

September 4, 2007

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Dear Dr. Kohler:

Please find the enclosed report, "Construction Safety Training Issues for New Construction Employees and Hispanic Construction Workers". This report is submitted to document the findings of CDC-NIOSH Contract Number 211-2005-M-13126.

We appreciate the support provided by NIOSH, and will acknowledge NIOSH's support in all publications related to this research. We look forward to publishing the findings of this research at both a construction conference and a health science conference. The findings of this research have are significant in both fields.

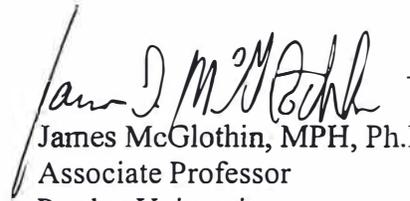
This research was a preliminary study, and identified areas that would benefit from additional research and study, including safety training for new employees and Hispanic workers. We would be interested in discussing the potential for follow up research, if these topics align with NIOSH's priorities.

Please do not hesitate to contact us if you have any questions or would like to discuss the research findings. Thank you again for the opportunity to conduct this research.

Best regards,



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Construction Safety Training Issues for New  
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## ABSTRACT

A large number of workplace fatalities occur in the construction industry. Many of these fatalities occur when workers are new to construction and have little experience, suggesting that adequate safety training programs are a necessary part of construction work. However, it is also important that safety programs are targeted to and understood by employees new to the construction industry, and by the different groups forming the construction industry. Hispanic construction workers are a growing group that, due to the increasing number of fatalities in this group, needs to be targeted.

To address these segments of the construction work force, two groups were interviewed. The first group consisted of construction interns, many of whom had never worked on a construction site. The results of these studies indicate that safety training can play an important role in safety and can familiarize new employees with potential construction hazards. Results indicate that safety training can be enhanced by explaining construction terminology and concepts during the training. Results also indicate that language barriers on the construction site may have negative impacts on safety. This finding motivated additional surveys of Hispanic construction workers.

The second group surveyed in this research consisted of Hispanic construction workers in Louisiana. The results indicate workers' perceptions of construction safety, levels of safety training, familiarity with construction terms, and population characteristics. The survey found that most Hispanic construction workers were between 25 and 34 years old. Nearly 60% did not have a high school degree, and 45% had less than five years of experience in construction in the U. S. Sixty percent had not worked in the construction industry prior to working in Baton Rouge or New Orleans, Louisiana. Fifty-one percent of the Hispanic workers considered falls from heights to be the main cause of accidents, yet 57% of those surveyed said worker carelessness was the main cause of construction related accidents. Fifty-eight percent of the Hispanic workers had not taken any formal training in construction safety. That said, most Hispanic workers who did take training said that the training was given in Spanish or in both English and

Spanish (90%). Only 20% of those surveyed understood any construction terminology. This pilot survey implies that it may be incorrect to assume that the large number of fatalities for Hispanic construction workers is due to lack of available training programs in their language. What may be lacking is the proper safety training format and tools (e.g., in the form of story book examples combined with OSHA 10-hour safety training terminology) for Hispanic construction workers. Additional research is needed in order to understand and to implement effective safety training strategies for Hispanic construction workers.

## INTRODUCTION

The construction industry is responsible for many on-the-job fatalities. According to the CDC, the construction industry has only about 6% of the total number of U.S. workers, but 20% of the fatalities [1]. Because of the nature of the work and the working conditions, there is potential for employees to find themselves in hazardous situations which may turn into fatalities. Many of these fatalities occur when workers are new to construction and have little experience. This finding suggests that adequate safety training programs are a necessary part of construction work. It is also important that these safety programs are targeted to and understood by the different groups forming the construction industry. Hispanic construction workers are a growing group that, due to the increasing number of fatalities in this group, needs to be targeted.

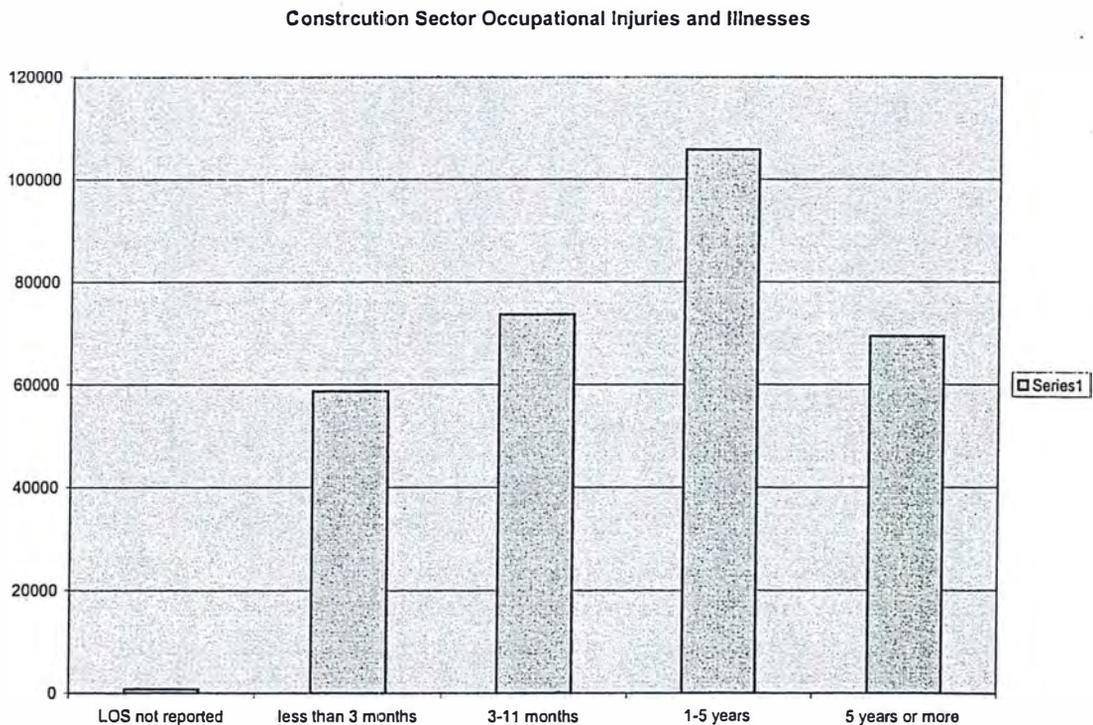
To learn more about new workers on the construction site, a series of three surveys was conducted with student interns in the construction industry. Students completed surveys 1) prior to OSHA 10-hour safety training, 2) after OSHA 10-hour safety training and before working on the construction site for their first internship, and 3) after working on the construction site for their first internship. The results of these surveys indicate both benefits and limitations of existing training. One significant limitation of existing safety training is that it requires an understanding of construction terminology that many inexperienced workers do not have. Survey results also indicate potential language barriers that may compromise safety on many construction sites. This finding motivated additional research regarding the safety training of Hispanic workers.

For this research, two groups of Hispanic construction workers in Louisiana were interviewed. The first group of participants, in New Orleans and Baton Rouge, was interviewed by students from Louisiana State University. The second group of participants, in New Orleans, was interviewed by students from Louisiana State University and Purdue University.

The information obtained in these interviews was analyzed to determine the characteristics of the Hispanic workers in that area, as well as their thoughts on and levels of safety training.

# BACKGROUND

The construction industry has the largest number of work related deaths of any industry in the United States [1]. As illustrated in Figure 1, multiple studies suggest that workers may be most vulnerable to construction injuries and fatalities at the beginning of their career in construction, when they have the least experience on the construction site [2]. Construction accidents reduce construction productivity, increase construction costs, and result in both direct and indirect costs to the construction industry to society. The Purdue University Construction Engineering and Management (CEM) program places many inexperienced student interns on construction job sites every summer. For this reason, there is a unique opportunity to evaluate safety training techniques for new employees without prior construction experience.



**Figure 1 Construction Sector Occupational Injuries and Illness**

In order to evaluate safety training principles for new workers on the construction site, a group of 65 Construction Engineering and Management (CEM) and Civil

Engineering students were surveyed multiple times during the process of preparing them for their first internship and after their construction internship experience. It is a requirement of the CEM program that students take an OSHA 10 hour training course prior to working on their first internship. The CEM program has an outstanding record of safety with their interns, however, prior to 2002 students did not receive any formal safety training before their first internship. This raised a concern with the CEM Internship Director and the CEM Industry Advisory Board since very few students have had any exposure to a commercial construction site prior to their internships (17 percent in 2005). Multiple types of safety training classes were evaluated to determine courses that prepared the students for safety on the construction site. In 2004 the CEM Industry Advisory Board recommended that the CEM program use the OSHA 10 hour safety training course. This industry recommendation was based on the fact that the OSHA 10 hour course covers a large breadth of material for the many types of job sites that the students will experience. It is also an industry standard for initial safety training for the construction industry.

After initiation of the required safety training program into the curriculum, many students were very concerned that they did not understand the material being presented. The Purdue engineering students participating in construction internships have a high level of education and achievement in a very challenging engineering curriculum. They have the ability to understand the concepts, however, they were not familiar with the construction terminology used in the OSHA 10 hour training. They were also not familiar with many of the construction techniques that were presented to emphasize many of the safety concepts. Multiple safety trainers were used to determine if it was a trainer specific issue. The results were consistent amongst the three trainers that were used over a three year period implying that this student comprehension was not specific to the trainer. The research objective for this project was to identify safety issues related to new employees on the construction site.

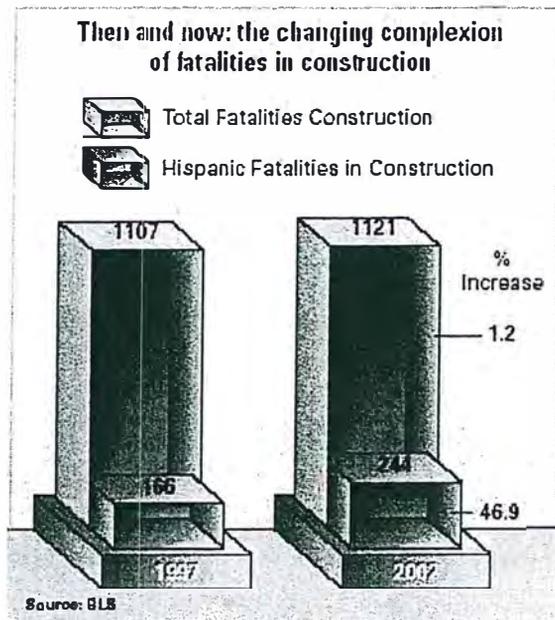
Due to the type of tasks performed in construction, employees can sometimes find themselves in hazardous situations which may result in fatalities. The most common causes of fatalities in the construction industry include:

- Being struck by an object. This occurs when workers are hit by sliding, falling, or rolling objects [3].
- Falls. Falls are especially dangerous in construction, illustrated by the finding that 88% of fatal falls involve construction workers [3]. Most falls in construction occur primarily in residential and commercial construction, and occur because workers did not correctly assess the possibility of hazards [4].
- Electrocutation. This is a hazard not only for those directly working with electricity, but also for other types of construction workers who may be working too close to power lines, or working on equipment without previously using lockout/tagout [4].

Although it may be easy to blame the construction environment for the accidents that take place, usually safety violations are due to employees' unsafe acts, such as not using the necessary safety equipment [7]. Workers' risk perception is sometimes incorrect, and they tend to think that certain situations "will not happen to them" [9]. This incorrect assessment of possible hazards occurs in untrained workers [8]. Therefore, safety training is very important and should be provided to construction workers.

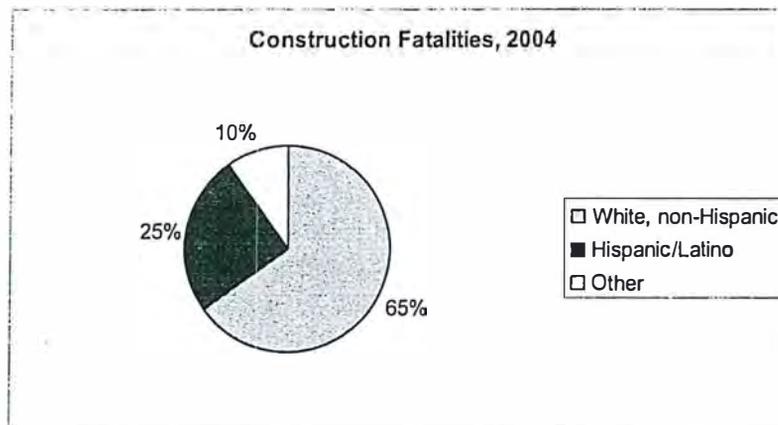
The number of Hispanic workers in the construction industry, as well as the fatalities in this group, has been growing [3]. In fact, the construction industry is responsible for the largest number of fatalities in Hispanic workers [8].

Due to the increasing number of fatalities in this group, Hispanic construction workers is a population that needs to be targeted. To illustrate, in 2004, the construction industry had more fatal work injuries than any other industry sector [3], but while fatalities for all construction workers increased 1.2% since 1997, fatalities for Hispanic workers increased 46.9%, as shown in Figure 1 [7].



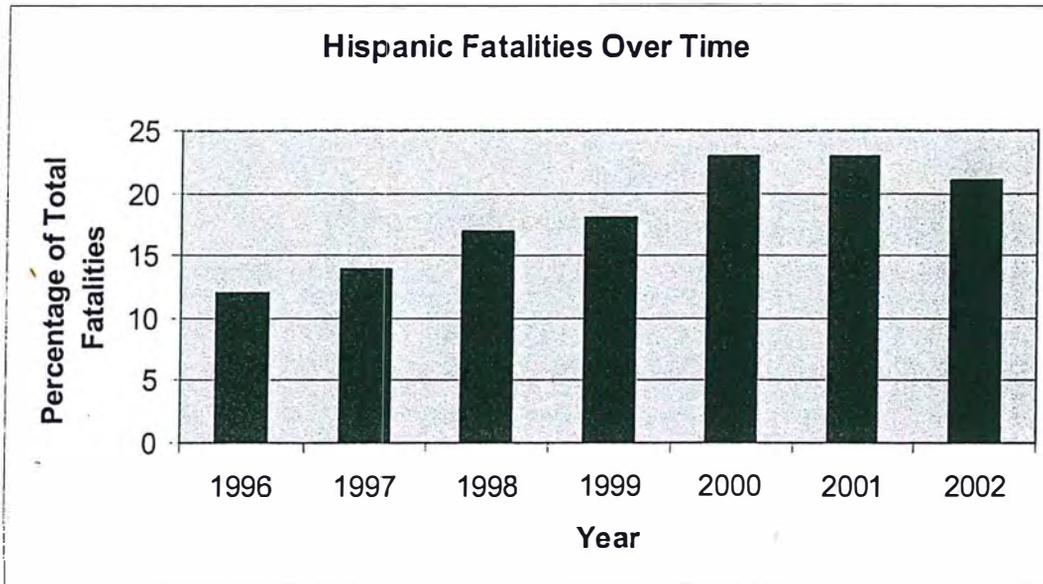
**Figure 2 Fatalities in Construction**

25% of the total number of construction fatalities occurred in this population (Figure 3) [14].



**Figure 3 Construction Fatalities**

Over the years, as the number of Hispanic workers in the construction industry has been growing, the number of fatalities has also been growing (Figure 4)[11]:



**Figure 4 Hispanic Fatalities over Time**

Some differences have been found between Hispanic and non-Hispanic construction workers. To quote, Hispanic workers:

- “are much younger, mostly non-citizens, less educated, less unionized, and earn less wages
- are mostly employed as unskilled or semiskilled workers with few managers or professionals
- have higher fatality rates and lower nonfatal injury and illness rates.” [4]

These differences, as well as their “limited economic and political resources and poor living and working conditions” [10] may be the reason Hispanic workers have such a large number of fatalities. Other reasons include, to quote:

- “Immigrant workers are hired to do the most dangerous jobs.
- They often don’t get any safety training.
- Safety information is often not provided to them in Spanish.
- They are not educated about their rights to a safe workplace and often did not have those rights in their country.
- They are afraid to complain because they will be fired (and/or deported) since they often do not have the protection of a union.

- There is inadequate enforcement by the Occupational Health and Safety Administration.” [11]

It is important to understand the differences between Hispanic and non-Hispanic workers in order to be able to design training programs for the specific populations being targeted.

# **SURVEYS OF STUDENT INTERNS AS NEW EMPLOYEES IN CONSTRUCTION**

New employees on the construction site are disproportionately affected by workplace accidents and injuries. To learn more about the issues facing new employees on the jobsite, this research surveyed student interns who were employed in the construction industry. These students presented a good opportunity for learning about the challenges of new employees. Most students had never worked in the construction industry. The research included surveys conducted before and after safety training and before and after work in the construction industry.

For this project we surveyed 65 engineering students that were participating in their first university sponsored construction internship. In accordance with Purdue University research protocol we filed for and were granted approval to perform the surveys through the Purdue University's Institutional Review Board (IRB) and the Committee on the Use of Human Research Subjects. A copy of the approval, a sample of the subject consent form, and the advertisement for the student subjects, and the surveys are included in the appendix.

The student population surveyed consists of engineering students participating in a university sponsored internship program through both the School of Civil Engineering and the Division of Construction Engineering and Management. The construction companies that sponsor the students are primarily general contractors that perform large commercial construction, industrial construction, and heavy civil construction. Examples of projects that the students work on in the large commercial construction area include office buildings, K-12 school facilities, and large shopping complexes. Examples of projects in the industrial sector include oil refineries, pharmaceutical plants, and ethanol production facilities. Finally, in the heavy civil construction students would be working

on road reconstruction and bridge projects. During the period the students were surveyed, there were no students on residential construction projects.

The first survey was conducted prior to the students taking the OSHA 10-hour training and going onto a construction site. The survey consisted of an evaluation of their prior construction experience, knowledge of construction safety, and perceptions of construction safety. The questions were formulated based on a general perception of faculty, staff, and employers that the students have very little construction experience. Based on interviews to be admitted into the internship program, the majority of the student subjects felt that they had construction experience from summer jobs working on residential construction on their own home (e.g., assisting a family member with building a deck or shed at their residence). However, the majority of students had never been exposed to the type of construction they would experience on their first internship, namely large scale commercial, industrial, and heavy civil construction.

### **Survey 1. Before Safety Training, Before Construction Internship**

The first survey conducted prior to safety training and construction internship is included in the appendix. The questions in the first survey were developed to specifically determine the extent of their construction experience. For example, rather than surveying the students to determine if they had ever worked on a construction site, we provided questions which addressed multiple levels of construction exposure. We also addressed prior safety training that they had obtained and gave them an opportunity to report additional safety training, beyond typical construction safety training. Many safety training programs at local fast food restaurants and community services (pools and camps) have initial safety training programs which can form student opinions on the need and importance of safety on the job.

The level of interest and the importance of safety on the job were also included in the survey of the student subjects. This included questions that addressed the willingness

of the student to attend the OSHA 10 hour training. The students were also asked to provide some information on what they felt the main cause accidents on the job and how important construction safety was to a practicing construction engineer. The students were also asked to review a list of terminology used on the construction site and used in typical OSHA 10-hour training material. The list was generated by reviewing two sets of OSHA 10-hour training material (ref AGC Doc and DPR slides) and selecting words that were common to the construction industry, but not typically used in everyday vocabulary. The results of this first survey are included in the results section.

## **OSHA 10-Hour Safety Training**

The students were provided the OSHA 10 hour instruction over a weekend period approximately one month prior to starting their construction internship. The instructor chosen for the course was an OSHA certified instructor who worked for one of the construction firms which support the internship program. The instructor taught the OSHA 10 hour course in the previous year and had excellent feedback from the students on the quality of the instruction. The instructor was aware that the student subjects had very little construction experience and adjusted the presentation of the material appropriately. The material presented was a standard OSHA 10-hour course for the construction industry. The topics covered included:

- Introduction to OSHA
- Electrical
- Fall Protection
- Fire Protection and Prevention
- Ladders and Stairs
- Personal Protective Equipment
- Excavations
- Scaffolding
- Cranes and Rigging

- Steel Erection
- Material Handling
- Road Construction Safety (Additional unit for students working on road and bridge jobs)

During the OSHA 10-hour course, the students were instructed to write down terminology and concepts that were presented that they did not understand. The objective of this exercise was to identify unfamiliar concepts in the class. For example, it is difficult for a student to understand the requirement to put on rebar caps to prevent injuries, if the student does not understand the term rebar and how rebar is used on a construction site. These lists were compiled and the results are included in the results section.

## **Survey 2. After Safety Training, Before Construction Internship**

The second survey was conducted after the completion of the OSHA 10-hour training was completed and before first internship. The survey is included in the Appendix. The main goal of this survey was to evaluate the training provided and to determine the initial student perception of construction site safety. To evaluate the course instruction, the first portion of the survey included standard questions based on Purdue University class evaluations. These questions were tailored for this particular short course. The main goal of the second portion of the survey was to determine some of the key instructional topics that the students considered important and those considered unessential. Finally, the survey was used to identify topics the students did not understand. These topics and the list gave insight into the areas of the OSHA 10-hour training that should be discussed in greater detail.

## **Survey 3. After Safety Training, After Construction Internship**

The third survey was developed to determine the students' perception of safety after their first internship on a commercial, industrial, or heavy civil construction site. The survey also focused questions on improving the OSHA 10-hour safety training and attempted to ascertain some of the critical safety issues encountered during their first internship. The students were asked to provide information on what percentage of time they would spend on safety related job duties and to evaluate the usefulness of the OSHA 10-hour training. The students were also surveyed to determine additional safety training that they had received over the course of their first internship.

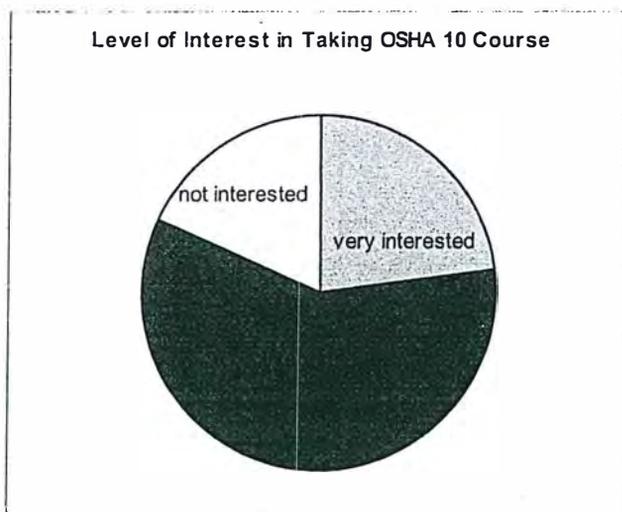
A number of questions centered on trying to improve the quality of the training. The students were asked to provide what improvements they would make to the training. They were surveyed again about specific terminology that they heard on the job site, but did not understand. This was a direct result of issues related to not understudying terminology used in the OSHA 10-hour training.

The students were also asked to provide information on whether they encountered any language barrier issues with any of the co-workers. If they had encountered a language barrier, they were asked to determine if it could potentially result in an unsafe working environment. These questions were included in the survey for preliminary research involving Hispanic workers in the construction industry.

# RESULTS OF STUDENT SURVEYS

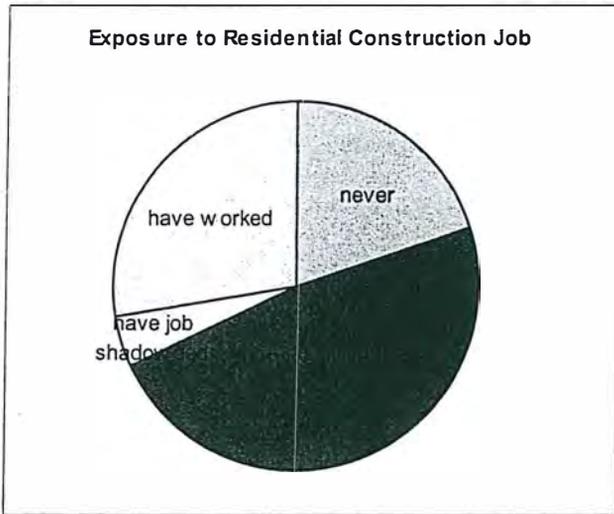
## Survey 1. Before Safety Training, Before Construction Internship

The first survey of the 65 students was used to determine their prior construction experience, knowledge of construction safety, and perceptions of construction safety. A detailed description is included in the Methods section. The survey indicated that the students started the course with a very high level of interest in taking the OSHA 10-hour course. The majority of students (77%) were either interested or very interested in the course ( Figure 5)

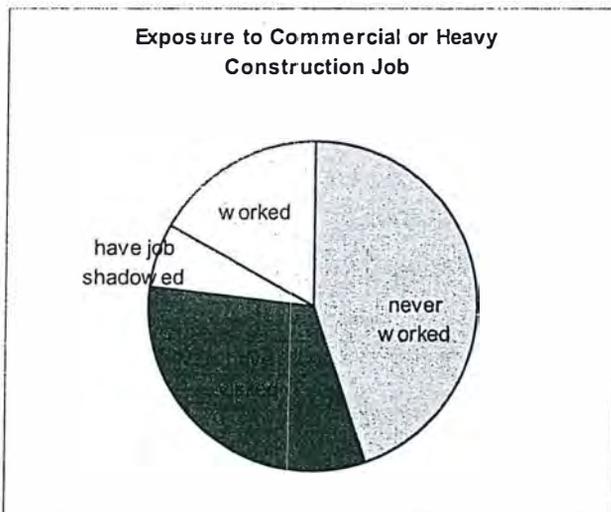


**Figure 5 Level of Student Interest in Course**

The students surveyed had very little construction experience either on a residential or commercial job site. As shown in Figure 6 and Figure 7, only 28% have ever worked on a residential construction site and less than 17% have ever worked on a commercial or heavy civil construction site. The limited exposure of the subject group to construction makes it challenging to provide instruction since the group does not fully understand many construction terms for typical construction practices.



**Figure 6 Exposure of Students to Residential Construction**



**Figure 7 Exposure of Students to Commercial or Heavy Civil Construction**

As expected, the student group surveyed had very little safety training for the construction site. Approximately 65% of the students surveyed had no safety training and only one student had had any other type of OSHA safety training. Figure 8 shows the percentage of students with previous safety training. Over half of the students surveyed (52%) did have some first aid training.



**Figure 8 Students with Previous Safety Training**

The students were also asked what they thought posed a hazard on the construction site. The majority of students thought that the main safety problem is with the worker and how they approach a job (carelessness, irresponsible, etc.). Others thought that the main problem was because of their work environment, including excessive heat, noise, and weather issues. When asked about who is responsible for safety on the construction site, the majority thought that the main responsibility rests with the worker and their direct supervisor, not the construction engineer / project manager on the job or the owner of the facility being built.

Table 1 shows a listing of the students' hands-on experiences that can be related back to specific topics in the OSHA 10-hour training course. Many of the students have had some experiences that a construction worker would have during a typical day on the job. For example, the students are familiar with power tools and working at heights. However, a very large percent of the student population have not experienced the more technical side of construction and related hazards. For example, 40% have not worked with basic electrical wiring procedures and approximately 70% have never worked around large machinery.

**Table 1 Percentage of Student with specific "Hands-On" Construction Experience**

<b>Percentage</b>	<b>Hands-On Experience</b>
91%	have used power lawn and or garden equipment
89%	have used power tools such as drill, circular saw, etc
81%	have been on the roof of a house or garage
75%	have been on a ladder higher than one story (10ft)
63%	have used harsh chemicals for cleaning, stripping furniture,etc
60%	have helped wire an electrical outlet, light swith or a light fixture
40%	have been in a hole or excavation more than 4 feet deep
31%	have worked around heavy construction equipment
26%	have worked around farm machinery

Table 2 is a listing of standard personal protective equipment (PPE) used by students prior to the OSHA 10-hour training. The results are consistent with the results for the hands-on construction experiences. A very large percentage, over 40%, have not worn a hard hat or been required to wear shoe protection.

**Table 2 Student Exposure to Safety Equipment**

<b>Percentage</b>	<b>Safety Equipment Used by Student Prior to Training</b>
95%	Safety Glasses or Goggles
83%	Rubber Gloves
69%	Ear Protection
57%	Hard Hat
49%	Steel Toe Boots or Shoes
48%	Mask to Filter Air Particles
48%	Life Vest
34%	Safety Harness
22%	Reflective Vest

The last portion of Survey 1 asked the students to identify construction terms that they were familiar with and understood. Table 3 lists the construction term and the

percentage of students that were familiar with the term. Based on the percentage, many of the basic terms used in OSHA training were not recognized or understood. Another list of terms used in the post OSHA training survey identified more terms that were not understood during the course of the training. The lack of understanding of basic terms used in the OSHA training indicates a significant issue for the trainer and the training process.

**Table 3 Construction Terminology Identification**

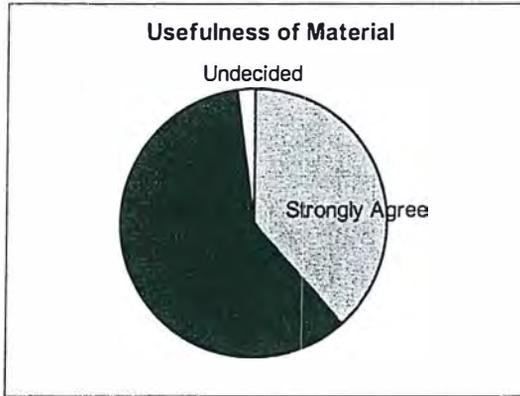
Percentage Students Familiar with Terminology	Construction Term
82%	Scaffold
72%	Rebar
57%	Amps
51%	Lanyard
49%	Girder
45%	Joist
43%	U bolt
40%	HVAC
28%	Rigging
25%	Sheathing
22%	Screw jack
20%	Shoring
17%	RFI
15%	Rip rap
15%	Lock out tag out
15%	Scraper pan
15%	Outrigger
12%	Slip forms
12%	Benching

9%	PTO
9%	SOG
8%	GFI
8%	Drift pin
5%	Web sling

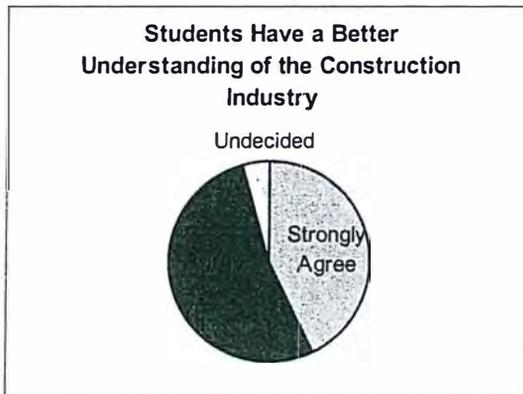
## Survey 2. After Safety Training, Before Construction Internship

The second survey was administered after the completion of the OSHA 10-hour course. The survey was used to evaluate the quality of the training and student perceptions about safety. A more detailed discussion about the survey is included in the Methods section.

After the OSHA 10-hour training, the students were still very positive about the training and the usefulness of the training they had received. Figure 9 shows that almost all of the students found the training useful for their upcoming career in the construction industry, indicating the students were starting to perceive the importance of safety on the job site. The students not only felt that they had a better understanding of safety, but also thought that they had a better understanding of the construction industry. As the training proceeded, many of the students asked questions about the construction industry and the construction process. The training not only provided a good foundation for safety, but educated the students in many aspects of the construction industry. As shown in Figure 10, all of the students thought either agreed or strongly agreed that they had a better understanding of the construction industry.



**Figure 9 Perceptions of Usefulness of OSHA 10-Hour Training**



**Figure 10 Student perception of their understanding of the construction industry**

The students also overwhelmingly agreed that the instruction provided was very good. The majority felt that the instruction was interesting, that the instructor did a good job using examples to explain the material, and that the instructor did a good job of explaining the more difficult material.

The students were also asked to list the three topics presented in the OSHA 10-hour training they believed they will use the most and the three topics that they will use the least on their upcoming summer internship. The three topics that the student felt that they will use the most include:

1. Fall Protection

2. Ladders and Stairs
3. Personal Protection Equipment

The three areas that the students thought they would use the least include:

1. Cranes and Rigging
2. Fire Protection and Prevention
3. Road Construction Safety

The student expectations on the main safety issues are consistent with previous student internship experiences. The students are not typically involved with complex crane and rigging operations. The majority of students are also on commercial construction jobs and not heavy civil road jobs. Therefore the perception that crane operations and road safety would not be as critical as other safety areas, is probably correct. The students perception of fall protection being important is a very positive result since the majority of fatalities in construction are related to falls (Reference 2).

The survey also addressed safety areas and topics that the students felt they did not understand. The students listed many items; however, a general theme of many of the answers was that the terminology used during the safety training was an issue. Other issues included concerns on how they will use each topic and how the OSHA organization affects their day to day job. The issue of students not understanding specific construction terminology used in the training also became apparent based on a list of unfamiliar terminology that the students generated during the training. This was one of the more critical pieces of the survey and gave some excellent insight into what areas of safety training that the students were having difficulty understanding. A list of key terms that relate closely to one of the safety topics that the students had difficulty understanding is provided in Table 4.

**Table 4 List of unfamiliar OSHA 10-hour training terminology**

1.	Tag line
2.	Lock out/Tag out
3.	Egress (path entering/exiting building)
4.	Bird Caging
5.	Base Plates
6.	Spoil Pile
7.	Out Riggers
8.	Toe Boards
9.	GFI
10.	Benching
11.	Rebar Caps
12.	Trench plate
13.	Welding Shield
14.	Lanyard
15.	MSDS
16.	Slip Forms
17.	Flammable Cabinet
18.	Mud Sills
19.	Rigging

### **Survey 3. After Safety Training, After Construction Internship**

The third survey was administered after the completion of the students' first internship with a construction firm. The survey was used to evaluate the quality of the training and the student perceptions about safety. A more detailed discussion about the survey is included in the Methods section.

The students thought that the training was very important to preparing them for the construction site. A very high percentage of students (96%) thought that they were better prepared for the construction site than they would have been without the training.

In general, the students thought that they would not spend a significant amount of time working with safety issues as a construction engineer. Of the students responding to the third survey (54 participants), 65% felt that they would spend less than 20% of their time with safety related duties.

The students felt that the most helpful part of the OSHA 10-hour safety training was the fall protection portion of the course. This is the same answer that the students provided in Survey 2, immediately after the OSHA 10-hour training and before their first internship. These results are very favorable since falls are one of the leading causes of fatalities in the construction industry (REF).

The second most helpful part of the OSHA 10-hour training was a better understanding of general safety procedures on the construction site. Since the students had very little construction experience, the OSHA 10-hour training provided the first opportunity to shape their concept of construction safety. The students noted that the OSHA 10-hour training provided a good background for what they should expect when they first arrive at the construction site.

The third item that the students listed as helpful in their first internship was excavation and trenching safety. After the initial OSHA training, students commented that they were unaware of the significant danger involved with excavations operations. The students thought trenching safety was a critical part of the training, even though trenching fatalities are not as high as other types of fatalities (REF). For instance, the students did not list electrical safety as a topic that they found helpful during their first internship. This may be because they knew that working with electricity was dangerous prior to going on a construction internship.

The students were also asked to provide safety issues that should have been addressed in the OSHA 10-hour training. The majority of students did not answer this specific question. The rest of the input was scattered across the many different areas of

construction safety. There was no one response that from a significant percentage of respondents.

During their summer internship, the students encountered many terms on the construction site that they were unfamiliar with. As was the case during the OSHA 10 hour training, students were not familiar with many terms used on the construction site. A list of terms that may create an unsafe situation if not fully understood is included in Table 5.

**Table 5 List of Unfamiliar Terms, Post Internship**

1	Reshore
2	Rebar
3	Rebar caps
4	Conduit
5	CMU
6	EFIS
7	Girder

The students were asked if a construction site visit prior to OSHA 10-hour training would be helpful to increase their overall understanding of construction safety. Of the 54 respondents, 63% felt that it would be helpful to have a construction site visit. Many noted that a visit like an OSHA inspector would make would be helpful. The students also noted that if some unsafe safety practices were staged on the construction site, it would help them to understand proper safety on a construction site.

Additional safety training received on the students' construction internship was another area of interest for this research. Each student's construction site is unique and we cannot design an OSHA 10-hour course to address all safety aspects of their specific construction site. The Purdue CEM program requests that each firm provide additional site specific safety training for the students. A common practice amongst construction companies is to give new employees a short review of specific safety issues that may occur on the job site. The survey results revealed that many of the companies do not

provide any additional safety training. Of the 54 respondents, 24% percent did not receive any additional safety training through out the summer and did not participate in any safety briefings, such as a tool box talk. Fifty four percent of the students did receive additional safety training and 40% participated in safety related activities such as tool box talks or safety walks (some participated in both).

In order to determine some of the hazards that the student interns were exposed to, the students were asked to provide information regarding duties they performed that they thought were hazardous. The students provided a broad range of potentially hazardous activities and the lists were grouped according to general areas. A list of the four the four most relevant areas are listed in Table 6. The most often cited hazardous part of an intern’s job was working around the heavy equipment. Based on the fact that only 31% of the students had ever worked around heavy equipment (Table 1), it seems reasonable that students would consider working around large equipment on a construction project to be a hazard.

**Table 6 Intern Hazardous Job Issues**

<b>Rank</b>	<b>Hazardous Job Issues</b>
1	Working around heavy equipment
2	Working at heights
3	Working in excavations or confined spaces
4	Working around traffic on a road construction job

The students were also asked if they encountered a language barrier with other workers on the construction site; 28% reported a language barrier on the construction site because they could not communicate effectively with some of the workers. Of those who reported a language barrier, over half (53%) thought the language barrier could lead to an unsafe work environment.

# SURVEYS OF HISPANIC WORKERS IN CONSTRUCTION

Hispanic construction workers were interviewed to learn more about their background in construction, their safety training history, and related issues, such as potential language barriers that may affect safety training.

## Survey

A survey was prepared in order to find out about workers' characteristics, experience, safety training, and familiarity with construction terms. The questions in the survey include:

- Country of origin
- Occupation in home country
- Age
- Education level
- Gender
- Years of experience in construction
- Years of experience in construction in the United States
- Job position
- Exposure to construction jobs
- Level of safety training
- Interest in taking safety training courses
- Characteristics of the safety training courses taken, if any
- Hazards in the construction site
- Possible actions to increase safety in the construction site
- Differences and similarities between construction in the U. S. and their home countries

Two groups of Hispanic construction workers in Louisiana were interviewed. The first group of participants, in New Orleans and Baton Rouge, was interviewed by students from Louisiana State University (Report in Appendix). The second group of participants,

in New Orleans, was interviewed by students from Louisiana State University and Purdue University.

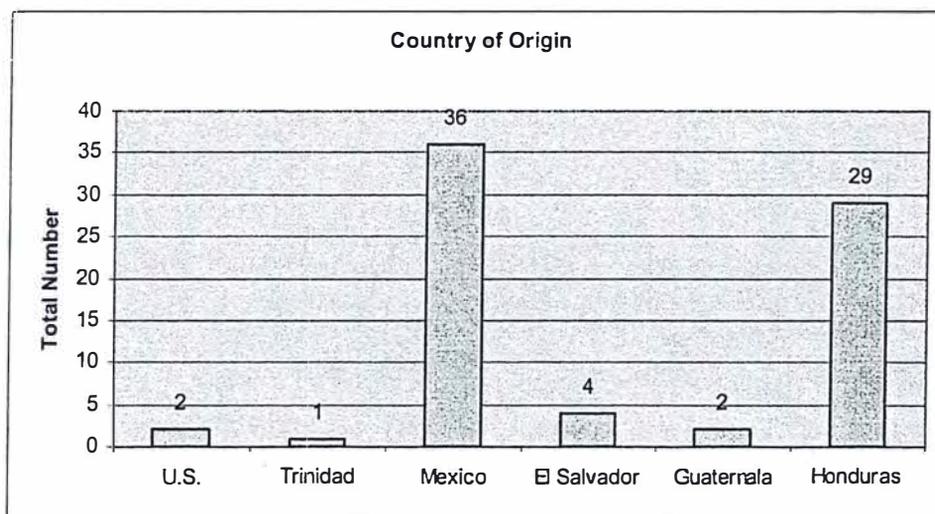
An IRB was submitted and approved in order to protect the workers' identities and guarantee confidentiality of the results.

A total of 74 Hispanic workers were interviewed. The information they provided was summarized and analyzed, and presented in the following section.

## Results

The information obtained by interviewing the 74 Hispanic construction workers in Louisiana is included below (Figure 11):

Most Hispanic construction workers come from Mexico and Honduras.

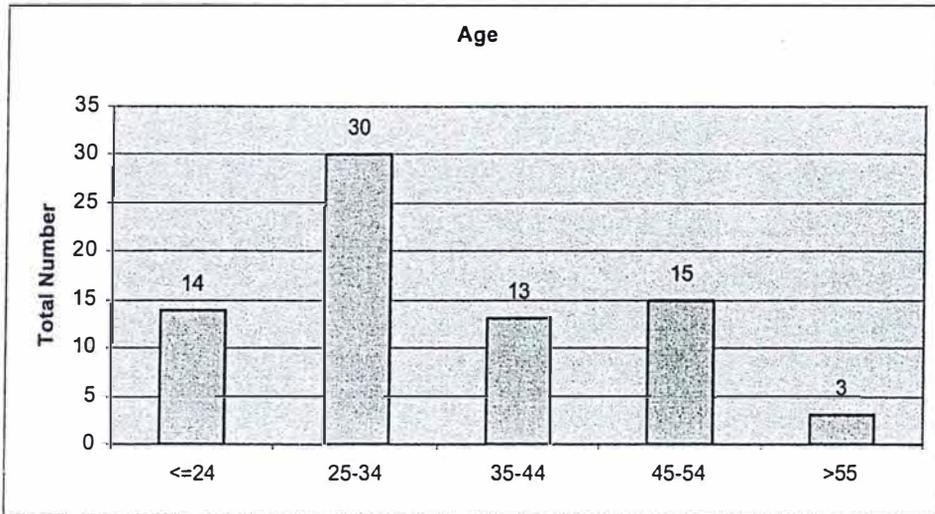


**Figure 11 Country of Origin**

In their home countries, only 29 out of the 74 current construction workers interviewed (approximately 39%) worked in the construction industry in some way. Approximately 19% worked in agriculture or fishing. Other occupations include being a

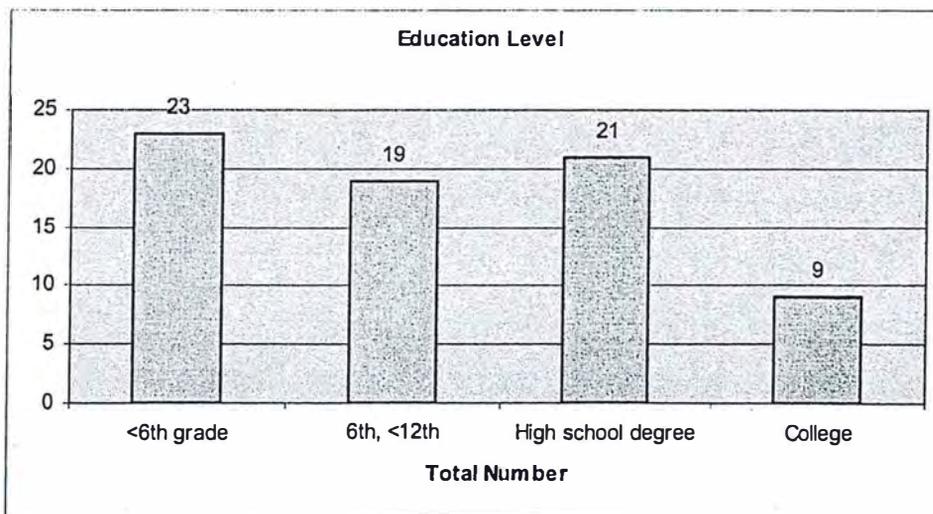


Approximately 41% of workers were in the 25-34 age group, with 14 workers under 25 years of age and 31 workers over the age of 34 (Figure 13).



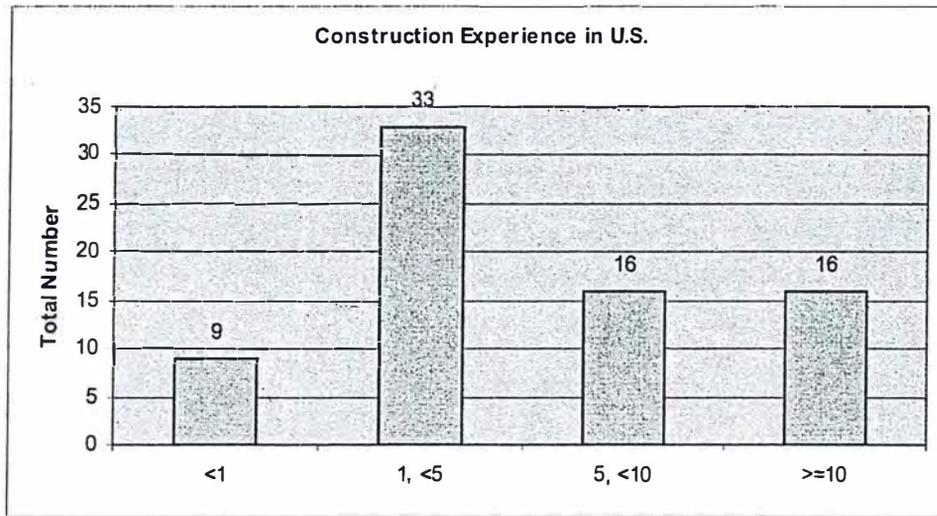
**Figure 13 Age of Participants**

The workers' education levels were distributed as follows: approximately 31% of workers had an elementary school level, 26% had reached high school but did not complete it, 28% had a high school degree, and 12% had either completed college or had taken some years of college (Figure 14).



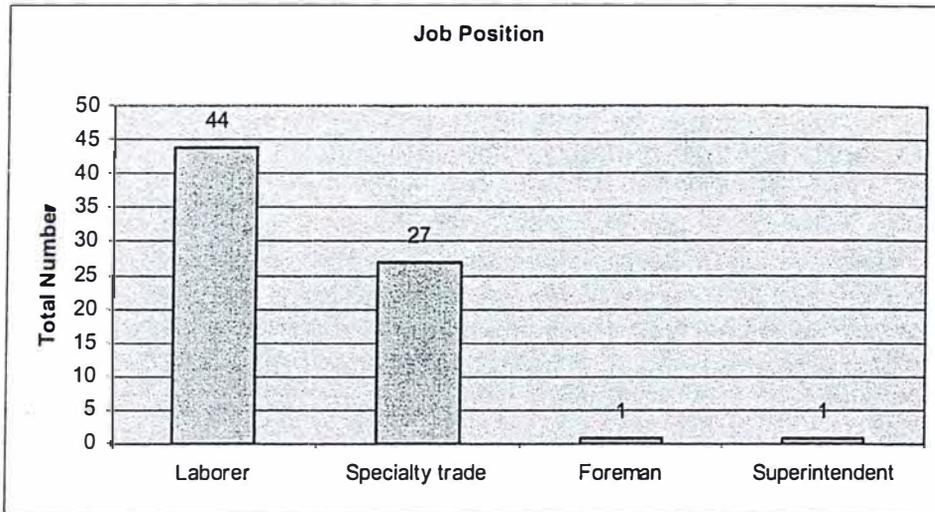
**Figure 14 Education Level**

Most of the interviewed workers (45%) had less than five years of experience in the U.S. construction industry, while 12% had less than a year. The same number of workers, 16 out of 74 (22%), were in the categories of over five but less than ten years, and over 10 years of experience (Figure 15).



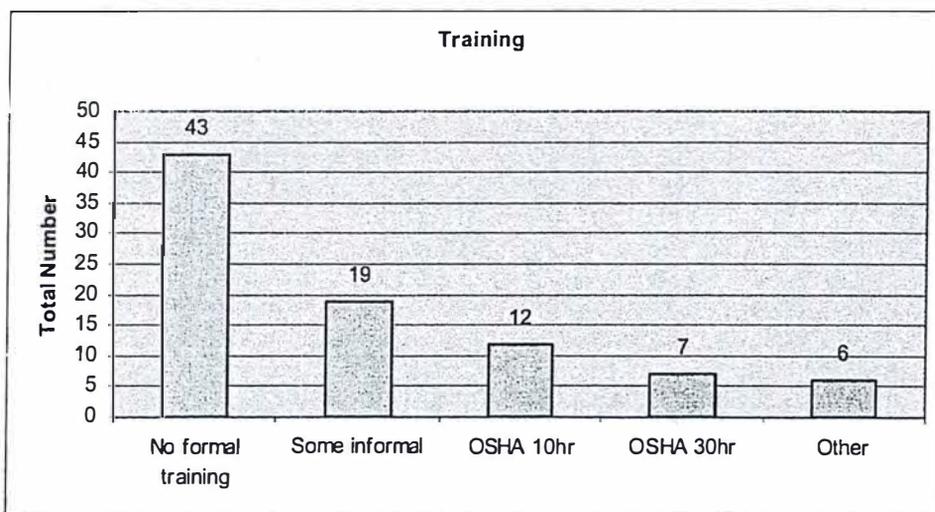
**Figure 15 Construction Experience in U.S.**

In the U.S., approximately 60% of interviewees worked as laborers, 36% had a specialty trade, and less than one percent had the positions of foreman or superintendent (Figure 16).

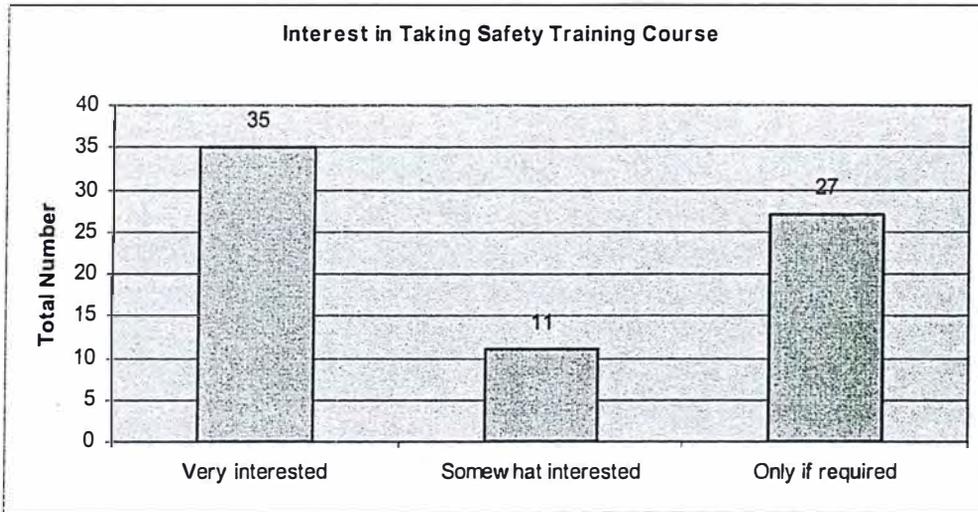


**Figure 16 Job Position**

Formal training was not very common for the interviewed group of workers: 58% had no formal training, and 26% had informal training. Only 26% of workers had taken an OSHA training course (Figure 17). Approximately 47% of interviewees said they would be very interested in taking a safety course, while 15% were somewhat interested and 36% would only take a safety course if it was required for their job(Figure 18).

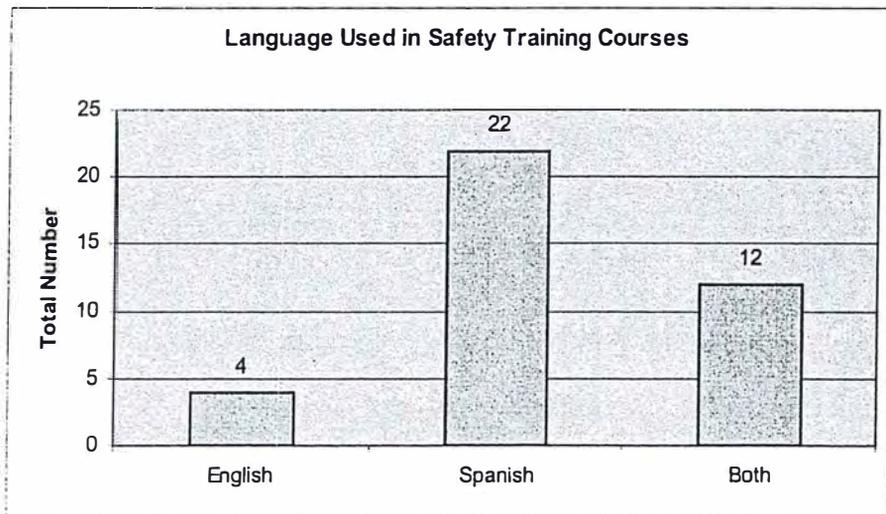


**Figure 17 Training**

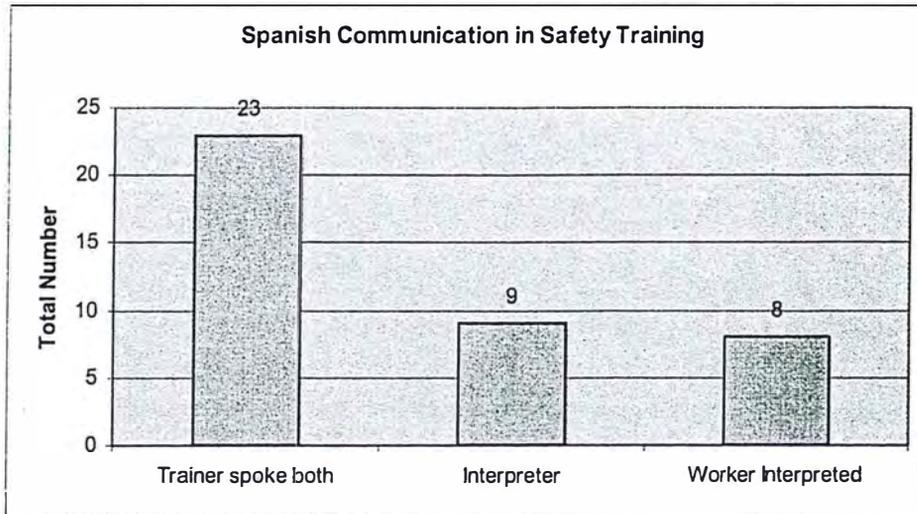


**Figure 18 Interest in Taking Safety Training Courses**

Of those workers who had taken some kind of safety training course, approximately 30% answered that the course was given in Spanish, and 31% said that the course instructor spoke both English and Spanish (Figure 19).



**Figure 19 Language Used in Safety Training Courses**



**Figure 20 Spanish Communication in Safety Training**

Workers were asked to specifically state, in their own words, what they considered to be main causes of accidents. Results are shown in Table 7:

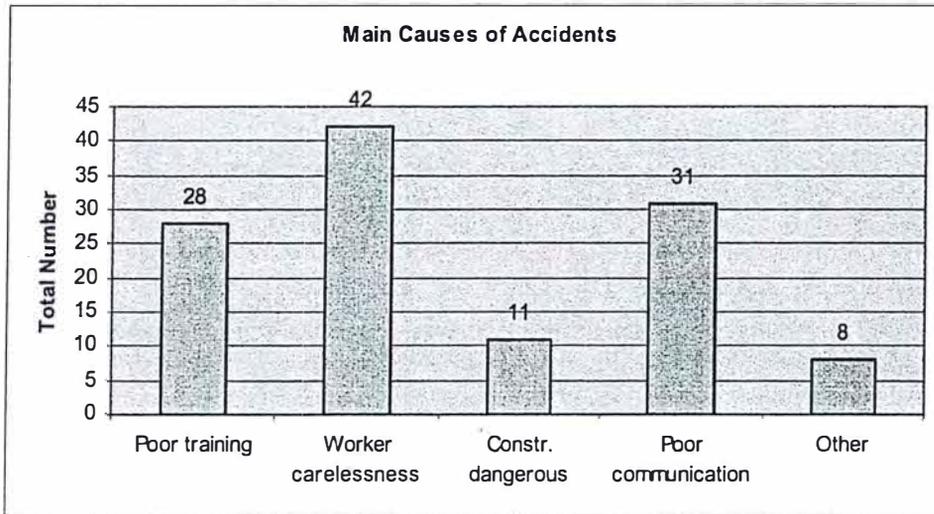
**Table 7 Causes of Accidents**

No proper equipment/ materials	17
Electricity	9
Tools	7
Chemicals	3
Lack of communication	1
Site not clean	4
Carelessness	26
Cuts	4
Excavation	1
Too much work/stress	2
No experience/knowledge/training	13
Fumes	2
Heights	38
Unsafe environment	4
Falling objects	2
Heavy objects/ lifting	2
Working in groups	1
Isolation	1

According to these results, 51% of this group of Hispanic construction workers in Louisiana considers heights/falls to be the most important cause of accidents, followed by worker carelessness (35%), not having/using the proper safety equipment (23%), and no knowledge or proper training (18%).

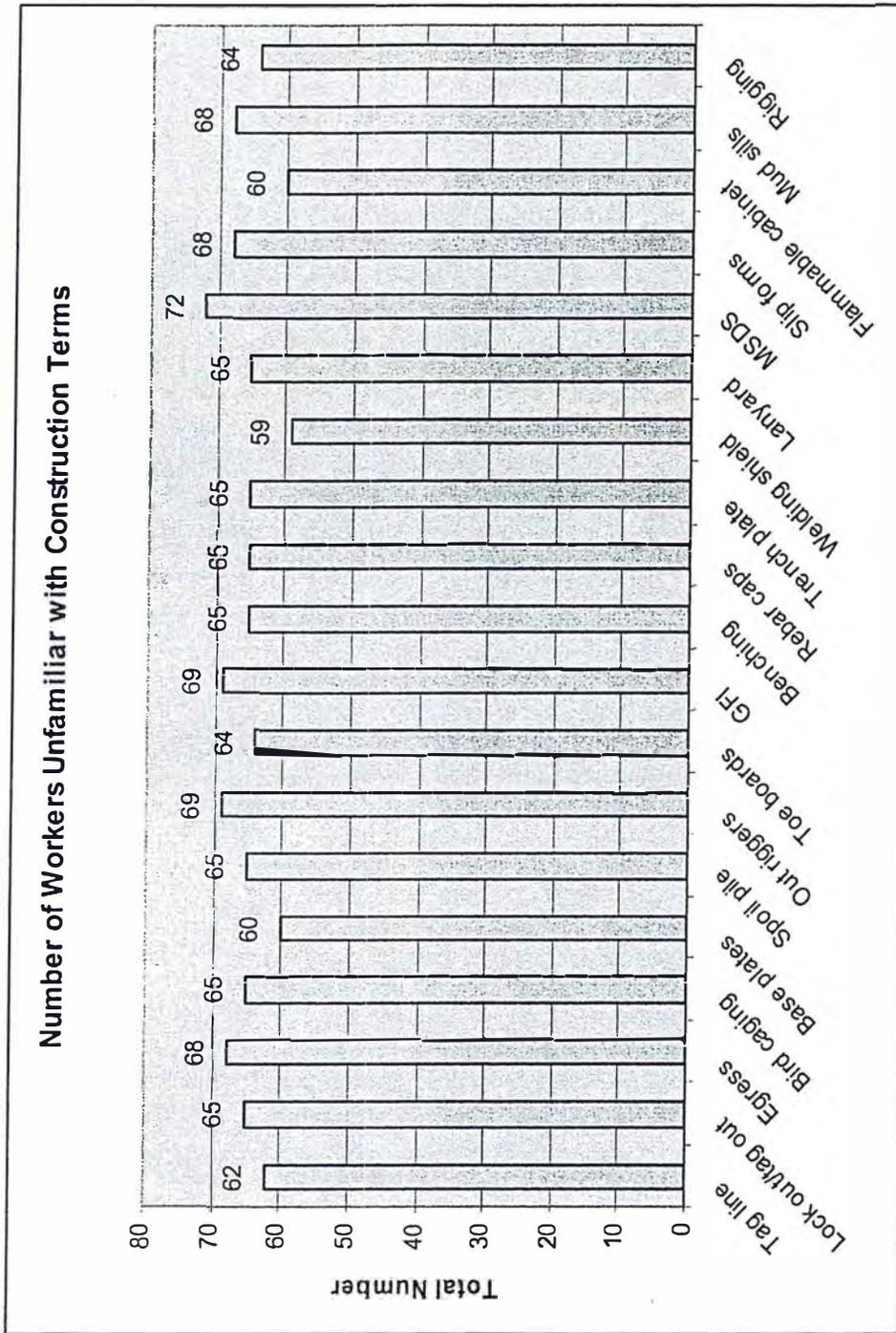
Workers were also asked to select which they considered to be causes of accidents. The possible choices were poor training, worker carelessness, construction is dangerous, and poor communication. Over half of the interviewed workers (57%) considered worker carelessness to be the main cause of accidents in a construction site.

Forty-two percent and 38% considered poor communication and poor training, respectively, to be main causes of accidents (Figure 21).



**Figure 21 Main Causes of Accidents**

Finally, workers were given a list of terms used in construction sites to determine their familiarity with these terms. Workers were asked to simply say yes if they knew what the terms meant, and no otherwise. As illustrated in Figure 22, the results indicate that approximately 80% of workers were unfamiliar with each of the terms.



**Figure 22 Number of Workers Unfamiliar with Construction Terms (74 Workers Sureyed)**

## **DISCUSSION**

This section provides a discussion of the results of the surveys conducted in this research. The findings address the surveys of students working as interns in the construction industry, as well as Hispanic workers.

### **Student Interns as New Employees**

There were a number of important findings in this research, identifying both limitations and benefits of existing training. The surveys were designed to identify issues related to the provision of OSHA 10-hour training to students who were going on their first construction internship. The surveys consisted of many questions on the students' construction experience, knowledge of specific terminology, and specific safety issues during their internship. The student group surveyed had very little construction experience or safety training. The group was very homogenous in terms of education, construction experience, safety training, and age. The surveys were also conducted at the same time for participants yielding consistent results.

Based on information from the first survey, the most striking result was that many of the students did not understand many terms that would be used in an OSHA 10-hour training. For example, less than 1 in 10 knew the terminology "PTO" (Power Take Off) or "GFI" (Ground Fault Interrupter). Only half of the students surveyed understood the terminology "Lanyard" prior to the training. Understanding these types of basic terms used on a construction site is a critical part of the pedagogical process for the OSHA 10-hour training. If these terms are not explained clearly by the OSHA 10-hour instructor, the training is much less effective.

The second survey indicated that the OSHA 10-hour safety training provided the students with a good understanding of construction safety. The students also felt that it provided them with a much better indication of how the construction industry works. This was confirmed in the third survey, which was conducted after the students spent at least twelve weeks on a construction job site.

The second survey indicated that during the OSHA 10-hour training the students still did not understand a significant number of advanced construction terms that were used by the OSHA trainer. These terms were more advanced construction terms than the initial construction list in Survey 1, however, the misunderstanding of the terms could be a critical issue that affects the students' ability to understand the safety training material. Even after the twelve week internship, the students still had difficulty with both basic and advanced construction terms. A more experienced construction worker would probably not have any difficulty understanding any of the vocabulary on the terminology lists.

Based on the results, the students would have a much better understanding of construction terminology and hence OSHA 10-hour safety training, if they would take the safety training after working on an actual construction site. However, exposing new workers to the construction site without the basic OSHA 10-hour training could be putting the worker at risk for an injury or fatality. The conundrum of the optimal time for safety training for a new construction worker is that safety training will be more meaningful to workers who have been exposed to the construction site, however, it is undesirable to expose a new worker to the construction site before they have had safety training.

The importance of safety training prior to any work experience was indicated by the third survey. In particular, the students indicated that trench safety was one of the more important topics covered in the OSHA 10-hour training. One of the reasons the student gave this high importance is because the students did not have an understanding of the extreme danger of trenches prior to the OSHA 10-hour training. Many of the dangers presented in safety training can be comprehended by an inexperienced construction worker. For example, many individuals understand the importance of fall protection at heights because of knowledge of the resulting injury or death from a fall at a significant height. However, going into an unprotected trench may not seem as dangerous to the casual observer.

The OSHA 10-hour training was also critical to the students' safety because the majority of companies provided very little additional safety training to the student interns. Many firms provide safety training multiple times a year. If the students' internship term does not coincide with one of the safety training classes, the students do not receive the safety training. If companies offer OSAH 10-hour safety training on either an annual or semi-annual basis, a construction worker could spend a significant amount of time on the job prior to participating in the training. The recent addition of on-line safety training classes does assist in increasing the frequency of when classes are offered.

The students indicated that working around heavy equipment was one of their most hazardous duties. The students were provided an additional safety training module that covered road construction safety that is typically not a part of a standard OSHA 10-hour training program. This module reinforced the concept of being aware of your surroundings and safe procedures for working around moving equipment. This module will continue to be offered to the student interns regardless of the type of construction project they will be working on (e.g. commercial building, industrial, or heavy civil) because of the importance of understanding how to work around traffic and heavy equipment.

In Survey 3, after working on the construction site, some of the students indicated that there were language barriers on the construction site. Many of these students believed that these language barriers may result in unsafe working practices. If educated workers without language barriers, such as the student interns, found that the effectiveness of safety training was constrained by a limited understanding of construction terminology, then less educated workers with potential language barriers may have even greater difficulties comprehending the material presented in safety training. This finding motivated the extension of the research to include surveys of Hispanic workers, and discussed below.

## Hispanic Workers

It has been found that in construction, unsafe acts, rather than unsafe conditions, have a greater impact on safety [7]. This was supported by the results of the survey in this research, in which 57% of the workers agreed that worker carelessness was a main cause of accidents in construction sites.

These unsafe acts may occur because workers inaccurately assess risks and hazards. This misperception of risks and hazards occurs in untrained and inexperienced workers [9]. Therefore, it is important to have safety training programs that will effectively teach workers about potentially hazardous situations, as well as what they can do to increase their safety at work.

Slightly over half of the participants considered heights/falls to be a main cause of accidents. The interviewed construction workers worked mostly in residential and commercial construction sites. Because most falls occur in these two areas [4], it is important to work on developing and implementing training programs for Hispanic workers employed in these two types of construction.

Hispanic construction workers generally have a poor command of the English language, for this reason it has been suggested that it is necessary to provide safety training in Spanish [8]. The interviews in Louisiana demonstrated that this has been done: approximately 90% of the workers who had taken safety training courses said the courses were conducted either completely in Spanish or in both English and Spanish. Therefore, it may be incorrect to assume that the large number of fatalities for Hispanic construction workers is due to lack of available training programs in their language.

Another interesting finding from this research was that only about 39% of the workers had worked in construction while in their home countries. This implies that about 60% of Hispanic workers that start to work in the U.S. construction industry have had no previous experience in this area. These workers are at a much higher risk of

injury than the other Hispanic workers who have previous experience in construction in their home countries.

A final important finding of this research is that many Hispanic workers are unfamiliar with advanced construction terminology used in OSHA 10-hour training. A survey of these terms indicated that no more than 20% of workers understood any terms, and some terms were understood by only 3% of the workers surveyed. This lack of understanding of construction terminology could diminish the effectiveness of safety training and result in potentially unsafe working practices.

## RECOMMENDATIONS

Recommendations include those related to new hires, as well as those related specifically to Hispanic workers. These are presented in the following two sections.

### **Student Interns as New Employees**

A number of recommendations were developed based on the results of the surveys conducted in this research. These recommendations are as follows.

- Provide a pictorial description of basic and advanced construction terminology for students to review before and during training, and refer to after training is completed.
- Before each module is presented, a diagram reviewing key terminology and pictures of relevant items on a construction sites should be presented
- Provide training in multiple sessions. An initial safety training session, such as OSHA-10 training, could be provided prior to work on the construction site. A follow-up safety training session could be provided after workers have spent a few weeks on the construction site. This would allow workers to have basic safety training prior to working on-site, and would allow safety training to reinforce safe practices after workers have become familiar with basic construction terminology.
- On-line safety training may be used to eliminate scheduling issues and close the gap between employee start date and safety training. On-line courses alleviate the need for a minimum class size and dedicated instruction.
- Consideration should be given to expanding OSHA 10-hour training to include a module regarding construction around traffic and heavy equipment.

- All safety training and supporting course materials such as the pictorial description of construction terminology should be provided in Spanish to enhance comprehension by native Hispanic workers.

## **Hispanic Workers**

A number of recommendations are provided as noted below.

- All safety training and supporting course materials such as the pictorial description of construction terminology should be provided in Spanish to enhance comprehension by native Hispanic workers.
- All safety training should include basic construction terminology to reflect the fact that many Hispanic and immigrant construction workers do not have previous construction experience in their own country.
- Safety training for all workers should define and explain advanced construction terminology covered in the safety training. This recommendation is important because research results indicate that the Hispanic workers surveyed who are currently working in construction are not familiar with any of the advanced terminology included in the OSHA 10-hour training. One possible safety training format and tools could take the form of story book examples with OSHA 10-hour safety training terminology for Hispanic construction workers.

In conclusion, both components of this research indicated that a limited understanding of construction terminology used in OSHA 10-hour training reduces the effectiveness of this training. It is important that this deficiency be addressed not only to enhance worker understanding of construction safety, but also to facilitate effective communication on the job site.



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## APPENDIX

1. Survey 1. Before Safety Training, Before Construction Internship
2. Survey 2. After Safety Training, Before Construction Internship
3. Survey 3. After Safety Training, After Construction Internship
4. Survey of Hispanic Workers in Construction Industry (English)
5. Survey of Hispanic Workers in Construction Industry (Spanish)
6. Louisiana State University Report
7. IRB Information for Purdue Student Survey
8. IRB Information for Hispanic Construction Workers Survey

**NIOSH Research Project Construction Safety Survey I**  
**March 31<sup>st</sup>, 2006**

**ID # \_\_\_\_\_**

1) Please indicate your level of interest in this OSHA 10 hour course (check one)

- a. I am very interested in taking this course
- b. I am somewhat interested in taking this course
- c. I am only taking this course because of a requirement

2) Exposure to a residential construction job (check one)

- a. I have never been on a residential construction site
- b. I have visited a residential construction site
- c. I have job shadowed a project engineer or other worker on a residential construction site
- d. I have worked on a residential construction site

3) Exposure to a commercial or heavy civil construction job (check one)

- a. I have never been on a commercial or heavy civil construction site
- b. I have visited a commercial or heavy civil construction site
- c. I have job shadowed a project engineer or other worker on a commercial or heavy civil construction site
- d. I have worked on a commercial or heavy civil construction site

4) Have you had any prior safety training (check all that apply)

- a. I have no formal construction safety training
- b. I have had some informal safety training (for example, safety walk through a site or a tool box talk)
- c. I have completed an OSHA training course
- d. I have other safety training described below

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5) Have you had any first aid training? (check all that apply)

- a. I have no formal first aid training
- b. I have had some first aid training in high school or in another training or classroom environment
- c. I have CPR or other first aid certification

6) List two things that you think might pose hazards on the jobsite and contribute to construction accidents

1. \_\_\_\_\_
2. \_\_\_\_\_

7) Who would you expect to be responsible for safety on the job site? (check all that apply)

- a. I would expect safety to be the responsibility of workers and their direct supervisors
- b. I would expect safety to be the responsibility of the owner (the company for whom the project is being constructed)
- c. I would expect safety to be the responsibility of a construction engineer on the job site

8) What kind of "hands on" experience have you had? (check all that apply)

- a. I have helped wire an electrical outlet, light switch or a light fixture
- b. I have been on a ladder higher than one story (10 ft)
- c. I have been on the roof of a house or garage
- d. I have been in a hole or excavation more than 4 feet deep
- e. I have worked around farm machinery
- f. I have worked around heavy construction equipment
- g. I have used power tools such as a drill, circular saw, etc.
- h. I have used power lawn and/or garden equipment
- i. I have used harsh chemicals for cleaning, stripping furniture, etc.

9) What kind of safety equipment have you used? (check all that apply)

- a. Safety glasses or goggles
- b. Hard hat
- c. Steel toe boots or shoes
- d. Ear protection (ear plugs)
- e. Rubber gloves
- f. Mask to filter air particles
- g. Reflective vest
- h. Life vest (for flotation)
- i. Safety harness

Check the construction terms that you are familiar with and understand

- a. Rebar
- b. Lanyard
- c. Rip Rap
- d. Scaffold
- e. PTO
- f. Lock Out Tag Out
- g. Girder
- h. Slip Forms
- i. Shoring
- j. Scraper Pan
- k. HVAC
- l. SOG
- m. RFI
- n. GFI
- o. Drift Pins
- p. Amps
- q. U bolt
- r. Web Sling
- s. Rigging
- t. Screw Jack
- u. Joist
- v. Sheathing
- w. Benching
- x. Outrigger

**NIOSH Research Project Construction Safety Survey  
Post OSHA 10 Hour Training**

ID # \_\_\_\_\_

1) I thought that the material presented at the OSHA 10 hour course will be useful for my career in the construction industry.

- Strongly Agree
- Agree
- Undecided
- Disagree
- Strongly Disagree

2) I thought that the material presented at the OSHA 10 hour course was interesting.

- Strongly Agree
- Agree
- Undecided
- Disagree
- Strongly Disagree

3) The instructor made good use of examples and illustrations so that I could understand the topics.

- Strongly Agree
- Agree
- Undecided
- Disagree
- Strongly Disagree

4) The instructor explained difficult material clearly.

- Strongly Agree
- Agree
- Undecided
- Disagree
- Strongly Disagree

5) I have a better understanding of safety on the job site than I did prior to the training.

- Strongly Agree
- Agree
- Undecided
- Disagree
- Strongly Disagree

6) I have a better understanding of construction industry than I did prior to the training.

- Strongly Agree
- Agree
- Undecided
- Disagree
- Strongly Disagree

7) I understood the examples used in class.

- Strongly Agree
- Agree
- Undecided
- Disagree
- Strongly Disagree

7) I feel more prepared walking onto a construction site than I did prior to the training.

- Strongly Agree
- Agree
- Undecided
- Disagree
- Strongly Disagree

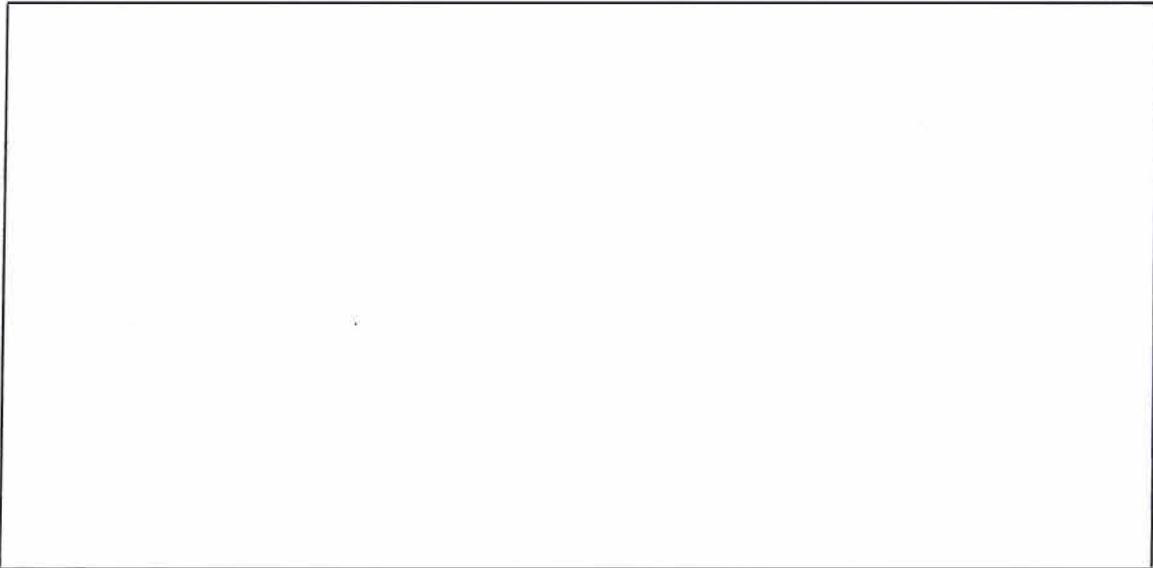
8) List three important safety topics you learned from the training that you believe will help you this summer.

- 1.
- 2.
- 3.

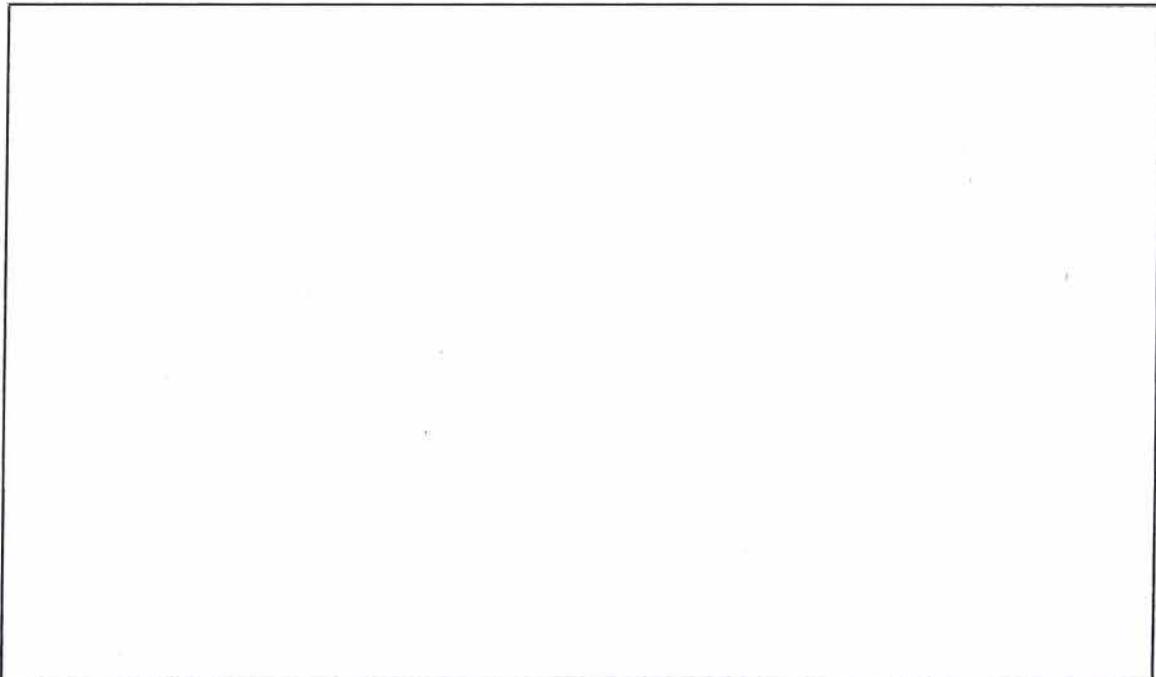
9) List three safety topics covered in class that you believe you will not use this summer.

- 1.
- 2.
- 3.

List any general topics in construction safety that you feel you do not understand well  
(These topics do not necessarily have to be part of the OSHA 10 hour training)



The safety training of our students is very important to use, please provide comments on  
how to improve the safety training for next year.



**Purdue CEM Sponsor Evaluation Form**

Intern's Name:

Sponsor's Firm:

Work Location:

Date: 9/5/2007

Internship: CEM 191:  CEM 291:  CEM 391:  4th Year:

**Directions:**

- This Evaluation Form is for the purpose of recording CEM student interns' experience and recommendations, to enable the Division of CEM to evaluate and improve the program.
- Complete this evaluation online
- ***Please limit your comments to 225 characters***

**Part I**

**Key for Grading Overall Performance, 1 to 5 scale compared to interns with similar experiences:**

- |  |  |
|--|--|
| 1 = Outstanding (far exceeds expectations or strongly agree) | 4 = Fair (below expectations but satisfactory) |
| 2 = Very Good (exceeds expectations)                         | 5 = Poor (unsatisfactory or strongly disagree) |
| 3 = Average (meets expectations)                             | N/A = Not applicable or not observed           |

**Evaluation of Internship Company**

	Outstanding	Average		Poor	Comments (225 Characters)	
<b>1. Appropriate Work Tasks</b> (Provide meaningful and varied tasks)	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input checked="" type="radio"/> 5 N/A	<input type="text"/>
<b>2. Opportunity for Observation</b> (Exposure to a variety of construction related activities)	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input checked="" type="radio"/> 5 N/A	<input type="text"/>
<b>3. Supervisor and/or Mentor</b> (Supervisor or other contact was available if I had problems or questions)	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input checked="" type="radio"/> 5 N/A	<input type="text"/>
<b>4. Responsibility</b> (Tasks and duties were appropriate for my level of experience and education)	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input checked="" type="radio"/> 5 N/A	<input type="text"/>
<b>5. Challenging Work</b> (Tasks were challenging enough to allow development of new skills)	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input checked="" type="radio"/> 5 N/A	<input type="text"/>
<b>6. Company Contact</b> (The main point of contact for my company is available)	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input checked="" type="radio"/> 5 N/A	<input type="text"/>
<b>7. Wages and Reimbursements</b> (The company met all the CEM program requirements for wages and reimbursements)	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input checked="" type="radio"/> 5 N/A	<input type="text"/>
<b>8. Relocation Information</b> (Someone at the company provided information on apartment locator services or suggestions for safe places to live, if requested)	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input checked="" type="radio"/> 5 N/A	<input type="text"/>

<b>9. Overall Internship Experience</b>	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5	<input checked="" type="radio"/> N/A	
---	-------------------------	-------------------------	-------------------------	-------------------------	-------------------------	--------------------------------------	--

<b>10. Permanent Employment</b>	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5	<input checked="" type="radio"/> N/A	
---------------------------------	-------------------------	-------------------------	-------------------------	-------------------------	-------------------------	--------------------------------------	--

(This would be a good company to work with after graduation)

**Part II**

**Evaluation of CEM Program**

	Outstanding	Average	Poor	Comments (225 Characters)
--	-------------	---------	------	---------------------------

<b>1. Safety</b>	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5	<input checked="" type="radio"/> N/A	
------------------	-------------------------	-------------------------	-------------------------	-------------------------	-------------------------	--------------------------------------	--

(The safety training provided by the CEM program prior to my first internship was appropriate)

<b>2. Preparation</b>	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5	<input checked="" type="radio"/> N/A	
-----------------------	-------------------------	-------------------------	-------------------------	-------------------------	-------------------------	--------------------------------------	--

(The information and assistance provided by the CEM department in preparation for my summer internship was adequate)

<b>3. Availability</b>	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5	<input checked="" type="radio"/> N/A	
------------------------	-------------------------	-------------------------	-------------------------	-------------------------	-------------------------	--------------------------------------	--

(CEM faculty and staff were available during the summer work period for problems or questions)

<b>4. Summer Visit (if Applicable)</b>	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5	<input checked="" type="radio"/> N/A	
--	-------------------------	-------------------------	-------------------------	-------------------------	-------------------------	--------------------------------------	--

(The summer visit by CEM faculty and/or staff was helpful)

<b>5. Value of Internship</b>	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5	<input checked="" type="radio"/> N/A	
-------------------------------	-------------------------	-------------------------	-------------------------	-------------------------	-------------------------	--------------------------------------	--

(My internship experience this summer is an important component of my education)

<b>6. Coursework</b>	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5	<input checked="" type="radio"/> N/A	
----------------------	-------------------------	-------------------------	-------------------------	-------------------------	-------------------------	--------------------------------------	--

(My coursework to date has provided relevant information for my internships)

<b>7. Overall Program Assistance</b>	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5	<input checked="" type="radio"/> N/A	
--------------------------------------	-------------------------	-------------------------	-------------------------	-------------------------	-------------------------	--------------------------------------	--

**Part III**

**Safety**

1. Had you ever been on a major construction site (commercial building or heavy civil project - not residential) prior to your first internship?

Yes  No

2. As a future construction engineer on a job site, I would expect construction safety to take up  % of my time on a daily basis.

3. If you received OSHA 10 hour training either at Purdue or at your company:

What was the most helpful (review your OSHA 10 hour handouts if necessary)?	
---	--

What do you think should have been included?	
--	--

4. Do you feel your training better prepared you for being on a construction site?

Yes  No

5. Were there any construction terms used at work that you did not understand?

Yes  No

If yes, please list some examples:

6. Do you think it would have been helpful to incorporate a construction site visit with OSHA 10 hour training?

Yes  No

If yes, what should we show / explain to the students?

7. During your internship, did your company provide any extra safety training?

Yes  No

If yes, please describe.

8. Did you participate in any company safety activities (tool box talks, safety walks, etc.)?

Yes  No

If yes, please list and describe all activities.

9. Did you use safety equipment that was not shown in the OSHA 10 hour class?

Yes  No

If yes, please list:

10. List all of the safety equipment you used during your internship (hard hats, safety glasses, harness, etc.).

11. What was the most hazardous part of your job?

12. Did you ever encounter a language barrier with any of the workers?

Yes  No

If yes, could it have lead to an unsafe work environment?

Yes  No

If yes, please explain:

**Part IV**

1. What Purdue course work, if any, has been beneficial to you during this work period (describe)?

2. What were your living arrangements this work period?

3. What assistance did your sponsor firm provide in finding lodgings?

4. Did your sponsor firm provide any extra benefits besides the required intern wage, travel reimbursement, and half-tuition reimbursement?

5. On reflecting, what action(s) by each of the following parties could have been taken which would have improved the value of your learning experience this period?

a. By your sponsor firm:

b. By the CEM Division:

c. By you:

6. In your opinion what are the top three duties of a construction engineer?

7. Do you have any tips to pass on to future CEM interns regarding their learning experiences or life experiences during their internships?

8. Any other comments or recommendations concerning the CEM program?

**Part V**

**Campus Information for the Fall Semester**

Address:  City:   
State:  Zip:

Local Phone:

Cell Phone:

E-Mail Address:

Expected Graduation Date:

- Please check your specialty option:
- Building
  - Heavy/Highway
  - Electrical
  - Mechanical

**Review Evaluation**

**NIOSH Research Project Construction Safety Survey  
Winter 2007**

**ID #** \_\_\_\_\_

**Location** \_\_\_\_\_

1) What is your age \_\_\_\_\_

2) What is your education level \_\_\_\_\_

3) Gender  Male  Female

4) How many total years of construction experience \_\_\_\_\_

5) How many years of experience in the U.S. Construction Industry \_\_\_\_\_

6) What is your job position

Laborer

Specialty trade (for example, painter) Trade \_\_\_\_\_

Foreman

Superintendent

7) List other kinds of work you have done (e.g. drywall, electrical, etc.)

8) Exposure to construction jobs (Please check all that apply)

I have worked on a residential construction site

I have worked on a commercial construction site (e.g. office building, or store)

I have worked on a road construction site

I have worked on a chemical plant or power plant construction site

9) Please check all that apply

I have helped wire an electrical outlet

I have been on a ladder higher than 1 story

I have been on the roof of a house

I have been in a hole or excavation more than 4 feet deep

I have worked around farm machinery

I have worked around heavy construction equipment

I have used power tools (drill, circular saw, etc..)

I have used power lawn and garden equipment

10) Level of safety training (Please check all that apply)

- I have no formal construction safety training
- I have had some informal safety training (for example, safety walk through a site or a tool box talk)
- I have completed an OSHA 10 Hour Course
- I have completed an OSHA 30 Hour Course
- Other safety training (please list)

11) I receive adequate safety training for my job

- I agree
- I disagree

12) Are you interested in taking a safety training course?

- I am very interested in taking a course
- I am somewhat interested in taking a course
- I would only take this course if it is a requirement for my job

13) **If you have had safety training:** I have a better understanding of safety on the job site than I did prior to the training.

- Strongly Agree
- Agree
- Undecided
- Disagree
- Strongly Disagree

14) What language was safety training provided in?

- English
- Spanish
- Both English and Spanish

15) If training was provided in Spanish or in both English and Spanish, please clarify (check all that apply)

- The trainer spoke English and Spanish
- The trainer brought an interpreter to assist in communication
- One of the workers helped translate when necessary

16) I understood the examples used in class, such as putting on a safety harness.

- Strongly Agree
- Agree
- Undecided
- Disagree
- Strongly Disagree

17) List three things that you think are hazards (reasons for accidents) on a construction jobsite

- 1.
- 2.
- 3.

18) List three things that you think would improve safety on a construction jobsite

- 1.
- 2.
- 3.

19) Do you think that the main cause of accidents on a construction site occur because of:

- Poor or inadequate training of workers
- Worker carelessness
- Construction is dangerous and accidents are inevitable
- Poor Communication
- Other (Please List) \_\_\_\_\_

20) As a construction worker on a job site, I would expect construction safety to take up \_\_\_\_\_% of my time on a daily basis

**Communication with Supervisor if you are originally from outside the U.S.**

21) Does your immediate supervisor speak Spanish?

- Yes, my supervisor speaks Spanish very well
- Yes, my supervisor speaks enough Spanish to tell us what we need to do although he doesn't speak Spanish well
- No, my supervisor doesn't speak Spanish well but we know what to do and don't need much input from the supervisor
- No, my supervisor doesn't speak Spanish well but someone translates

22) Are there a lot of differences in construction terms used in your home country and the United States?

- Yes, there are a lot of differences in terms and construction language
- No, many terms and a lot of the language used in construction are the same

If yes, please give some examples:

23) Do you use the same kind of equipment and methods when working in your home country and the United States?

- Yes, we use a lot of the same equipment and methods
- No, many terms are different in Mexico and the United States

24) What priority does safety have in your home country compared to the United States?

- Higher
- Same
- Lower

25) How would you classify the safety risk of your work in construction in the United States?

- Higher
- Same
- Lower

26) Does re-construction work have similar safety risks to new construction work?

- Higher risk
- Same (Yes).
- Lower risk

If not, please give some reasons why there are higher or lower risks:

27) Are there any construction terms used on the job site that you do not understand?  
Please list

28) Do you know what the following terms mean?

Yes No                      Term

		Tag line
		Lock out/Tag out
		Egress (path entering/exiting building)
		Bird Caging
		Base Plates
		Spoil Pile
		Out Riggers
		Toe Boards
		GFI
		Benching
		Rebar Caps
		Trench plate
		Welding Shield
		Lanyard
		MSDS
		Slip Forms
		Flammable Cabinet
		Mud Sills
		Rigging

**Proyecto de Investigación NIOSH  
Encuesta de Seguridad en Construcción  
Invierno 2007**

**ID #** \_\_\_\_\_

**Lugar** \_\_\_\_\_

1) Cuál es su edad? \_\_\_\_\_

2) Cuál es su nivel de educación? \_\_\_\_\_

3) Género  Masculino  Femenino

4) En total, tiene cuántos años de experiencia en construcción? \_\_\_\_\_

5) Cuántos años de experiencia en construcción tiene en Estados Unidos? \_\_\_\_\_

6) Cuál es su posición de trabajo?

- Obrero  
 Trabajador especializado (por ejemplo, pintor) Especialización \_\_\_\_\_  
 Capataz  
 Superintendente

7) Escriba otros tipos de trabajos que ha hecho (por ejemplo, tableros de yeso, eléctricos, etc.)

8) Exposición a trabajos de construcción (Seleccione todo lo que aplique)

- He trabajado en construcción de residencias  
 He trabajado en construcción de comercios (edificios de oficinas o tiendas)  
 He trabajado en construcción de calles  
 He trabajado en construcción de plantas químicas o centrales eléctricas

9) Seleccione todo lo que aplique:

- He ayudado a conectar/electrificar salidas eléctricas/tomas de corriente  
 He estado en escaleras más altas de un piso  
 He estado en el techo de una casa  
 He estado en una excavación de más de 4 pies de profundidad  
 He trabajado alrededor de maquinaria de granja  
 He trabajado alrededor de equipos de construcción pesados  
 He utilizado herramientas eléctricas (perforadoras eléctricas, sierras circulares, etc..)  
 He utilizado equipos de jardín

10) Nivel de entrenamiento de seguridad (Seleccione todo lo que aplique)

- No tengo entrenamiento formal de seguridad en construcción
- He tenido entrenamiento de seguridad informal (por ejemplo, caminatas de seguridad en el sitio de construcción o charlas de cajas de herramientas)
- He completado un curso de 10 horas de OSHA
- He completado un curso de 30 horas de OSHA
- Otros entrenamientos de seguridad (por favor enumerar)

11) Recibo entrenamiento de seguridad adecuado para mi trabajo

- Estoy de acuerdo
- No estoy de acuerdo

12) Está interesado en tomar un curso de entrenamiento de seguridad?

- Estoy muy interesado en tomar un curso.
- Estoy un poco interesado en tomar un curso.
- Sólo tomaría este curso si es requerido por mi trabajo.

13) **Si ha tenido entrenamiento de seguridad:** Ahora tengo un mejor entendimiento de lo que es la seguridad en el trabajo del que tenía antes del entrenamiento.

- Estoy muy de acuerdo
- Estoy de acuerdo
- No sé
- Estoy en desacuerdo
- Estoy muy en desacuerdo

14) En qué idioma fue el entrenamiento de seguridad?

- Inglés
- Español
- Inglés y Español (ambos)

15) Si el entrenamiento fue en español o en inglés y español (ambos), por favor clarifique (seleccione todo lo que aplique):

- El instructor habló inglés y español
- El instructor trajo un traductor para ayudar en la comunicación
- Uno de los trabajadores ayudó a traducir cuando fue necesario

16) Comprendí los ejemplos utilizados en clase, como el ejemplo de cómo ponerse un arnés de seguridad

- Estoy muy de acuerdo
- Estoy de acuerdo
- No sé
- Estoy en desacuerdo
- Estoy muy en desacuerdo

17) Escriba tres cosas que usted piensa son peligros (causas de accidentes) en un sitio de construcción.

- 1.
- 2.
- 3.

18) Escriba tres cosas que usted piensa aumentarían la seguridad en un sitio de construcción.

- 1.
- 2.
- 3.

19)Cuál piensa usted que es la principal causa de accidentes en un sitio de construcción?

- Entrenamiento pobre o inadecuado de los trabajadores
- Descuido de los trabajadores
- La construcción es peligrosa y los accidentes son inevitables
- Falta de comunicación
- Otros (Por favor enumere) \_\_\_\_\_

20) Como un trabajador en el sitio de construcción, la seguridad en construcción tomaría \_\_\_\_\_% de mi tiempo cada día

## Comunicación con el supervisor si usted no es originario de los Estados Unidos

21) Su supervisor inmediato habla español?

- Sí, mi supervisor inmediato habla español muy bien
- Sí, mi supervisor habla suficiente español para decimos lo que tenemos que hacer, aunque no habla español muy bien
- No, mi supervisor no habla español bien, pero nosotros sabemos lo que tenemos que hacer y no necesitamos mucha dirección del supervisor
- No, mi supervisor no habla español, pero alguien traduce

22) Hay muchas diferencias entre el vocabulario de construcción utilizado en su país y el utilizado en Estados Unidos?

- Sí, hay muchas diferencias en el vocabulario de construcción
- No, una gran parte del vocabulario de construcción utilizado es igual en ambos países

Si su respuesta es sí, por favor escriba algunos ejemplos:

23) Usted utiliza los mismos equipos y métodos cuando trabaja en construcción en su país y en Estados Unidos?

- Sí, utilizamos los mismos equipos y métodos
- No, son diferentes en México y Estados Unidos

24) Qué prioridad tiene la seguridad en su país en comparación con los Estados Unidos?

- Más prioridad en mi país
- La misma prioridad
- Menor prioridad en mi país

25) Cómo clasificaría los riesgos de seguridad de su trabajo en construcción en los Estados Unidos?

- Mayores riesgos
- Iguales
- Menores riesgos

26) El trabajo de reconstrucción tiene riesgos de seguridad similares a los de nuevos trabajos de construcción?

- Mayor riesgo
- Igual riesgo
- Menor riesgo

Si tiene mayor o menor riesgo, escriba algunas razones:

27) Hay alguna palabra en el vocabulario de construcción utilizado en el trabajo que usted no comprende? Por favor enumere.

28) Sabe que significan las siguientes palabras?

Sí No Palabra

Sí	No	Palabra
		Tag line
		Lock out/Tag out
		Egress (path entering/exiting building)
		Bird Caging
		Base Plates
		Spoil Pile
		Out Riggers
		Toe Boards
		GFI
		Benching
		Rebar Caps
		Trench plate
		Welding Shield
		Lanyard
		MSDS
		Slip Forms
		Flammable Cabinet
		Mud Sills
		Rigging

**LOUISIANA STATE UNIVERSITY**

**IE 4461 HUMAN FACTORS**

**DR. AGHAZADEH**

**SEMESTER PROJECT REPORT**

**NIOSH  
HISPANIC WORKERS  
SAFETY SURVEY**

Research Assistants

**BERTOT, JACKOBY**

**HUERTA, JOSE**

**PLAYER, LAURA**

April 2007

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## Summary

Various reports show a continuous downward trend in the number of reported fatal injuries among workers in the private and public sectors in general. Overall rates and numbers have fallen slightly, but for certain groups of workers including Hispanic workers, such numbers are on the rise. Fatal injuries among Hispanic workers have increased from 815 in 2000, to 891 in 2001 according to the Bureau of Labor Statistics Census of Fatal Occupational Injuries. This alarming numbers represents a 9 percent increase.

In previous years, increases of Hispanic worker deaths were caused by a rise in fatalities in the construction industry, however the 2001 increase was seen particularly in the field of agriculture. It is also noticed that the problem is even more serious for Hispanic workers who were born outside of the United States than for those who were actually born here. Without any surprise the states where more of these fatalities occur are the states where the presence of Hispanics is large-California, Texas, New York and Florida.

## Background Information

The number of Hispanic workers has been increasing significantly over the last 20 years. In the 2000 Census, 35 million Hispanics were reported living in the United States. This is around 12.5 percent of the population (AFL-CIO, 9). Now the number of Hispanics is estimated to be more than 40 million, 14 percent of the population of the United States. By 2050 the Census projects that the Hispanic population will account for one out of every four Americans (Richardson, 64).

Hispanic population as a percentage of the U.S. population 1980-2000

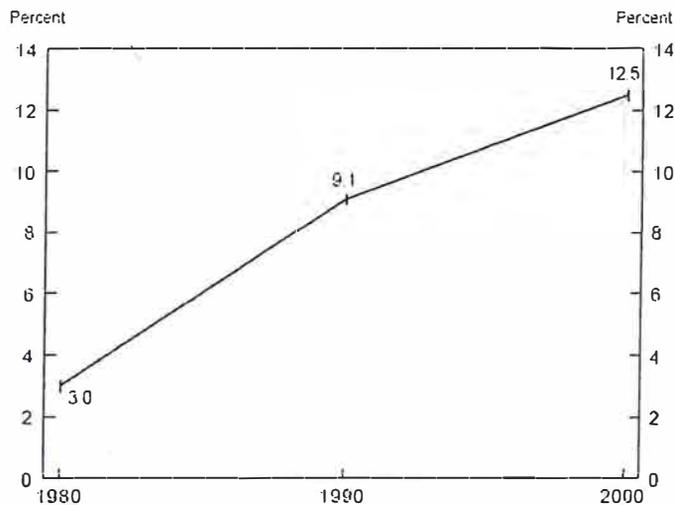


Figure 1.1

Monthly Labor Review 2005. Visual Essay: Hispanic Worker Fatalities

Source: U.S. Census Bureau

A very important fact is that most of these people are of working age. Another important fact is that the number of work-related fatalities and injuries has been increasing among

Hispanic workers at a disproportionate rate. Even though, the overall number of fatalities has dropped, from 1992 to 2001 the number of fatalities for Hispanic workers has increased by 67 percent (AFL-CIO, 9). Overall, about a fourth of fatal work injuries among Hispanic workers occur in the construction industry. This number was 3.5 higher in 2002 than it was in 1992 (Richardson, 67). Most of these workers were foreign born.

Fatal work injuries involving Hispanic workers in private construction by nativity,  
1993-2002

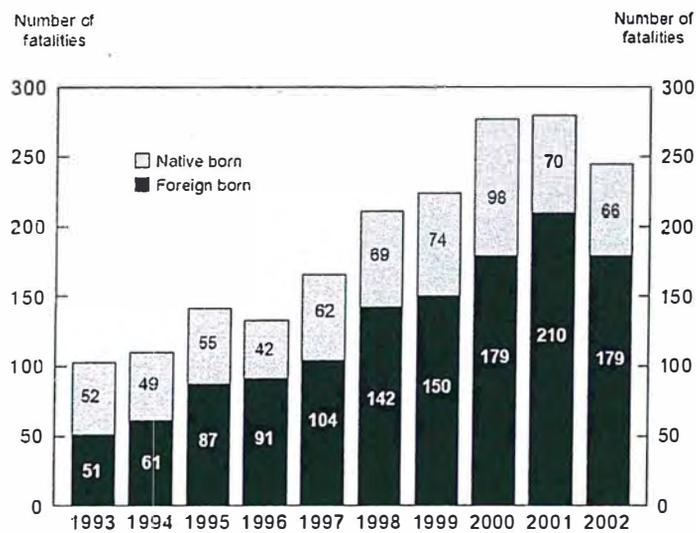


Figure 1.2

Monthly Labor Review 2005 Visual Essay: Hispanic Worker Fatalities

Source: Census of Fatal Occupational Injuries

There are several reasons that explain the cause of this trend. Some of those reasons may be arguable. The following table summarizes the main reasons proposed by experts and organizations:

Main Reasons for Hispanic Work Related Fatalities and Injuries
<ul style="list-style-type: none"><li>○ Hispanic immigrants are hired disproportionately into the most dangerous jobs</li><li>○ They are often unskilled</li><li>○ They have less job or safety training than American-born workers</li><li>○ They are not really used to work in a safe manner</li><li>○ Big communication gap between Hispanic workers and contractors</li><li>○ Immigrants are usually newer to their jobs than Americans</li><li>○ Workers are not provided with the appropriate safety equipment</li><li>○ They are reluctant to complain about dangerous working condition because they are more afraid about losing their job or being deported.</li></ul>

Some reports relate these reasons to each other. For example Hispanic immigrants receive less job and safety training than Americans, because they do not speak English (Greenhouse, 11) or if training is provided they do not fully understand what it is taught (Sant, 18). But, why is it that immigrants are hired into the most dangerous jobs? Some an answers to this may be low levels of education, few job skills, lack of understanding of

the English language in addition to their illegal residence status in the United States. To make matters worse, some of these workers can not even read in their native language (Dayton, 1). Many Hispanic workers are day laborers: “If you’re a day laborer who gets picked up at a local 7-Eleven and paid cash for that day, there’s no opportunity to learn about safety on the job.... They (contractors) are not going to spend a day teaching you about safety...” (Greenhouse, 11)

There are also cultural problems involved, as stated in one of the reasons in the table. Hispanic workers are simply not used to working in a safe manner. In fact, they also say that Hispanic employers are worse to work for because they are less caring about safety and work conditions (Greenhouse, 11) than American employers. Probably the most arguable reason is the language barrier. Safety experts say these barriers contribute to an increase of the injury rate. For example, in many job sites safety instructions and warnings appear only in English. Another example, if someone yells “watch out” a person that does not understand English would not react as fast as he could (Greenhouse, 11). However, there are people like Philip Ford, president of the Charleston Trident Homebuilders Association, who states that language barrier is not a real cause because “Most sites where Hispanics workers are employed include some Hispanics who speak English fluently.”(Dayton, 1)

There are others who say that employers are responsible for this situation because they do not provide the worker with appropriate safety equipment. “They also want to get things done and they do not enforce their safety rules” (Sarmiento, 1). Activists say that many

accidents or deaths are not reported because the workers were not documented. In few words, some employers take advantage of the undocumented situation of many Hispanic workers.

### Most Common Construction Accidents

<p><b>Electrical Incidents</b></p>	<ul style="list-style-type: none"> <li>• Contact with Power Lines</li> <li>• Lack of Ground-Fault Protection</li> <li>• Path to Ground Missing or Discontinuous</li> <li>• Equipment Not Used in Manner Prescribed</li> <li>• Improper Use of Extension and Flexible Cords</li> </ul>
<p><b>Falls</b></p> <p>Falls are the leading cause of fatalities in the construction industry.</p>	<ul style="list-style-type: none"> <li>• Unprotected Sides, Wall Openings, and Floor Holes</li> <li>• Improper Scaffold Construction</li> <li>• Unguarded Protruding Steel Rebars</li> <li>• Misuse of Portable Ladders</li> </ul>
<p><b>Struck by</b></p> <p>Approximately 75% of struck-by fatalities involve heavy equipment such as trucks or cranes.</p>	<ul style="list-style-type: none"> <li>• Vehicles</li> <li>• Falling/Flying Objects</li> <li>• Constructing Masonry Walls</li> </ul>

<b>Trenching and Excavation</b>	<ul style="list-style-type: none"><li>• No Protective System</li><li>• Failure to Inspect Trench and Protective Systems</li><li>• Unsafe Spoil-Pile Placement</li><li>• Unsafe Access/Egress</li></ul>
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Taken from OSHA's Construction eTool.



What is being done to reduce these fatalities?

Many companies are trying to teach their supervisors to speak Spanish, some of them also promote Spanish videos to teach Hispanic workers how to take precautions at work and protect themselves (Greenhouse, 11)

OSHA and Hispanic Contractors of America Inc. alliance:

- Stimulate development of safety and health resources for Spanish speakers
- Disseminate information through conferences, events, community-based activities and electronic media.
- Work with community organizations and other groups to build safety and health awareness within Hispanic community.
- Encourage bilingual individuals in construction to take OSHA's train-the-trainer class so they can teach the class in Spanish.

(Professional Safety, 14)

SPALW (Society's Safety Professionals and the Latino Workforce) 2005 Conference

Working effectively with Latino workforce:

- Learn about the culture and traditions of Spanish-speaking employees
- Try to greet Latino employees in their language, use first names and smile. These small steps help bridge the communication and cultural gap.
- Train Spanish-speaking workers in their language. Use pictures, diagrams, and charts, and avoid technical works in presentations and printed materials
- Hire an effective Spanish-speaker trainer.
- If using an incentive plan, try to incorporate group rewards.

(Professional Safety, 23)

OSHA provides an excellent and easy to understand safety construction guide called “OSHA Construction eTool” as a webpage. Its Spanish version is available. Reference to this webpage is given in the bibliography section of this report.

### **Objectives:**

The main objective of our project is to evaluate the reasons why the numbers of job fatalities among Hispanic workers are on the rise. Our group carried out such task via a survey which contained questions targeted to obtain information on the levels of safety training among Hispanic workers in the city of New Orleans as well as the city of Baton Rouge, both located in Louisiana. The city of New Orleans experiences a large presence of Hispanic workers pre and post Katrina, on the other hand the city of Baton Rouge has only experienced an increase in the presence of Hispanic workers post Hurricane Katrina.

### **Hypothesis:**

The main reasons why the numbers of job fatalities among Hispanic workers are on the increase are:

- a) Lack of proper safety training
- b) Lack of knowledge of the English language

### **Methods and Procedures:**

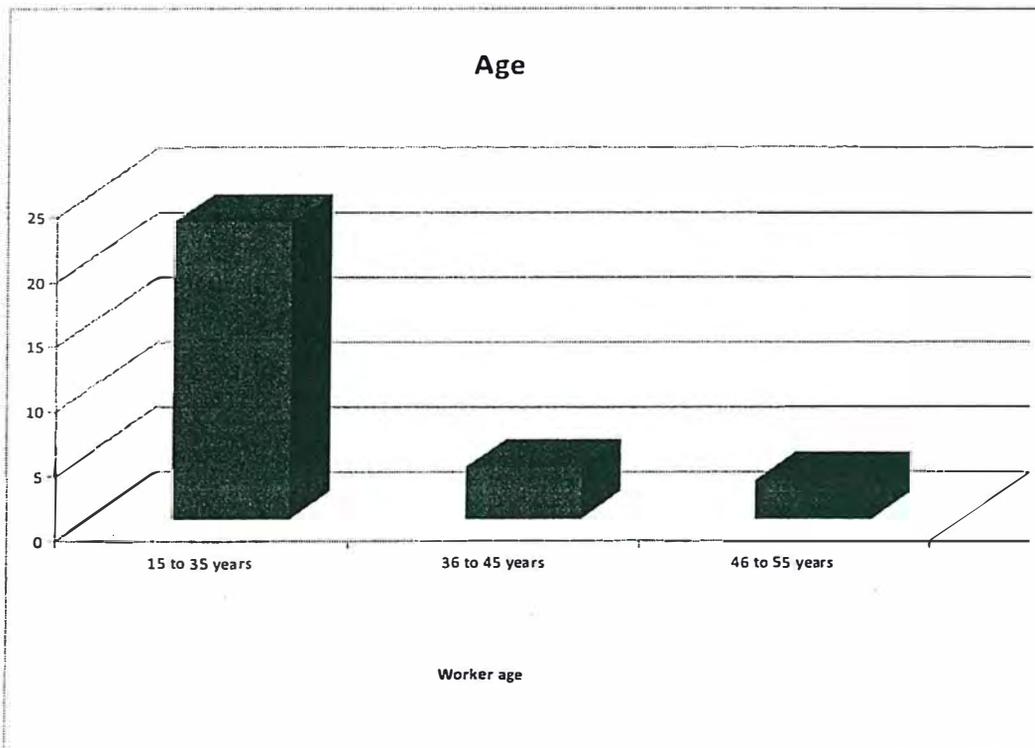
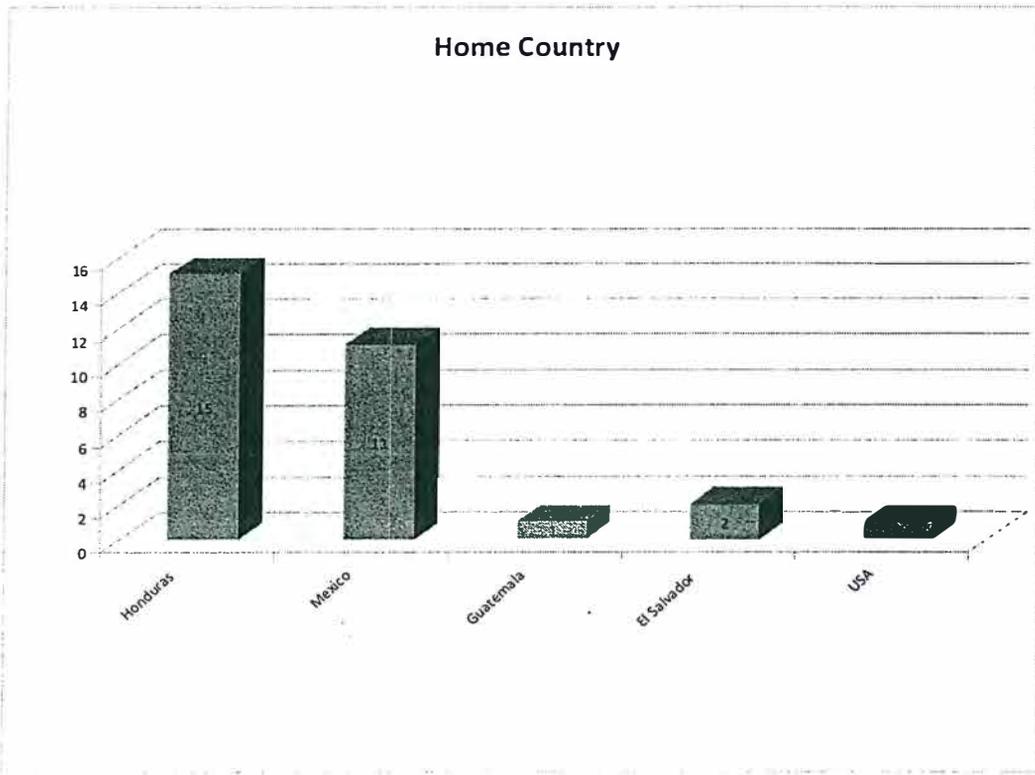
The procedure to obtain our information starts with the elaboration of a survey-questionnaire which consists of numerous questions ranging from country of origin, level of education, type of work previously performed, existence of formal or informal safety

training among others. It ends with the evaluation of a series of common safety phrases. Our group spoke face to face to each and every one of those individuals subjected to the questionnaire.

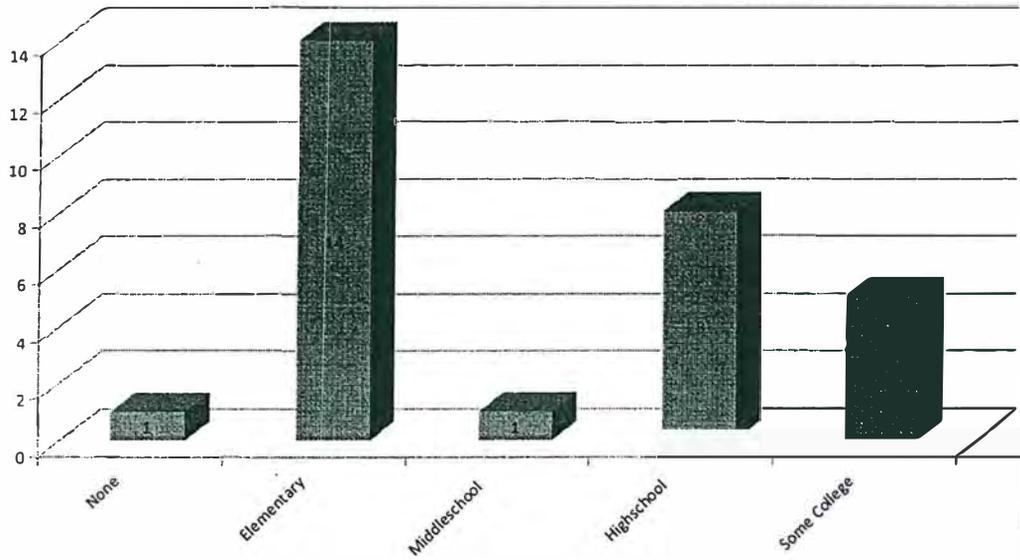
Secondly, once the information is collected, we proceed to evaluate such information aiding us with an Excel Software Program. Representations through Bar Charts as well as Pie Charts will provide with extremely helpful details which later will allow to draw conclusions and make the proper recommendations.

Finally, the last part of our project takes all the information collected, carefully reviews the evidence in the form of data and graphs and tries to draw conscious conclusions that will provide or attempt to provide reasonable answer to our original hypothesis. Are the numbers of job fatalities among Hispanic workers on the rise due to lack of safety training and knowledge of the language?

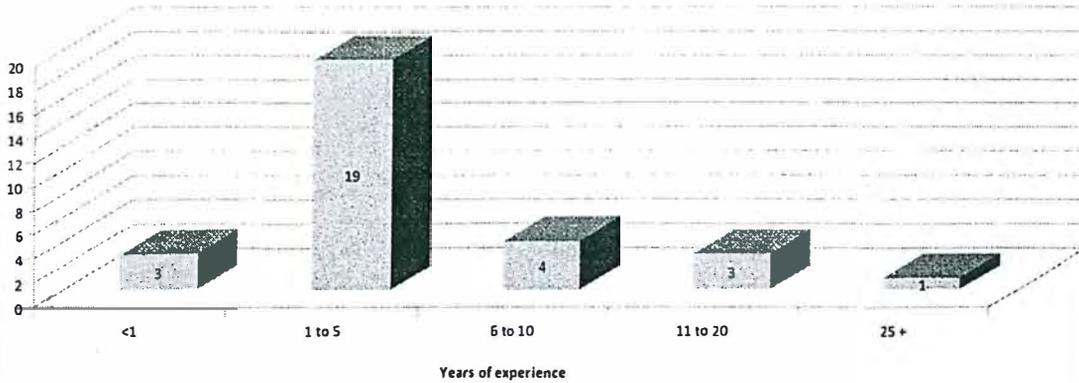
**Results:** These are the results of the NIOSH survey in graph format.



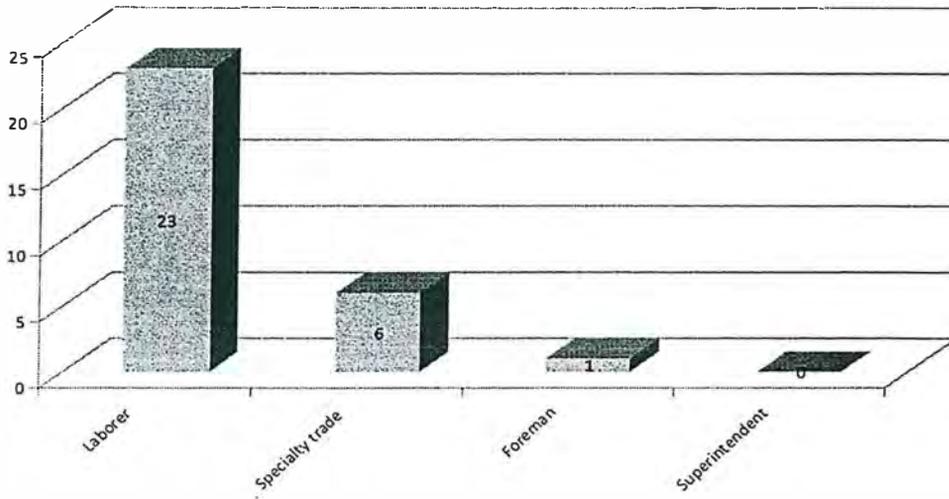
### Educational Level



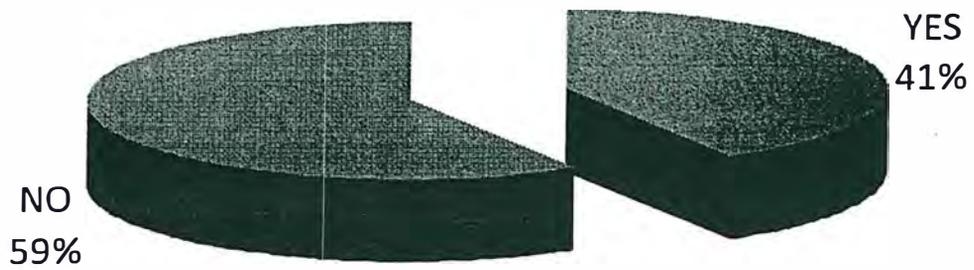
### Years of Experience in Construction



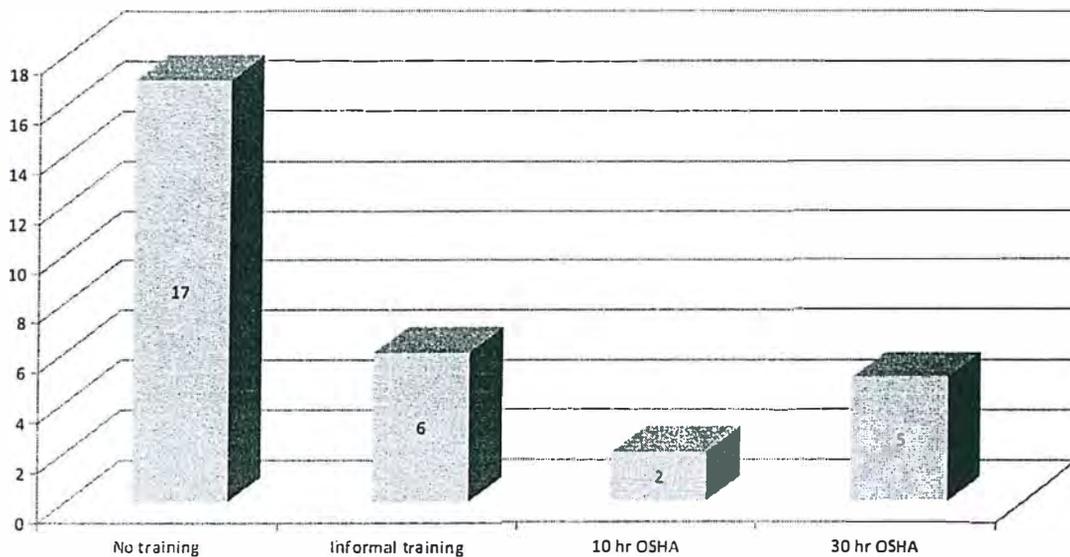
### Job Position



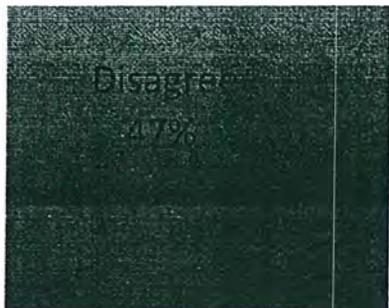
### Worker has done other kinds of work besides construction



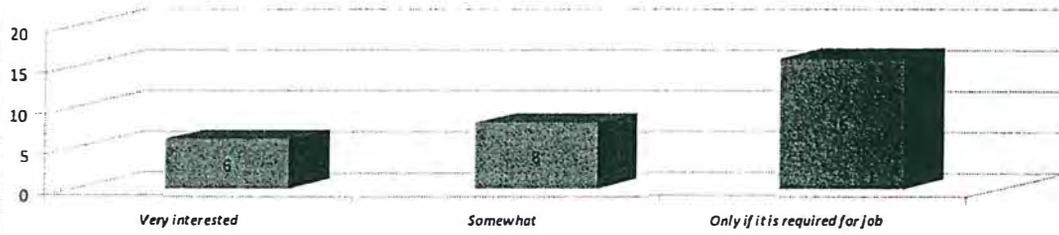
### Level of Safety Training



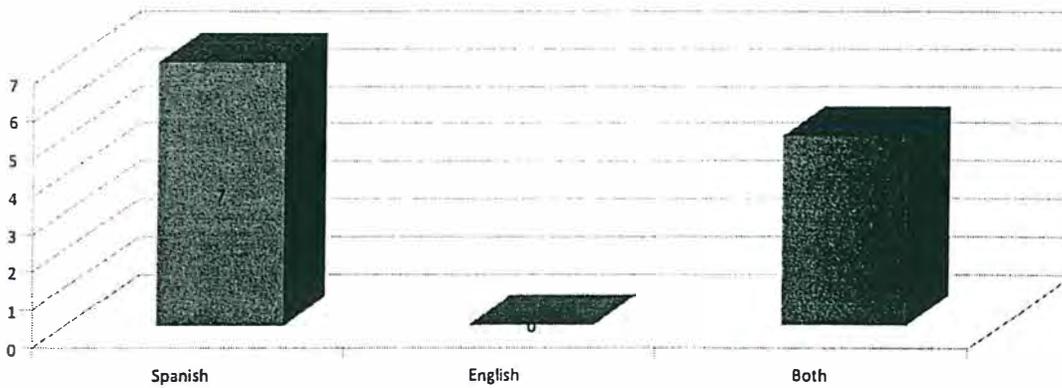
### Received Adequate Safety Training



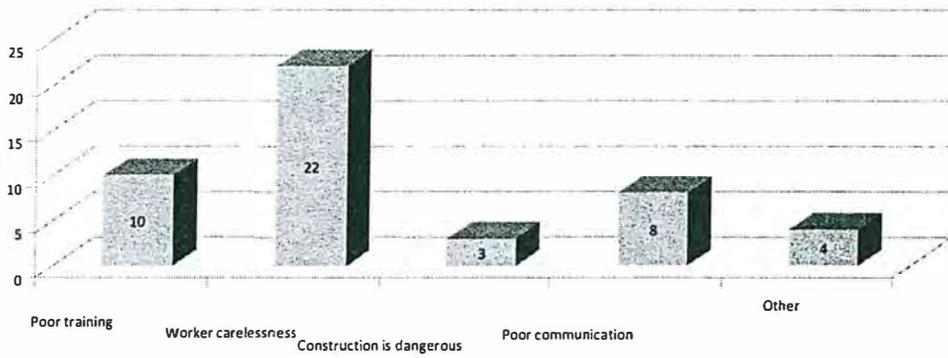
### Interested in taking Safety Training Course



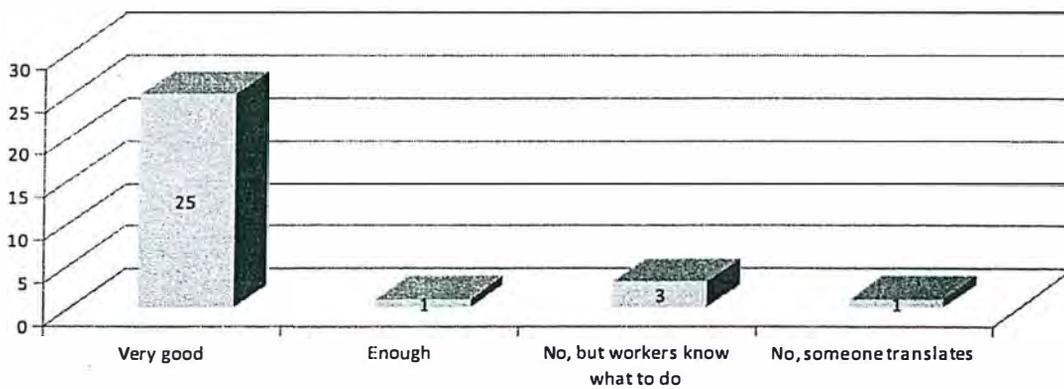
### What language was the safety training provided in?



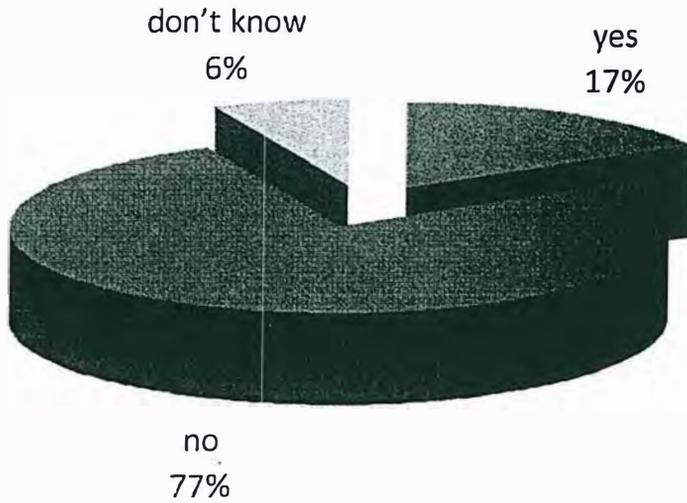
### Main Cause of Accidents



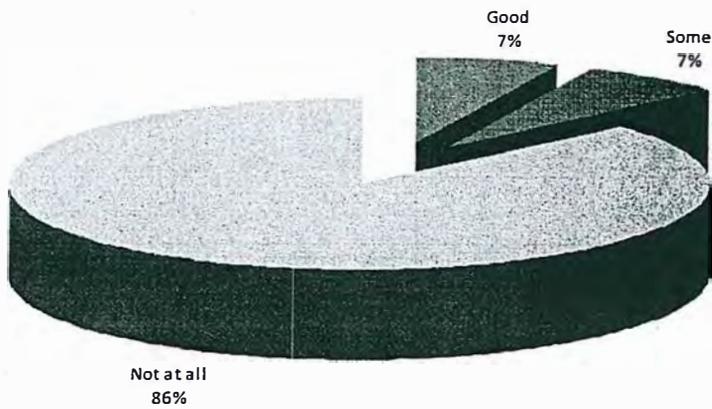
### Does Immediate Supervisor speak Spanish?



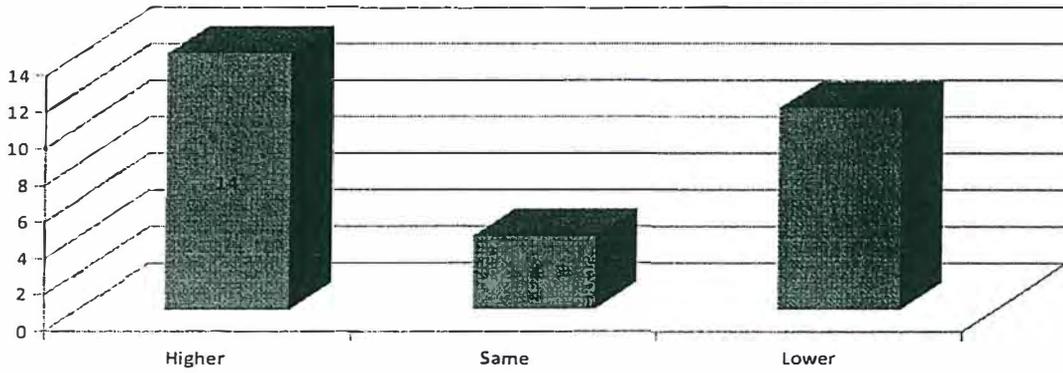
**Are the equipments and mehtods used in your Home Country compared to USA the Same?**



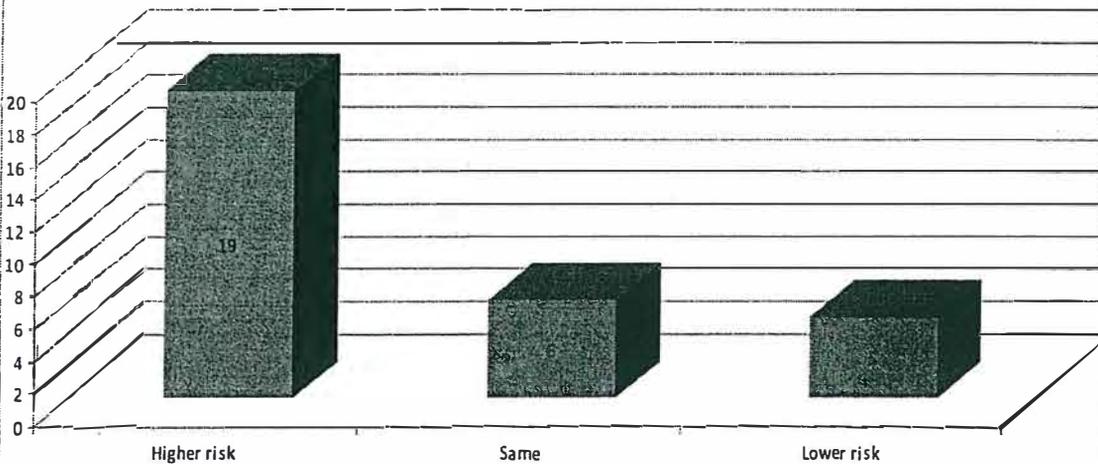
**English Language Level**



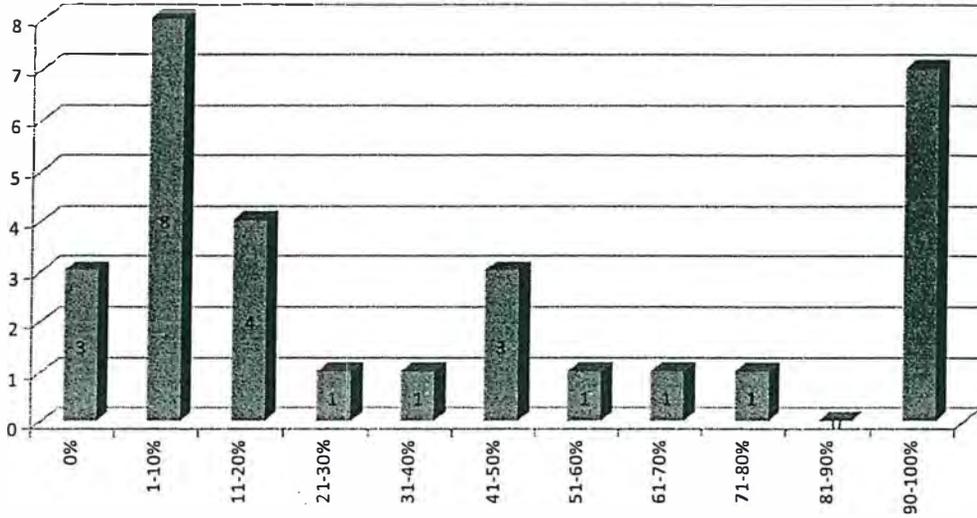
### Safety Priority in USA compared to Home Country



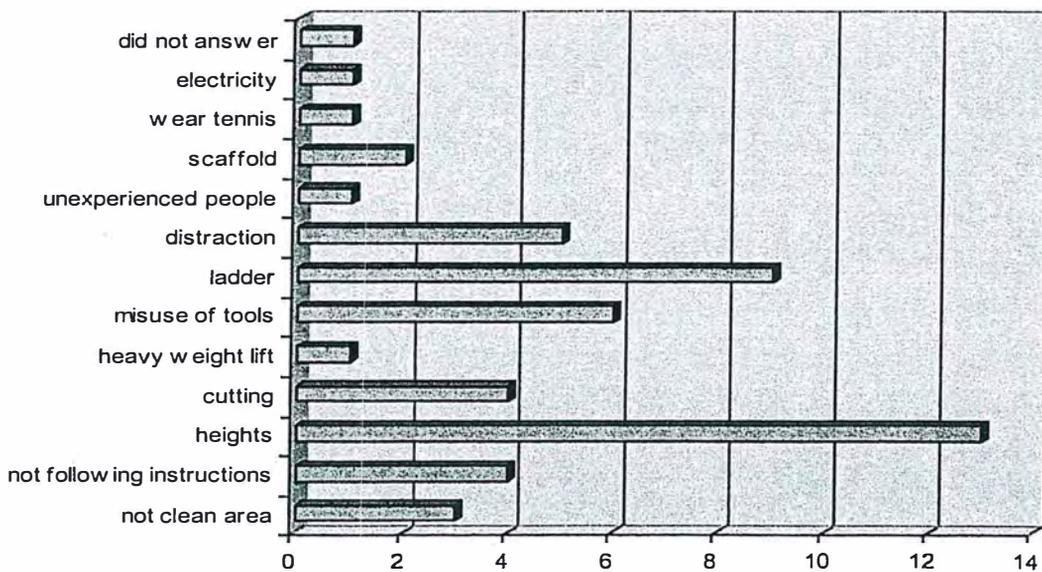
### Reconstruction Risk compared to New Construction Risk



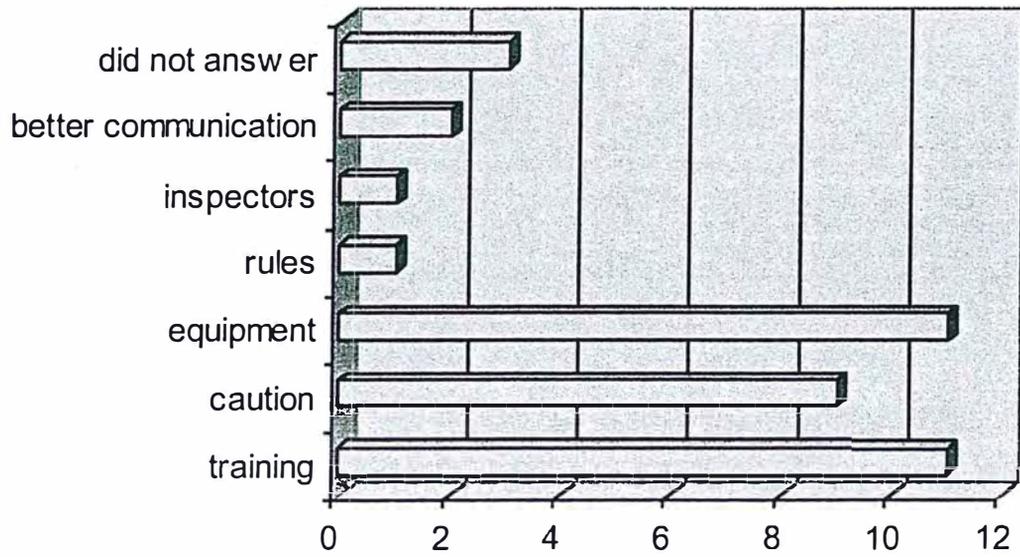
### Percentage of worker's time dedicated for safety (per day)



### Construction Site Hazards



### Suggestions to Improve Safety in Construction



## Data Results:

After collecting, organizing and analyzing all the data the following results were obtained. From the graphs we can summarize the following:

1. **Honduras** is the home country of most of the interviewed workers (15) followed by Mexico with 11.
2. **19 to 35 years of age** is the age range of most of the interviewed workers. Most of them are under 26 years of age.
3. **Elementary school** was the highest educational level attained by the workers. Most of them did not make it past 6<sup>th</sup> grade.
4. **1-5 years** is the range of **experience** that the majority of the interviewed workers have. Most of them have 3 years or less.
5. **Laborer** is the job position for most of the interviewed people (23). Most of them have worked in residential and commercial construction sites. The great majority has been on a ladder higher than one story and on the roof of a house.
6. **59% of the workers have worked only in construction**

7. **Most of those interviewed do NOT have Construction Safety training (17).** The rest (13) have had some kind of formal (OSHA) or informal training. For those who had the training everyone stated that they **understood the material** and all of them say **the course was given in Spanish**, or Spanish and English together.

8. **53% of the interviewed workers AGREE** that they receive **adequate safety instructions in their jobs (feel safe).**

9. Most of the workers would take safety training **only if it is a requirement for their jobs.**

10. **Worker carelessness is the main cause of accidents** on a construction site according to most of the Hispanic interviewed workers (22) followed by poor training (10).

11. A great majority say that their **immediate supervisor speaks Spanish (25).** Only 3 people said that the immediate supervisor does not speak Spanish but they know what to do.

12. **Different equipment and methods** are used in the U.S. from those used in their home countries according to **77%** of the interviewed workers.

**13. The United States is safer country to work at** (higher safety priority and lower risks at work) **than their home countries** (14), however the number is not that far from those who think the other way (11)

**14. Reconstruction work risks are higher** than new construction work according to most of the workers (19 out of 30).

**15. Construction safety takes up from 1-10% of the worker's time** on a daily basis based on the slightly majority of the answers (8). A group of 7 workers answered that safety in the workplace should take 90-100% of their time. It was difficult to get an answer to this question probably because most of the workers do not have a systematic or fixed way to arrange security in their workplace. Most of them answered "You just have to be careful all the time." After the question was explained and asked again, they still did not know what to answer. Most of their safety "rules" are based on their personal experiences or common sense.

**16. Working on elevated surfaces** is the most dangerous situation in construction according to most of the Hispanic workers.

**17. Appropriate training and equipment** are side by side according to the suggestions by the workers as to how to improve security in their workplace.

Both answers to parts 17 and 18 were difficult to obtain during the survey.

Workers were asked for 3 job hazards and 3 job suggestions which would improve safety. They hardly mentioned one, some of them did not answer at all or simply kept quiet. There are many possible reasons, the most consistent with the rest of the data may be that they actually do feel safe in their workplace or they have never learned about the risks.

18. The very last question in the survey had to do with the knowledge of about 19 different safety terms. The majority of those interviewed did not know any of the terms being asked. **86% of the interviewed workers do NOT speak English at all.**

## Conclusions:

The more we analyze the pattern on the answers it becomes more and more evident that equipment and safety rules are not used by these workers. Most of them seem to put their trust mostly in the skills gained through their own experience. One of the most safety conscious workers, who has a college degree from Mexico, responded to some questions with interesting suggestions as to how to increase safety, he said “Inspectors should constantly check if the safety rules and equipment are being applied. It is mandatory that employers supply the safety equipment and workers to use it. This is already being done in other states, and it works ...but I have not seen any of that in Louisiana...” he said.

Philip Ford, president of the Charleston Trident Homebuilders Association, said “I think it is amazing that many more are not injured.” After this research his statement makes more sense to us. With no equipment or safety rules to follow, it is reasonable to think that more accidents could have happened.

Finally, after intense scrutiny of our data we feel highly confident in rejecting our initial hypothesis that language barrier is the main cause of the accidents, since there is usually someone (in this case the supervisor) who speaks Spanish as well as English. There also those workers who have had some formal training, they said that such training was given in Spanish and that they completely understood its content.

As for the second part of our hypothesis which states poor or lack of safety training as being responsible for the increase of job fatalities among Hispanic workers, we strongly feel that we can NOT reject such hypothesis. Certainly, lack of safety training appears to be the main reason that accounts for the majority of the fatalities.

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**Appendix A**  
**Survey in English**

**NIOSH Research Project Construction Safety Survey**  
**Winter 2007**

**ID #** \_\_\_\_\_

**Location** \_\_\_\_\_

1) What is your age \_\_\_\_\_

2) What is your education level \_\_\_\_\_

3) Gender  Male  Female

4) How many total years of construction experience \_\_\_\_\_

5) How many years of experience in the U.S. Construction Industry \_\_\_\_\_

6) What is your job position

- Laborer  
 Specialty trade (for example, painter) Trade \_\_\_\_\_  
 Foreman  
 Superintendent

7) List other kinds of work you have done (e.g. drywall, electrical, etc.)

8) Exposure to construction jobs (Please check all that apply)

- I have worked on a residential construction site  
 I have worked on a commercial construction site (e.g. office building, or store)  
 I have worked on a road construction site  
 I have worked on a chemical plant or power plant construction site

9) Please check all that apply

- I have helped wire an electrical outlet  
 I have been on a ladder higher than 1 story  
 I have been on the roof of a house  
 I have been in a hole or excavation more than 4 feet deep  
 I have worked around farm machinery  
 I have worked around heavy construction equipment  
 I have used power tools (drill, circular saw, etc..)  
 I have used power lawn and garden equipment

10) Level of safety training (Please check all that apply)

- I have no formal construction safety training
- I have had some informal safety training (for example, safety walk through a site or a tool box talk)
- I have completed an OSHA 10 Hour Course
- I have completed an OSHA 30 Hour Course
- Other safety training (please list)

11) I receive adequate safety training for my job

- I agree
- I disagree

12) Are you interested in taking a safety training course?

- I am very interested in taking a course
- I am somewhat interested in taking a course
- I would only take this course if it is a requirement for my job

13) **If you have had safety training:** I have a better understanding of safety on the job site than I did prior to the training.

- Strongly Agree
- Agree
- Undecided
- Disagree
- Strongly Disagree

14) What language was safety training provided in?

- English
- Spanish
- Both English and Spanish

15) If training was provided in Spanish or in both English and Spanish, please clarify (check all that apply)

- The trainer spoke English and Spanish
- The trainer brought an interpreter to assist in communication
- One of the workers helped translate when necessary

16) I understood the examples used in class, such as putting on a safety harness.

- Strongly Agree
- Agree
- Undecided
- Disagree
- Strongly Disagree

17) List three things that you think are hazards (reasons for accidents) on a construction jobsite

- 1.
- 2.
- 3.

18) List three things that you think would improve safety on a construction jobsite

- 1.
- 2.
- 3.

19) Do you think that the main cause of accidents on a construction site occur because of:

- Poor or inadequate training of workers
- Worker carelessness
- Construction is dangerous and accidents are inevitable
- Poor Communication
- Other (Please List) \_\_\_\_\_

20) As a construction worker on a job site, I would expect construction safety to take up \_\_\_\_\_% of my time on a daily basis

**Communication with Supervisor if you are originally from outside the U.S.**

21) Does your immediate supervisor speak Spanish?

- Yes, my supervisor speaks Spanish very well
- Yes, my supervisor speaks enough Spanish to tell us what we need to do although he doesn't speak Spanish well
- No, my supervisor doesn't speak Spanish well but we know what to do and don't need much input from the supervisor
- No, my supervisor doesn't speak Spanish well but someone translates

22) Are there a lot of differences in construction terms used in your home country and the United States?

- Yes, there are a lot of differences in terms and construction language
- No, many terms and a lot of the language used in construction are the same

If yes, please give some examples:

23) Do you use the same kind of equipment and methods when working in your home country and the United States?

- Yes, we use a lot of the same equipment and methods
- No, many terms are different in Mexico and the United States

24) What priority does safety have in your home country compared to the United States?

- Higher
- Same
- Lower

25) How would you classify the safety risk of your work in construction in the United States?

- Higher
- Same
- Lower

26) Does re-construction work have similar safety risks to new construction work?

- Higher risk
- Same (Yes).
- Lower risk

If not, please give some reasons why there are higher or lower risks:

27) Are there any construction terms used on the job site that you do not understand?  
Please list

28) Do you know what the following terms mean?

Yes No Term

Yes	No	Term
		Tag line
		Lock out/Tag out
		Egress (path entering/exitting building)
		Bird Caging
		Base Plates
		Spoil Pile
		Out Riggers
		Toe Boards
		GFI
		Benching
		Rebar Caps
		Trench plate
		Welding Shield
		Lanyard
		MSDS
		Slip Forms
		Flammable Cabinet
		Mud Sills
		Rigging

**Appendix B**  
**Survey in Spanish**

**Proyecto de Investigación NIOSH**  
**Encuesta de Seguridad en Construcción**  
**Invierno 2007**

**ID #** \_\_\_\_\_

**Lugar** \_\_\_\_\_

- 1) Cuál es su edad? \_\_\_\_\_
- 2) Cuál es su nivel de educación? \_\_\_\_\_
- 3) Género  Masculino  Femenino
- 4) En total, tiene cuántos años de experiencia en construcción? \_\_\_\_\_
- 5) Cuántos años de experiencia en construcción tiene en Estados Unidos? \_\_\_\_\_
- 6) Cuál es su posición de trabajo?
- Obrero
- Trabajador especializado (por ejemplo, pintor) Especialización \_\_\_\_\_
- Capataz
- Superintendente
- 7) Escriba otros tipos de trabajos que ha hecho (por ejemplo, tableros de yeso, eléctricos, etc.)
- 8) Exposición a trabajos de construcción (Seleccione todo lo que aplique)
- He trabajado en construcción de residencias
- He trabajado en construcción de comercios (edificios de oficinas o tiendas)
- He trabajado en construcción de calles
- He trabajado en construcción de plantas químicas o centrales eléctricas
- 9) Seleccione todo lo que aplique:
- He ayudado a conectar/electrificar salidas eléctricas/tomas de corriente
- He estado en escaleras más altas de un piso
- He estado en el techo de una casa
- He estado en una excavación de más de 4 pies de profundidad
- He trabajado alrededor de maquinaria de granja
- He trabajado alrededor de equipos de construcción pesados

- He utilizado herramientas eléctricas (perforadoras eléctricas, sierras circulares, etc..)
- He utilizado equipos de jardín

10) Nivel de entrenamiento de seguridad (Seleccione todo lo que aplique)

- No tengo entrenamiento formal de seguridad en construcción
- He tenido entrenamiento de seguridad informal (por ejemplo, caminatas de seguridad en el sitio de construcción o charlas de cajas de herramientas)
- He completado un curso de 10 horas de OSHA
- He completado un curso de 30 horas de OSHA
- Otros entrenamientos de seguridad (por favor enumerar)

11) Recibo entrenamiento de seguridad adecuado para mi trabajo

- Estoy de acuerdo
- No estoy de acuerdo

12) Está interesado en tomar un curso de entrenamiento de seguridad?

- Estoy muy interesado en tomar un curso.
- Estoy un poco interesado en tomar un curso.
- Sólo tomaría este curso si es requerido por mi trabajo.

13) **Si ha tenido entrenamiento de seguridad:** Ahora tengo un mejor entendimiento de lo que es la seguridad en el trabajo del que tenía antes del entrenamiento.

- Estoy muy de acuerdo
- Estoy de acuerdo
- No sé
- Estoy en desacuerdo
- Estoy muy en desacuerdo

14) En qué idioma fue el entrenamiento de seguridad?

- Inglés
- Español
- Inglés y Español (ambos)

15) Si el entrenamiento fue en español o en inglés y español (ambos), por favor clarifique (seleccione todo lo que aplique):

- El instructor habló inglés y español

- El instructor trajo un traductor para ayudar en la comunicación
- Uno de los trabajadores ayudó a traducir cuando fue necesario

16) Comprendí los ejemplos utilizados en clase, como el ejemplo de cómo ponerse un arnés de seguridad

- Estoy muy de acuerdo
- Estoy de acuerdo
- No sé
- Estoy en desacuerdo
- Estoy muy en desacuerdo

17) Escriba tres cosas que usted piensa son peligros (causas de accidentes) en un sitio de construcción.

- 1.
- 2.
- 3.

18) Escriba tres cosas que usted piensa aumentarían la seguridad en un sitio de construcción.

- 1.
- 2.
- 3.

19)Cuál piensa usted que es la principal causa de accidentes en un sitio de construcción?

- Entrenamiento pobre o inadecuado de los trabajadores
- Descuido de los trabajadores
- La construcción es peligrosa y los accidentes son inevitables
- Falta de comunicación
- Otros (Por favor enumere) \_\_\_\_\_

20) Como un trabajador en el sitio de construcción, la seguridad en construcción tomaría \_\_\_\_\_% de mi tiempo cada día

## Comunicación con el supervisor si usted no es originario de los Estados Unidos

21) Su supervisor inmediato habla español?

- Sí, mi supervisor inmediato habla español muy bien
- Sí, mi supervisor habla suficiente español para decirnos lo que tenemos que hacer, aunque no habla español muy bien
- No, mi supervisor no habla español bien, pero nosotros sabemos lo que tenemos que hacer y no necesitamos mucha dirección del supervisor
- No, mi supervisor no habla español, pero alguien traduce

22) Hay muchas diferencias entre el vocabulario de construcción utilizado en su país y el utilizado en Estados Unidos?

- Sí, hay muchas diferencias en el vocabulario de construcción
- No, una gran parte del vocabulario de construcción utilizado es igual en ambos países

Si su respuesta es sí, por favor escriba algunos ejemplos:

23) Usted utiliza los mismos equipos y métodos cuando trabaja en construcción en su país y en Estados Unidos?

- Sí, utilizamos los mismos equipos y métodos
- No, son diferentes en México y Estados Unidos

24) Qué prioridad tiene la seguridad en su país en comparación con los Estados Unidos?

- Más prioridad en mi país
- La misma prioridad
- Menor prioridad en mi país

25) Cómo clasificaría los riesgos de seguridad de su trabajo en construcción en los Estados Unidos?

- Mayores riesgos
- Iguales
- Menores riesgos

26) El trabajo de reconstrucción tiene riesgos de seguridad similares a los de nuevos trabajos de construcción?

- Mayor riesgo
- Igual riesgo
- Menor riesgo

Si tiene mayor o menor riesgo, escriba algunas razones:

27) Hay alguna palabra en el vocabulario de construcción utilizado en el trabajo que usted no comprende? Por favor enumere.

28) Sabe que significan las siguientes palabras?

Sí No Palabra

Sí	No	Palabra
		Tag line
		Lock out/Tag out
		Egress (path entering/exiting building)
		Bird Caging
		Base Plates
		Spoil Pile
		Out Riggers
		Toe Boards
		GFI
		Benching
		Rebar Caps
		Trench plate
		Welding Shield
		Lanyard
		MSDS
		Slip Forms
		Flammable Cabinet
		Mud Sills
		Rigging

## Appendix C Safety Glossary

Tag line -- Cord that is used to move around an object connected to a crane. For example: If a worker was placing a piece of steel on a building they would use the tag line to guide the piece of steel into the proper location.

Lock out/Tag out -- When you “Lock out / Tag Out” an electrical connection you put a lock on the electrical box so that it cannot be energized. You must always label the lock so that other workers know who has it locked out and why.

Egress -- path entering/exiting building

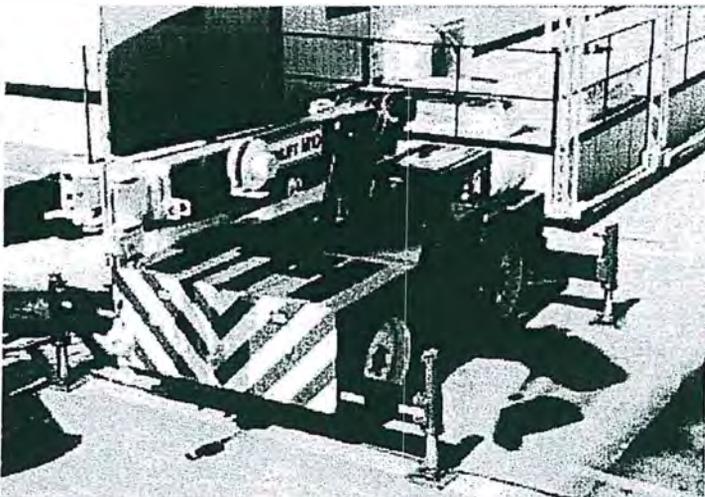
Bird Caging – damage to wire rope



Base Plates – A steel plate placed under a piece of equipment or scaffold to stabilize and to provide an adequate foundation. On a scaffold, the base plates typically sit on top of the mudsill (see below).

Spoil Pile – The mound of dirt removed from an excavation (if placed near a trench, the spoil pile can create enough weight to collapse the trench).

Out Riggers -- Adjustable legs that assist in stabilizing a crane or other device.

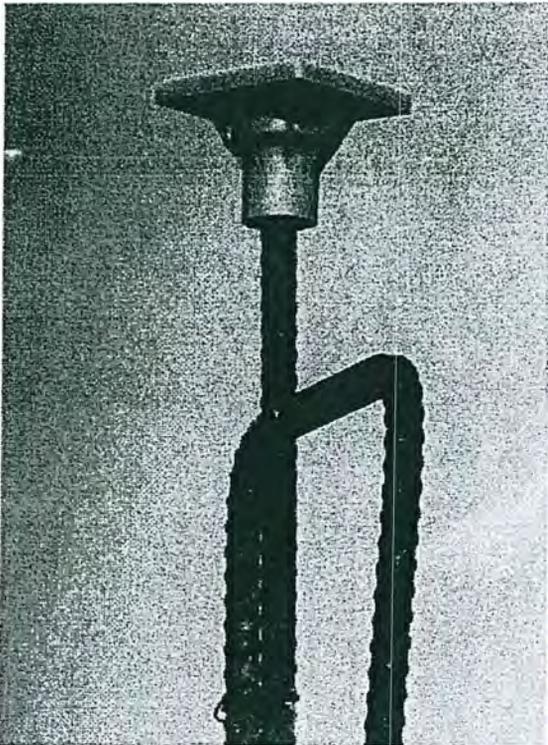


Toe Boards – The lowest piece on a railing

GFI Ground Fault Interrupter ( To avoid electrical shock in wet conditions)

Benching -- When digging a trench, the soil is terraced or sloped to reduce the risks of cave-ins. This is called benching.

Rebar Caps -- A protective device over the end of the rebar to prevent injury (impalement) if someone falls on a piece of rebar sticking up through the concrete.



Trench plate -- A plate used to shore a trench so that it does not collapse.

Welding Shield - A curtain or other means to shield people from a welding operation.

Lanyard – The rope or cord that is used to hook a safety harness (fall protection) to a stable point.

MSDS -- Material Safety Data Sheet -- a description of a chemical product (e.g., glue), the precautions that must be taken when using the product, and emergency information.

Slip Forms -- A type of concrete form.

Flammable Cabinet – A cabinet used to store flammable items, such as gasoline .

Mud Sills -- A plank used to help distribute the load of the scaffold.

Rigging -- The chains, ropes, and steel beams used to hoist an object with a crane.

**To:** BRYAN HUBBARD  
CIVL

**From:** RICHARD MATTES, Chair  
Social Science IRB

**Date:** 11/29/2006

**Committee Action:** Renewal

**Approval Date:** ~~11/14/2005~~ 11/28/06

**IRB Protocol #:** 0509003008

**Study Title:** Safety Training for Student Interns Prior to Working on the Construction Site

**Expiration Date:** 11/27/2007

The above-referenced protocol was granted approval following review by the Institutional Review Board (IRB). If written informed consent was submitted as part of your protocol, the IRB-stamped and dated "master" consent form(s), approved by the IRB for this protocol only, are attached. Please make copies from the attached "master" document(s) for subjects to sign upon agreeing to participate. The original consent forms signed by subjects should be placed in your study files and maintained for a period no less than three (3) years following the termination of the protocol. A copy of the signed consent form should be given to the subject.

**Continuing Review:** It is the Principal Investigator's responsibility to obtain continuing review and approval for this protocol prior to the expiration date noted above. Please allow sufficient time for continued review and approval. No research activity of any sort may continue beyond the expiration date. Failure to receive approval for continuation before the expiration date will result in the approval's expiration on the expiration date. Data collected following the expiration date is unapproved research and cannot be reported or published as research data. If you do not wish to continue approval, please notify the IRB of the study closure.

**Adverse Events:** All adverse events that occur at a Purdue University research site must be reported to the IRB within three (3) business days of recognition/notification of the event. If the adverse event occurred at an external site as part of a multi-site research project for which Purdue University is the lead institution, it must be reported to the IRB within ten (10) business days.

**Amendments:** If you wish to change any aspect of this study, please submit the requested changes to the IRB. No new procedure may be implemented until IRB approval has been granted.

If you have any questions or concerns, please contact our office.

*Daniel H. Halperin*

**RESEARCH PARTICIPANT CONSENT FORM**

**SAFETY TRAINING FOR STUDENT INTERNS PRIOR TO WORKING ON THE CONSTRUCTION SITE**

Bryan J. Hubbard  
Purdue University  
Construction Engineering and Management

Purpose of Research

I understand that the purpose of this research is to evaluate current safety training programs used in the construction industry.

Specific Procedures to be Used

During the study, I will be taking surveys before and after my required OSHA 10 hour safety training. I will also be answering questions about the usefulness of the training after my summer internship.

Duration of Participation

I understand that the duration of each survey will be no more than 60 minutes. There will be three surveys for the research study.

Benefits to the Individual

I understand that there are no direct benefits to myself for participating in this study.

Risks to the Individual

I understand that the risks associated with this study are minimal and are no more than what I would encounter in everyday life.

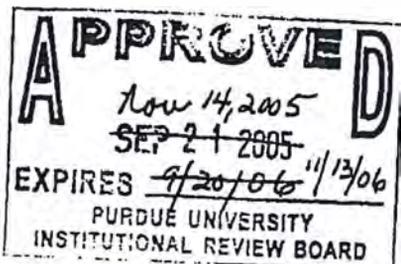
Confidentiality

I understand that all information gathered will be kept confidential; results of this study will be submitted for publication without any subject identifiable information by using assigned subject ID; and when my data are not being directly examined or used by the researchers, they will be kept in a locked storage area accessible only to the research team. The survey data will be kept indefinitely. I understand that any videos/photos taken of myself during this study will not be used in published materials and/or for educational purposes without my permission. I understand that if photos are used, all efforts will be made by the researchers to block out the face of the individual if I request it. I understand that the video recordings will be kept three years after the project is completed and will be destroyed by the project researchers thereafter.

*Use of photos in published materials and/or for educational purposes*

- No, I do NOT give my permission to use any photos taken of myself during this study in published materials and/or educational purposes.
- Yes, I give my permission to use any photos taken of myself during this study in published materials and/or educational purposes with the understanding that my identity will be blocked if requested.

Block my identity:  Yes  No



\_\_\_\_\_  
Participant's Initials

\_\_\_\_\_  
Date

Research Project Number \_\_\_\_\_

---

Voluntary Nature of Participation

I do not have to participate in this research project. If I agree to participate, I can withdraw my participation at any time without penalty. If I choose to withdraw my participation, I will contact Dr. Bryan Hubbard at (765) 494-2241 and my information will not be included in the study or used for future educational purposes.

Human Subject Statement:

If I have any questions about this research project, I can contact Dr. Bryan Hubbard at (765) 494-2241. If I have concerns about the treatment of research participants, I can contact the Committee on the Use of Human Research Subjects at Purdue University, 610 Purdue Mall, Hoyde Hall Room 307, West Lafayette, IN 47907-2040. The phone number for the Committee's secretary is (765) 494-5942. The email address is [irb@purdue.edu](mailto:irb@purdue.edu).

I HAVE HAD THE OPPORTUNITY TO READ THIS CONSENT FORM, ASK QUESTIONS ABOUT THE RESEARCH PROJECT AND AM PREPARED TO PARTICIPATE IN THIS PROJECT.

\_\_\_\_\_  
Participant's Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Participant's Name

\_\_\_\_\_  
Researcher's Signature

\_\_\_\_\_  
Date

**To:** BRYAN HUBBARD  
CIVL

**From:** RICHARD MATTES, Chair  
Social Science IRB

**Date:** 04/06/2007

**Committee Action:** Amendment to Approved Protocol

**Approval Date:** ~~11/19/2005~~ 4-5-2007

**IRB Protocol #:** 0509003008

**Study Title:** Safety Training for Student Interns Prior to Working on the Construction Site

**Expiration Date:** 11/27/2007

The above-referenced protocol was granted approval following review by the Institutional Review Board (IRB). If written informed consent was submitted as part of your protocol, the IRB-stamped and dated "master" consent form(s), approved by the IRB for this protocol only, are attached. Please make copies from the attached "master" document(s) for subjects to sign upon agreeing to participate. The original consent forms signed by subjects should be placed in your study files and maintained for a period no less than three (3) years following the termination of the protocol. A copy of the signed consent form should be given to the subject.

**Continuing Review:** It is the Principal Investigator's responsibility to obtain continuing review and approval for this protocol prior to the expiration date noted above. Please allow sufficient time for continued review and approval. No research activity of any sort may continue beyond the expiration date. Failure to receive approval for continuation before the expiration date will result in the approval's expiration on the expiration date. Data collected following the expiration date is unapproved research and cannot be reported or published as research data. If you do not wish to continue approval, please notify the IRB of the study closure.

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If you have any questions or concerns, please contact our office.

**RESEARCH PARTICIPANT CONSENT FORM**

**SAFETY TRAINING FOR STUDENT INTERNS PRIOR TO WORKING ON THE CONSTRUCTION SITE**

Bryan J. Hubbard  
Purdue University  
Construction Engineering and Management

Purpose of Research

I understand that the purpose of this research is to evaluate current safety training programs used in the construction industry and the impact of communication issues on safety.

Specific Procedures to be Used

During the study, I will be taking surveys about my work on the construction site.

Duration of Participation

I understand that the duration of each survey will be no more than 60 minutes. There will be one survey for the research study.

Benefits to the Individual

I understand that there are no direct benefits to myself for participating in this study. I will be compensated with ten dollars for participation.

Risks to the Individual

I understand that the risks associated with this study are minimal and are no more than what I would encounter in everyday life.

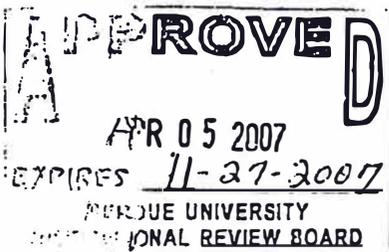
Confidentiality

I understand that all information gathered will be kept confidential; results of this study will be submitted for publication without any subject identifiable information by using assigned subject ID; and when my data are not being directly examined or used by the researchers, they will be kept in a locked storage area accessible only to the research team. The survey data will be kept indefinitely. I understand that any videos/photos taken of myself during this study will not be used in published materials and/or for educational purposes without my permission. I understand that if photos are used, all efforts will be made by the researchers to block out the face of the individual if I request it. I understand that the video recordings will be kept three years after the project is completed and will be destroyed by the project researchers thereafter. The project research records may be inspected by the Purdue Institutional Research Board or its designees (CDC-NIOSH) to ensure that participant's rights are being protected.

*Use of photos in published materials and/or for educational purposes*

- No, I do NOT give my permission to use any photos taken of myself during this study in published materials and/or educational purposes.
- Yes, I give my permission to use any photos taken of myself during this study in published materials and/or educational purposes with the understanding that my identity will be blocked if requested.

Block my identity:  Yes  No



Participant's Initials

Date

Voluntary Nature of Participation

I do not have to participate in this research project. If I agree to participate, I can withdraw my participation at any time without penalty. If I choose to withdraw my participation, I will contact Dr. Bryan Hubbard at (765) 494-2241 and my information will not be included in the study or used for future educational purposes.

Human Subject Statement:

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I HAVE HAD THE OPPORTUNITY TO READ THIS CONSENT FORM, ASK QUESTIONS ABOUT THE RESEARCH PROJECT AND AM PREPARED TO PARTICIPATE IN THIS PROJECT.

\_\_\_\_\_  
Participant's Signature

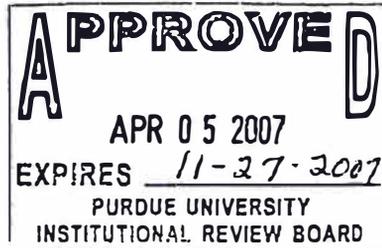
\_\_\_\_\_  
Date

\_\_\_\_\_  
Participant's Name

\_\_\_\_\_  
Researcher's Signature

\_\_\_\_\_  
Date

ID # \_\_\_\_\_



**FORMULARIO DE CONSENTIMIENTO PARA PARTICIPANTES EN PROYECTO DE INVESTIGACION**

**ENTRENAMIENTO DE SEGURIDAD PARA ESTUDIANTES INTERNOS ANTES DE EMPEZAR A TRABAJAR EN EL SITIO DE CONSTRUCCION**

Bryan J. Hubbard  
Purdue University  
Construction Engineering and Management

Propósito de la Investigación

Tengo entendido que el propósito de este proyecto de investigación es evaluar los actuales programas de entrenamiento de seguridad utilizados en la industria de construcción y el impacto de la comunicación en la seguridad.

Procedimientos Específicos a Ser Utilizados

Durante el estudio, estaré completando encuestas sobre mi trabajo en el sitio de construcción.

Duración de la Participación

Tengo entendido que cada encuesta no durará más de 60 minutos. Habrá una encuesta para este estudio.

Beneficios al Individuo

Tengo entendido que para mí no hay beneficios directos por participar en este estudio. Recibiré diez dólares por mi participación.

Riesgos al Individuo

Tengo entendido que los riesgos asociados a este estudio son mínimos y no son mayores a los que encontraría en la vida cotidiana.

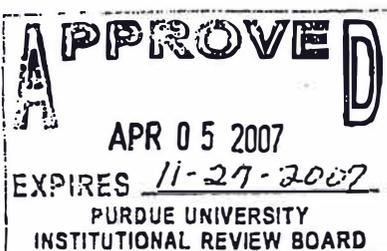
Confidencialidad

Tengo entendido que toda la información obtenida será confidencial; los resultados de este estudio serán sometidos para publicación de tal manera que los participantes no puedan ser identificados por la información proporcionada. Para lograr ésto, cada participante será asignado un número de identificación; y cuando mi información no esté siendo directamente examinada o utilizada por los investigadores, estará guardada encerrada con llave en un área de almacenamiento accesible solamente al equipo de investigación. La información será guardada indefinidamente. Tengo entendido que videos o fotos que me hayan sido tomados en este estudio no serán utilizados en materiales publicados y/o con fines educativos sin mi permiso. Tengo entendido que en caso de que las fotos sean utilizadas, los investigadores harán todo lo posible por tapar la cara del individuo si así lo solicito. Tengo entendido que las grabaciones en video serán guardadas hasta tres años después de que el proyecto sea terminado y luego serán destruidas por los investigadores. Los documentos del proyecto de investigación podrán ser inspeccionados por el Purdue Institutional Research Board o las instituciones designadas (CDC-NIOSH) para asegurar que los derechos del participante estén siendo protegidos.

*Uso de fotos en materiales publicados y/o con fines educativos*

- No, NO doy mi permiso para usar fotos que me hayan sido tomadas en este estudio en materiales publicados y/o con fines educativos.
- Sí, doy mi permiso para usar fotos que me hayan sido tomadas en este estudio en materiales publicados y/o con fines educativos y entiendo que mi identidad puede ser escondida si así lo solicito.

Esconder mi identidad:  Sí  No



\_\_\_\_\_  
Iniciales del Participante

\_\_\_\_\_  
Fecha

Carácter Voluntario de la Participación

No tengo que participar en este proyecto de investigación. Si estoy de acuerdo con participar, puedo retirar mi participación en cualquier momento sin ninguna penalización. Si decido retirar mi participación, contactaré al Dr. Bryan Hubbard al número (765) 494-2241 y mi información no será incluida en el estudio o utilizada en futuros fines educativos.

Declaración de Sujetos Humanos:

Si tengo alguna pregunta sobre este proyecto de investigación, puedo contactar al Dr. Bryan Hubbard al número (765) 494-2241. Si tengo alguna preocupación sobre el trato a los participantes del estudio, puedo contactar al Committee on the Use of Human Research Subjects at Purdue University, 610 Purdue Mall, Hovde Hall Room 307, West Lafayette, IN 47907-2040. El número de la secretaria del Committee es (765) 494-5942. El correo electrónico es [irb@purdue.edu](mailto:irb@purdue.edu).

HE TENIDO LA OPORTUNIDAD DE LEER ESTE FORMULARIO DE CONSENTIMIENTO, HACER PREGUNTAS SOBRE EL PROYECTO DE INVESTIGACION Y ESTOY PREPARADO PARA PARTICIPAR EN ESTE PROYECTO.

\_\_\_\_\_  
Firma del Participante

\_\_\_\_\_  
Fecha

\_\_\_\_\_  
Nombre del Participante

\_\_\_\_\_  
Firma del Investigador

\_\_\_\_\_  
Fecha

Número de Identificación ID # \_\_\_\_\_

