being provided to Hispanic workers who are not proficient in English. This study shows that the injury rates of Hispanic workers were significantly reduced when the safety training is offered in Spanish.

This study focused on the roofing contractors who were FRSA members. The findings are, therefore, limited to Florida roofing contractors, which tend to be small contractors by most standards. Further study could determine the extent that the findings apply to other types of contractors or to roofing contractors in other locations.

Recommendations

Subcontractors, regardless of size, should place greater emphasis on their safety programs. This survey identified some simple safety practices that all subcontractors can implement regardless of their economic resources.

Additionally, subcontractors should implement the same safety approaches for all workers (that is, Hispanic workers should receive the same consideration when it comes to safety as non-Hispanic employees. Employers should expend the effort to understand their Hispanic workers' background, beliefs, customs and culture so that employers can adjust their safety approaches to accommodate Hispanic workers accordingly.

Employers have a responsibility to not only check immigration status when hiring Hispanic workers, but also to help them assimilate into their workforces and protect them from injury. This

will require a concerted effort to encourage Hispanic workers to question authority in situations where unsafe practices or conditions are encountered. This will require a sustained effort to convince the workers about the company's sincerity about its commitment to safety.

Additional research should focus on subcontractors' safety programs. A study on safety practices of other subcontracting trades should be conducted to determine whether the benefits of any particular safety practices are associated with specific trades. If this were to occur, a set of best safety practices by trade could be developed. A case study should be conducted with several subcontractors of different sizes that do not currently use many safety practices. These firms would be asked to implement select safety programs.

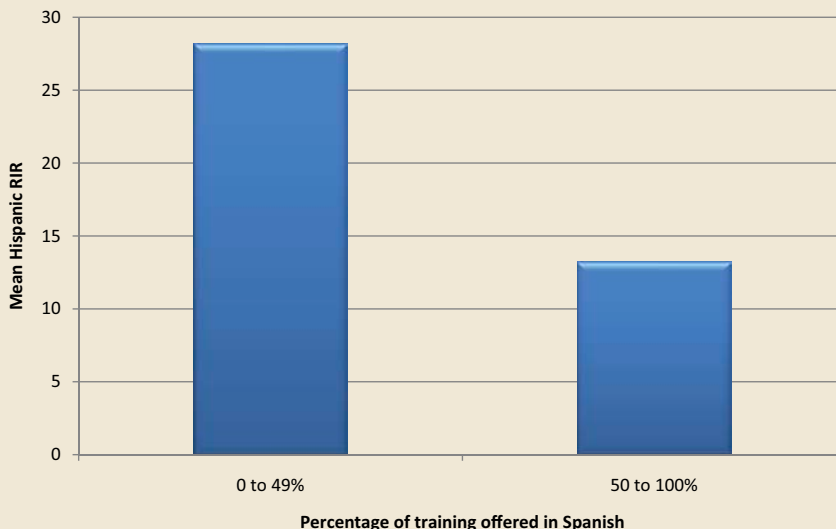
The objective would be to investigate how these subcontractors initiate and follow through the implementation of a new safety program. Safety initiatives could include a requirement to wear safety glasses; implement drug testing; employ a safety director with direct involvement in field operations; provide new worker orientation; and monitor the firm's safety record.

Further research on Hispanic worker safety is needed. For example, Hispanic workers and their employers could be interviewed to investigate their experiences on the jobsite, their feelings about safety, experiences in their native countries and their ability to identify risks, and to obtain their thoughts on how safety programs can be modified to make them feel protected and part of the team.

Employer interviews could examine employers' perceptions about their Hispanic workforce. This could include, for example, employers' perceptions

Figure 9

Amount of Training Offered in Spanish & Safety Performance



Note. N = 37

The firms that offered most of their training in both English and Spanish had better safety performances than firms that delivered less than half of their training in Spanish.

about the Hispanic culture; employers' ability to provide instruction in Spanish; and thoughts on how Hispanic workers identify and deal with hazards on construction sites.

Results of these interviews could be used to create a safety program that would teach Hispanic workers to identify and mitigate hazards. Results could also help employers understand the perceptions of their Hispanic workers so that they can communicate more efficiently about jobsite safety with their Hispanic workers. **PS**

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