Healthy Workplaces

Electrical Contractors Industry Focus Group Report

Technical Report Number: 67-4-2003

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A Note About this Report

The purpose of this report is to document the opinions and ideas of electrical contractors, electricians, apprentices, and training directors as stated in the focus groups. This report does not attempt to interpret whether these opinions meet the regulatory requirements set forth in the Washington State Administrative Code. Mention of any strategies used by companies in this document does not constitute endorsement by Labor and Industries or by the SHARP program.

Ordering Information

To receive copies of the Electrical Contractors Industry Focus Group Report (Technical Report # 67-4-2003), the Food Processing Industry Final Report (Technical Report # 67-2-2001), or the Furniture, Fixtures and Millwork Industry Final Report (Technical Report # 67-3-2003), contact the Safety and Health Assessment and Research for Prevention (SHARP) Program at:

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TABLE OF CONTENTS

TABLES AND FIGURES

Tables

Figures

Glossary

The following is a definition of the terms used in this report:

Electrical apprentice: An electrical apprentice is a person who is enrolled in an electrical apprenticeship training program. To be eligible for this study, the electrical apprentice had to have completed at least two years of on-the-job experience.

Electrical contractor: An electrical contractor for this study refers to a company that performs electrical wiring in buildings involving 600 volts or lower in either commercial or residential buildings (i.e., not exclusively industrial or marine electrical contractors) in Washington State. The electrical work is done by contract (bids) with other companies, including General Contractors. To be eligible for this study, electrical contractors must:

- Be classified in Standard Industrial Classification (SIC) code 1731 (the code for Electrical Contractors), and
- Have had payroll hours in any one of the Washington State Risk Classifications 0601-00, 0601-07, 0601-15, 0608-01, 0608-02, 0608-04 (i.e., all Risk Classifications that included job activities with electrical wiring, installation, or hook-up).

Focus group session: A focus group session is a small group of about 8 to 10 people who gather to discuss a topic. The discussion is lead by a trained moderator. Focus group members generally represent a mix of opinions. A *telefocus group* is a focus group session where participants are gathered via a conference telephone call.

Healthy workplace: A healthy workplace enhances productivity and human health through a balance of technology, organization, environment, and tasks.

International Brotherhood of Electrical Workers (IBEW): The International Brotherhood of Electrical Workers (IBEW) represents more than 780,000 union members who work in a wide variety of fields, including utilities, construction, telecommunications, broadcasting, manufacturing, railroads, and government. The IBEW has members in both the United States and Canada.

Joint Apprenticeship and Training Committee (JATC): An education partnership between the National Electrical Contractors Association (NECA) and International Brotherhood of Electrical Workers (IBEW) union. The JATC provides five years of training for electrical apprentices. It also provides continuing education for journeyman electricians.

Journeyman electrician: A journeyman electrician is an electrician that is licensed to perform electrical work in Washington State. To be eligible in this study, electrical journeyman must have been licensed in Washington State within the past year. The title of journeyman implies passing the state licensing examination, and it implies that the journeyman has completed a 5-year apprenticeship program to be eligible for the state licensing exam.

National Electrical Contractors Association (NECA): The National Electrical Contractors Association represents member electrical contracting companies. NECA is dedicated to enhancing the industry through continuing education, labor relations (union), current information, and promotional activities. NECA works to promote higher standards, quality workmanship, and training for a skilled workforce.

Successful strategy: Successful strategies are approaches used by company management that reduce or eliminate work-related illness or injury, or reduce exposure to hazards. The approaches may include engineering or administrative controls, personal protective equipment, implementation of communication systems, or other safety and health programs or program elements.

Workers' compensation (WC) claim: A workers' compensation claim refers to an insurance claim filed with Washington Department of Labor and Industries (L&I) in regard to a work-related injury or illness. All WC claims in this study refer to accepted, state-fund claims.

Workers' compensation (WC) claim rate: A WC claim rate is the number of WC claims per 100 full-time equivalent (FTEs) employees, where 1 FTE = 2,000 hours worked. For this study, all WC claims are accepted, state fund claims. The WC claim rate is calculated as follows:

$$\text{WC claim rate (claims/100 FTE)} = \frac{\text{Number of WC claims} \times 200{,}000 \text{ (hrs/100 FTE)}}{\text{Number of worker hours}}$$

(1 FTE = 2,000 hours)

EXECUTIVE SUMMARY

Electrical Contractors Industry Focus Group Report

Background

The Safety and Health Assessment and Research for Prevention (SHARP) Program is implementing an initiative to determine factors that create workplace health and to disseminate that information throughout industries in Washington State. The overall goal of this initiative is to reduce work-related injuries and illnesses. In 2001 and 2002, the initiative focused on the Food Processing Industry and in the Furniture, Fixtures, and Millwork Industries, respectively. In 2003, SHARP focused on the Electrical Contractor Industry.

Focus groups were held in the Electrical Contractors Industry for the purpose of identifying strategies used to address occupational safety and health. A total of six focus group sessions were held with representatives from three key industry groups: company managers, journeymen and apprentices, and electrical apprenticeship training center representatives.

Methods

A total of 43 individuals participated in the focus groups. The participants included 21 company managers, 17 journeymen electricians, 2 apprentices, and 3 training center representatives. Some, but not all participants, were members of the International Brotherhood of Electrical Workers (IBEW) union and the National Electrical Contractors Association (NECA). We included urban participants from Seattle and Spokane, as well as rural representatives throughout the state. Some of the focus groups were held in person, while other groups were held over the telephone as a teleconference. All focus group sessions ran about two hours in length.

Each group identified and prioritized their top health and safety concerns and discussed potential solutions. The groups identified the following top hazards and injuries: ladder hazards; lack of fall protection; back injury; energized work and failure to lock-out/tag-out; eye, face and hand injuries; and housekeeping hazards.

Findings

Ladder hazards and lack of fall protection were discussed extensively in most groups. Some of the issues included: standing too high on a ladder, poor ladder condition, improper use of ladders, and proper use of lifts. Highlights of some of the perceived successful strategies used by companies included:

- Provide ladders with a variety of heights so that the correct size could be used, and dispose of unstable ladders or those in disrepair.
- To avoid having workers stand on the ladder top and top step, place a “dunce cap” over the top, or use rails or wood panels as a barrier for stepping in this area.
- Use aerial lifts when feasible.
- Use a checklist to inspect all ladders or lifts daily.

Back injury and other musculoskeletal injuries were discussed in most of the focus group sessions. Managers recognized that back injury resulted in work time lost and light duty assignments. Strategies used by companies included:

- Educate workers about how to take care of their back and to treat strains before they become a serious injury. Some participants used training programs that included instruction by a chiropractor or physical therapist.
- Use buckets and hand carriers with wheels in place of tool belts to reduce the load on the back.

Energized work and failure to use lock-out/tag-out procedures were serious concerns mentioned by respondents. Strategies to control or reduce electrical events included:

- Do not work on an energized circuit unless necessary. Management commitment and enforcement of a company's hotwork policy is key to working hot only when necessary.
- Educate the customer about issues around energized work. Work with the customer to establish policies that are safe for everyone.
- Have two independent people check to make sure all power sources are shut off.
- Never walk away from a hot panel. Secure the hot panel with setscrews, or restrict the area to qualified persons.
- Stock a variety of locks in the electrician's toolbox for locking out different types of power sources (such as lines and boxes).

Injuries to the eyes, face, and hands were brought up as concerns in the focus groups. Some of the strategies for reducing eye injuries included:

- Label power tools with the words "Eye Protection Required" so that the user would be reminded to wear their safety glasses with each use.
- One company felt it was easier to buy large quantities of inexpensive safety glasses, and replace them as often as needed. Another company felt that buying nice, streamlined stylish glasses that come in a kit with a belt pack was needed to encourage electricians to wear the glasses.

Poor housekeeping was recognized as a safety hazard in several groups. It can be difficult to keep a clean work area on construction sites that have multiple trades using the same space.

- One manager expressed that when you go about keeping a clean worksite, a person may be organizing their mind at the same time, planning, thinking, and doing things efficiently.
- One participant recalled the "Board of Shame," a tactic used by a general contractor to promote housekeeping. Polaroid photos of messes were taken and posted on a board for everyone to see. No one wanted their mess featured on the board; initially there were "tons of pictures on the board", but as people starting keeping their areas neat, the photos became more rare.

- Garbage bins, dumpsters, and recycling cans need to be readily available throughout the site and emptied frequently to promote housekeeping.
- One electrician mentioned using a caddy box on their teacart to put scrap into as they completed their work.

In the context of discussing the hazards and injuries listed above, topics such as employee training, incentive programs, hazard analysis, worker involvement, safety rule enforcement, and management commitment were discussed. Highlights of these subjects include:

- Safety meetings are a common venue for safety training. Journeymen mentioned that when safety training incorporates actual safety issues that are current on the job site for that week, it makes everyone more aware and adds to the overall safety of the job.
- At one company, twice a month the foreman picks one other person to walk through a job. They look specifically for things that could be a safety hazard. They write the hazards down, and when they go over safety issues in their regular meetings, they include these site-specific hazards that the foreman and worker found.
- Disciplinary procedures can be used to deal with safety violations and set the tone for safety on a jobsite.
- Without the support of top management, integrating safety into the work is much more difficult.

Summary

In summary, managers, workers and training center representatives shared similar health and safety concerns. The focus groups that were held were an effective way to learn about the safety and health issues, concerns, ideas, and potential solutions in the electrical industry. The information gained could be further developed into an educational tool and shared industry-wide. It is hoped that through discussion of industry safety and health concerns and exploration of solutions, the safety performance of this industry can be raised.

When controlling for occupational hazards, one of the most successful strategies that can be used to prevent injury is hazard elimination. While some of the discussion in a few of the focus groups was on hazard analysis and hazard elimination, many of the strategies being used to reduce injuries are education, training, and use of personal protective equipment. The concepts of hazard analysis and hazard elimination should be promoted throughout this industry. Awareness needs to be raised on how to eliminate hazards rather than coping with the hazards.

INTRODUCTION

Background

The Safety and Health Assessment and Research for Prevention (SHARP) Program is implementing an initiative to determine factors that create workplace health and to disseminate that information throughout industries in Washington State. The overall goal of the Healthy Workplaces Initiative is to reduce work-related injuries and illnesses. In 2001 and 2002, the initiative focused on the Food Processing Industry and on the Furniture, Fixtures, and Millwork Industries, respectively. In 2003, SHARP focused on the Electrical Contractors Industry.

Electrical contractors are a specialty trade within the construction industry. According to the Washington State Employment Security Department's 1998 industry profile, the construction industry employed 133,800 covered workers, and the annual payroll was $4.5 billion. With self-employed and proprietors included, the total 1998 state construction employment was 201,200 with earnings over $7.0 billion (Employment Security Department, 2003). While employment within the construction industry has declined over the years, there has been growth within the specialty trades, including the Electrical Contractors Industry sector.

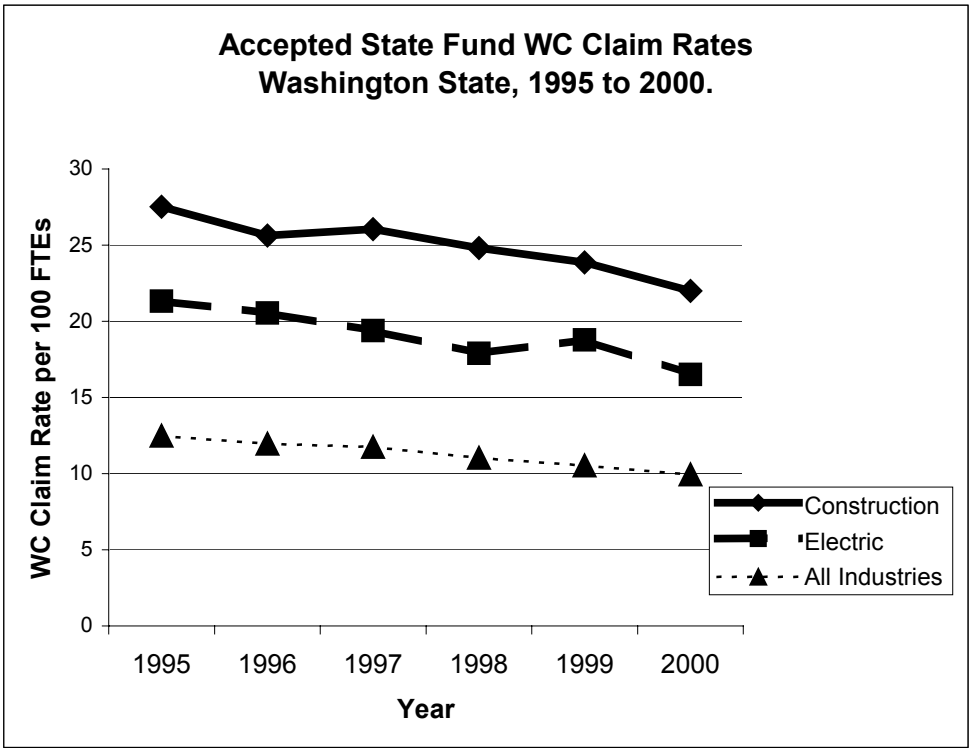
Significance of the Problem

The state fund workers' compensation (WC) claim rate for the Electrical Contractors Industry in Washington State has declined between 1995 and 2000. While still well above the WC claim rates for all industries (combined) in Washington State, the electrical industry claim rates are below the rates for all construction (Figure 1).

Between 1998 and 2001, there were 11,410 WC state fund claims accepted in Washington State for electrical workers. The nature of these WC claims primarily involved cuts (n=2,957; 26%). There were 2,581 (23%) musculoskeletal disorders, 1,282 (11%) acute sprains, and 1,183 (10%) scratches. There were 136 (1.2%) injuries due to electric shock and 130 (1.1%) due to heat burns. Of those shock and burn injuries, 65 (24%) were due to contact with an electric arc. Over the four-year period, there were two fatalities (both in 1998). One fatality involved injuries from a motor vehicle accident. The other fatality involved multiple injuries from being struck by a falling pallet.

The WC claims cost a total of $54,051,636 for that same time period. Musculoskeletal disorders accounted for 33% of the cost, acute sprains 20%, cuts 4%, and scratches 1%. The total cost of injuries due to electric shock was $702,597 (1.3%).

Figure 1. Accepted state fund workers' compensation (WC) claim rates among electrical contractors, Washington State, 1995 to 2000.



Note: See glossary for definition of WC claim rate.

Project Goal

The goal of this study was to identify and describe successful strategies used to achieve occupational safety and health among electrical contractors and to distribute that information industry-wide. This document describes the focus groups that were held and summarizes the most important industry hazards perceived by company managers, electricians, and training center representatives. The strategies used by the industry to address these hazards are included. SHARP will use the focus group information to develop an educational document that will be distributed industry-wide.

METHODS

Industry Selection

High Hazard Industry

The first criterion SHARP used for industry selection was the extent to which the industry faced significant health and safety issues. Because there were no direct measures of workplace hazards, we relied on two indirect measures for industry selection: 1) the 3-year average workers' compensation (WC) claim rate, and 2) the 3-year average count of WC claims, for the years 1998 to 2000. Each industry was ranked on these two measures. Then, the two ranks were averaged to generate a prevention index.

Intra-Industry Dispersion

In a second step, SHARP selected the top 40 most hazardous industries (by prevention index) that also exhibited significant variation in size of companies and WC claim rates. This approach increased the likelihood that we would see a broad range of practices, and it improved the chances of identifying and transferring successful strategies within the industry. This screening process identified the following top candidate industries:

- Motor and Freight Transportation and Warehousing (SIC 42)
- Construction Special Trade Contactors (SIC 17)
- Lumber and Wood Products (SIC 24)
- Building Construction – General Contractors and Operative (SIC 15)
- Transportation by Air (SIC 45)
- Food Processing (SIC 20)

Within the 'Construction Special Trade Contractors', the Electrical Contractors (SIC 1731) industry sector was among the top ten with the highest hazard ranking.

Industry Structure

A further selection step involved choosing an industry that: 1) consisted of relatively homogeneous products and processes, 2) lacked dominance by any one company, and 3) had the assistance and interest of trade associations and labor representatives.

Previously, SHARP studied the food processing industry in 1999, and millwork, furniture and fixtures industry sectors in 2001. Of the remaining industries, we selected the Electrical Contractors Industry sector for the third industry study. SHARP changed its study approach for the electrical contractors study based in part on experience from the previous industry studies, and because the workplaces in the electrical contractors' industry sector were not fixed locations, as was the case in the previous studies.

Identifying Electrical Contractors in Washington State

Before we could begin the focus groups, we needed to identify the electrical contractors in Washington State. In general, we were interested in companies who had a Standard Industrial Classification (SIC) code of 1731; these were predominantly companies that performed commercial and residential electrical work. A detailed description of further criteria used to determine eligibility of companies is included in Appendix A. Ultimately there were a total of 774 electrical contracting companies in Washington State that met the focus group inclusion criteria. Fifty-nine percent of these companies were small in size (3 to 10 employees), 34% were medium in size (11 to 49 employees), and 7% were large in size (50+ employees).

Study Design

Focus Group Sessions

We held six focus group sessions among the key industry groups. We aimed for focus group sessions that included local and statewide representation among company managers and electricians.

We made the following assumptions for the study:

- The safety and health professionals/managers have or would know of solutions, recommendations, and/or successful strategies in occupational safety and health management. Additionally, members of the National Electrical Contractors Association might have a perspective on safety and health that was different from non-members.
- The union and non-union electricians would have an interest in promoting safety and health in their industry and that they would have experienced a variety of health and safety programs or management strategies throughout their work/career.
- The training center directors would be knowledgeable about the occupational safety and health issues and practices of electrical contractors and of the industry.
- Opinions/perspectives from union and non-union participants would be different.
- Management approaches may differ between small and large companies, and work experiences may differ between rural/urban areas of Washington State.

We used a neutral, independent survey research company that had expertise in conducting focus group sessions and experience in conducting research in occupational safety and health. Focus group sessions were held either in-person or as a teleconference call. Groups were held in both urban and rural areas statewide. Table 1 shows the distribution of groups.

Table 1. Distribution of focus group sessions.

Group Type	# of Groups	Group Format and Representation
Non-Union Electricians	1	In-person, Spokane
Union Electricians	1	In-person, Seattle combined with Telephone, Statewide
Management, NECA	1	In-person, Seattle
Management, Non-Affiliated	2	Telephone, Statewide
Training Center Directors	1	Telephone, Statewide

All focus group and telefocus sessions were audiotaped and transcribed. Each focus group session lasted from 1.5 to 2 hours. The target number of participants for each focus group session was between 8 and 10 members.

Participant Recruitment and Screening for Focus Group Sessions

Contact Call Lists

In order to recruit company managers, electricians, and the training center representatives, SHARP prepared contact call lists. The lists were given to the independent contractor who solicited participants over the telephone. The call list of NECA company managers was compiled from the Washington NECA chapter's website. The call list for non-affiliated company managers, licensed journeymen electricians, and training centers was derived from L&I's databases. A list of apprentices who wished to participate was gathered through the Joint Apprenticeship Training Committee (JATC) training centers as well as the non-union training centers in Washington State. Further details of how the contact call lists were put together, including the numbers of participants on each list, are described in Appendix B.

Screening/Recruitment

In addition to developing the call lists, SHARP compiled screening questionnaires that were administered during the initial solicitation call. The purpose of these questionnaires was to ensure diverse industry representation. In the manager focus groups, we were primarily seeking individuals who either owned the company or were responsible for safety and health, who did low voltage work (600 volts or less), and who's work was primarily in either the residential or commercial sectors. In addition, we sought manager representation from small, medium and large companies, as well as from both NECA members and non-affiliated members. In journeymen groups, we sought representation from small, medium, and large firms, from workers who had been in the profession a few, medium, and high number of years and from both union and non-union members. For the training centers, we sought the participation of the training center director, or a representative that they nominated to take their place. Further details of participant criteria, group composition recruitment targets, and the screening questionnaires themselves can be found in Appendix C.

Discussion Guides

The content and flow of the discussion was the same for all groups. The independent moderator and SHARP collaborated in developing the discussion guides. The moderator used the same guide for managers and training center representatives, a separate guide was developed for journeymen and apprentices (see Appendix D).

The basic format of each focus group session was as follows: Focus group ground rules, a brief explanation of the project and the purpose of the group, identify the top health and safety concerns, identify successful strategies to solve these problems, a discussion about rush jobs/special circumstances, including upset conditions, and a closing review.

For each group, participants were asked to generate a broad list of occupational health and safety concerns in their industry. Then participants were asked to independently write down their own personal top three occupational health and safety concerns (from the broad list that the group identified). A tally system was used to narrow the list to the top three or four concerns for the group. Questions and prompts were used to elicit discussions about what the problems were, and what the participants felt were the successful strategies/solutions in regard to those problems. These questions were developed based on prior knowledge, experience, and the safety literature.

A debriefing session was held between SHARP and the focus group moderator after the first focus group session and before the conduct of the second focus group session for the purposes of clarifying questions, the process, and for making revisions, if needed.

Human Subjects and Data Management

Each focus group session was audio taped and transcribed. Copies of the transcripts were sent to SHARP with participant names removed. Focus group session participants were compensated for their time.

RESULTS

Demographic Characteristics

There were a total of 43 participants in the six focus group sessions and they included 21 company managers, 17 journeymen, 2 apprentices, and 3 training center representatives. Of the 43 participants, 37 were male and 6 were female. The number of participants in each group ranged from three to 11, an average of seven participants per group.

Manager Focus Group Sessions

There were a total of 21 managers who participated in the three manager focus groups. One focus group was held with NECA members and 2 groups were held with non-affiliated managers.

For the in-person session with NECA managers, there were five male participants and one female participant. Their years of experience ranged from six to 18 years.

There were two telefocus group sessions with non-affiliated company managers. There were a total of 15 participants between the two groups: 12 males and three females. Their years of experience ranged from five to 30 years.

Worker Focus Group Sessions

There were a total of 19 participants in the two worker focus group sessions. One focus group session was held with union workers, and one with non-union workers.

For the session with IBEW union workers, there were 11 participants, all of whom were male. Of those, nine were journeyman and two were apprentices. Participants' years of electrical work experience ranged from two to more than 10 years. Three participants were from companies with fewer than 50 employees, and eight were from companies employing more than 50 workers. All 11 participants indicated that they did commercial work, with three who also did residential work.

There were eight males that participated in the focus group session for non-union workers. All were certified journeymen and all had more than 10 years of electrical work experience. Six of the eight indicated that they did both commercial and residential work, and two said they did commercial work only. Four participants came from companies with three to 10 employees, one from a company with 11 to 49 employees, and two from companies employing over 50 people.

Apprenticeship Training Centers Focus Group Session

There was one telefocus group session conducted with training directors or their representatives. Only three participated in this group: one male and two females. Another male began with the

group, but then declined to participate early in the session (reason unknown). Only one of the three participants had electrical experience. Two of the three were training center directors; one was a representative from a training center. Their years of experience as training center directors/representatives ranged from two to eight years. Each participant represented a different training center.

Focus Group Findings

Participants in each group were asked to privately identify their top three health and safety concerns. Based on each individual's private list, the group as a whole tallied all of the top concerns to distill 3 topics for in-depth discussion within each group. The goals of these focused discussions were to understand the perceived health and safety hazards, how the hazards occurred, and to explore solutions or strategies (actual or brainstormed) to control or reduce the hazards or problems. The groups discussed both hazards as well as injury types. Table 2 shows the broad list of health and safety concerns as well as the prioritized list discussed in-depth in each group.

The opinions expressed in the focus groups are summarized over the following pages. The focus group results are organized first by the top hazards and injuries discussed in the groups. These hazards and injuries included:

- Ladder hazards
- Lack of fall protection
- Back injuries
- Energized work and failure to lock-out/tag out
- Eye, face, and hand protection and use of personal protective equipment
- Housekeeping hazards

In the context of discussing the hazards and injuries, additional topics were raised. These topics are also covered in this result section and include:

- Employee training
- Incentives to promote safety
- Hazard analysis
- Worker involvement
- Enforcement of safety rules
- Management commitment

Table 2. Health and safety concerns from focus group participants.

Broad List of Health and Safety Concerns		Prioritized List
NECA Managers		
Ladder hazards	Training (standardized)	Ladder hazards
Proper use of tools	Confined space	Energized work/LOTO
Energized work/LOTO	Hazardous materials	Back injury
Fleet safety	Back injury	
Non-Affiliated Managers (Group 1)		
Falls	Trip hazards	Back injury
Back injury	Hand injury	Eye injury
Energized work	Eye injury	Hand injury
Punctures	Dust/fiberglass/PPE use	
Non-Affiliated Managers (Group 2)		
Ladder hazards		Ladder hazards
Eye injury		Back injury
Back injury		Eye injury
Asbestos		
Union Workers		
Housekeeping hazards	Ladder hazards	Ladder hazards
Lack of fall protection	Trip hazards	Energized work/LOTO
Lifting	Illumination	Housekeeping hazards
Energized work/LOTO	PPE	
Hazard analysis	Wire pulling	
Non-Union Workers		
Energized work/LOTO	Housekeeping hazards	Energized work/LOTO
Labeling circuits	Eye protection	Housekeeping hazards
Back/shoulder injuries	Dust - Asbestos	Back injury
Ladder safety	Tool maintenance	
Burns	Noise	
	Confined space	
Training Center Directors		
Hand injury		Ladder hazards/fall protection
Energized work		Energized work
Ladder hazards		Hand injury
Lack of fall protection		
Wire pulling		

Ladder Hazards

Discussions involving ladder hazards primarily involved ladder use and the condition of the ladders. Managers brought up a number of issues related to ladder hazards. These included standing too high on the ladder, leaning out on the sides, using the wrong size of ladder for the job, setting the ladder at a wrong angle, not tying off the ladder or anchoring it, and keeping ladders in good working order.

Workers brought up the following issues about ladder hazards: The condition of ladders (falling apart or broken), using ladders on scissor lifts, and that the rules about tying off were confusing (i.e., rules are different for ladder vs. manlift).

Most of the participants felt that addressing ladder hazards was important.

> *"Electricians spend 80% of their life on a ladder…so keeping that in mind…ladder safety is pretty important for us." (Training Center Representatives)*

There was much discussion about the specific issues regarding ladder hazards and a few solutions were mentioned. The main issues/solutions discussed included:

- Standing too high on a ladder
- Poor ladder condition
- Improper use of ladders
- Use of lifts

Standing Too High on a Ladder

Many of the focus group participants said that electricians were likely to stand on the ladder top and the top step of the ladder.

Solutions for Standing Too High on a Ladder

One solution mentioned for standing too high on the ladder was the "dunce cap." The dunce cap is a plastic cover that fits over the top of the ladder to keep workers from stepping on the ladder top and the top step. It was used as a form of negative reinforcement for not following the rules:

> *"It's just a plasticized, corrugated plastic thing that says, 'Danger, do not step,' and covers those steps so you can't physically use them. And I was thinking of purchasing a few strictly, like I say, as a dunce cap to wear if I caught someone using it, that they would have to for the rest of the shift have that on their ladder so that everyone could see they had violated ladder safety." (NECA Managers)*

The idea was to encourage peer pressure to abide by ladder safety. Another idea presented was to block or barricade the opening between the top step and the top of a ladder so that it could not be used.

"I saw another contractor… who on all their ladders on the job, the top step of the ladder, that whole square opening, they had cut plywood and bolted plywood in there, so you couldn't even use it." (Non-Affiliated Managers)

The manager who saw this innovation thought it was an interesting approach.

Poor Ladder Condition

Workers mentioned that some ladders had fallen into disrepair and employers did not want to replace them:

"The quality of the ladders themselves…it seems like it's hard to get one that's not falling apart."

"In one case, we had an injury because of an old wooden ladder that was pretty rickety and basically falling apart. Well, they took that ladder and put some tape on it and stuck it over in the corner and said this is garbage, don't use it. Well, after about a month, the tape came off and it went back into service."

"The only way to get rid of a ladder is take a band saw and cut one of the legs off."

"…I've taken the Sawzall and cut it down long ways and there ain't no patching that back together." (All from Union Workers)

The three-legged ladders (tripod or orchard ladders) were another safety issue. Several workers thought these ladders should not be used:

"One of the worst ladders that they keep sending out are three-legged cherry-picking [tripod] ladders. Normally these are ladders that have been out in the weather for a long time. They weigh four times what they should weigh because they're soaked with water. And when they dry, they get rickety. I think they should get rid of those three-legged ladders on commercial jobs." (Union Workers)

"I just wanted to comment on three-legged ladders as well. I don't believe they're as safe as they claim to be and I'd like to see them off the market. They're just—I mean they're convenient for tight areas, but I believe that they're just unsafe." (Union Workers)

Solutions to Poor Ladder Condition

Managers, on the other hand, said that they always wanted to provide good, safe ladders, but that the workers needed to inform them when a ladder needed to be replaced.

- A foreman said that his company had replaced all the wooden ladders with fiberglass ones because the company thought those would be sturdier and less likely to break.
- A worker mentioned that some ladders had rails that served to keep the worker from leaning out, as well as gave them something to hang onto; some come with a platform at the top.

- Another respondent said that some ladders had a handrail around the top instead of a step.
- One worker mentioned that rules were needed regarding acceptable ladders and that companies should have a policy on inspecting ladders and lifts daily before use.
- Another worker mentioned that companies could use a daily process (a checklist) for initially checking equipment to indicate that it had been inspected, and have the foreman go around once a week to verify that the checklist was completed every day.

Improper Use of Ladders

In some cases, the workers reportedly leaned the step ladder against the wall instead of extending the legs of the ladder. Some managers mentioned the danger in that the ladder can slip out from under the worker.

One manager mentioned that workers should not lean out beyond the ladder if they want to maintain proper balance. Constant observation or walk-throughs by the supervisor were one way of curtailing these work practices. An approach that was used by one company, and familiar to several others, was the "belt buckle rule":

> *"I spend a lot of time doing inspections of job sites, doing walk-throughs with the superintendents and catching people on the top step of the ladder or whatever…I've found that using a couple little, quirky little ideas for ladder safety helps. One that comes to mind was the belt buckle rule…that if you keep your belt buckle between the rails, you won't get in a position to lose balance one direction or the other. It's just a simple rule of thumb that's been used for years and years. It's amazing how many journeymen go 'What the heck are you talking about?' But it's something then that sticks with them…" (NECA Managers)*

Another rule of thumb that was mentioned regarding ladder hazards was the three-point contact rule:

> *"[Company name] has a bazillion different types of those [rules]. And the three point contact rule, that is basically three appendages have to be touching the ladder: …two feet and a hand or two hands and a foot if climbing." (Union Workers)*

Another worker objected to this rule in that much of the work could not be done with one hand.

"Ladder-walking" was mentioned as a type of improper and unsafe use of a ladder. This practice was described as, *"Stand on the top of a six foot ladder and then jerk it along,"* rather than get down from the ladder, move it, then climb back up the ladder.

Other issues with ladders included using the wrong size ladder and tying off on a ladder. For the first issue, the example given was taking a 10-foot ladder, because it is close at hand, to do a 12-foot ladder job. This was mentioned as one of the reasons that workers might use the ladder top or top step to stand on.

With extension ladders, it is mandatory to tie them off to an anchor point on the building. The problem was that there was not always a good point to which to tie off:

"A ladder's supposed to be tied off in such a way that it won't slip or fall, but in building situations it's not always easy to do." (Non-Affiliated Managers)

"… Sometimes we use products made by companies that are designed for fall protection, anchors; sometimes we, especially in industrial applications, we'll utilize structures, objects, steel, concrete. And it's hard to say 'cause there's, you know, WISHA and OSHA. Both have very specific rules about how strong the anchor point's supposed to be and it's hard to -- especially for, I think, contractors who don't have a lot of engineering background to figure out, -- does this meet the requirements for an anchor point? So a lot of it's just common sense, but I think for us to keep it successful, making sure that we plan and design and engineer an anchor point on a case-by-case basis from job-to-job. …. Most of the time it's a case-by-case basis: How are we going to tie off? Let's figure it out. I think if you leave it to the guys … to figure it out when they get up on a ladder, more often than not they're going to [do] nothing because it's too much time and trouble. They're there to get the job done as quick as possible." (Non-Affiliated Managers)

"One of the things we do with our fall protection and eye protection and everything, is we stock a variety of options. One thing we've been successful at is we bring a catalog in. We have about 30 different options and we'll say, "Pick one that you like," and then we make those available to the employees." (Non-Affiliated Managers)

<u>*Solutions to Improper Use of Ladders*</u>

Regarding adjustable ladders, one manager had a solution:

"… 'Little Giant' [brand name] makes a great product that is able to work on a stairway…. And the one I have will extend out to 16 feet and you can raise it up and down on the individual legs about four feet. And it locks into place and it's 300-lb. rated. It's an expensive ladder compared to others, but it solves the problem of being on uneven surfaces." (Non-Affiliated Managers)

Others in that group had seen these ladders and thought the ladders were a great way of dealing with uneven surfaces.

<u>*Use of Lifts*</u>

Lifts were considered a safer alternative to ladders when it was possible to use them. A variety of types of lifts were mentioned: aerial lifts, scissor lifts, boom lifts, snorkel lifts, and hydraulic lifts.

- The benefits mentioned were that lifts were generally safer, they had rails around the platform (enclosure), they provide a stable platform, and the height was adjustable.

- Barriers to using a lift included the fact that lifts were expensive to own, if lifts were not owned they would need to be rented, additional training and supervision was involved, and some lifts may not fit into certain types of spaces.

Several managers and workers indicated that using lifts could be a solution to avoid ladder accidents:

> *"…We normally have a group of ladders that we send out with the guys. Stepladders of varying heights. And once it gets to the point where they would have to tie themselves off or tie their ladder off, we will typically employ a lift in a case like that. And we've found precious few situations where you can't get a lift, either an articulating lift or a boom-lift of some sort that would get the worker up to where he needs to be. … It's just, we've just found that it's safer, there's less long-term problems and danger of injury if you use a stepladder for what you're supposed to use it for, and then don't use extension ladders and that, other than gaining access to roofs and things like that. It's basically how we've solved the problem here." (Non-Affiliated Managers)*

> *"Actually, we've shifted over to using man-lifts more and more." (NECA Managers)*

> *"He had to use his hands to do the job and he wasn't able to…any longer hang onto the ladder, and then the load shifted on him and he fell off and damaged his back…Actually what would have worked in this case is a small lift … working from the ladder and being off-balance contributed to the accident." (Union Workers)*

> *"In [city name], we've gotten away from a lot of fall protection issues by going to lifts. And the industry has changed immensely over the last three years. There's a whole bunch of different one-man and two-man lifts. (Union Workers)*

There was much discussion about the decision to use a lift. Managers weighed the scope of the job against the cost of the lift. For example, if a ladder was only needed a few times in a day, then it was usually chosen for reasons of cost. However, if the majority of a job or a job segment required working at heights, then a lift was worth the cost:

> *"If the job could be done from a ladder, that's generally less expensive. However, if there are a multitude of…light fixtures to put in, it probably could justify the price of a lift." (Non-Affiliated Managers)*

Discussions also included that the use of lifts might be hindered in some cases by the cost of the lift. A manager estimated that the cost for using a lift for a day was $200 to $500, and the cost for using a man on a ladder for a few hours was $100 to $200. Including the extra cost for the lift in a bid might jeopardize the chances of getting the job if others were bidding based on ladder usage. In a larger company, one manager said that his company would use a lift "for safety reasons," whenever it was possible to get one into the space.

One group talked about an unmanned "chandelier lift" to put in lighting fixtures in residential spaces with two story ceilings. This was a less expensive alternative for that type of work and may have fewer safety issues as well.

Safety issues mentioned in regard to aerial lifts included tying off, closing the gate, and inspecting the equipment before use. One respondent indicated that the rental agent usually trained the operators and users when a company rents the lifts. Comments about the proper fall protection procedures with different types of lifts included:

> *"In a boom lift, you have to tie off…you have to wear a full body harness, clip it to the cage…on a scissor lift, you close the door. Boom lift, it usually closes automatically when you get in." (NECA Managers)*

Lack of Fall Protection

Discussions about lack of fall protection included use of harnesses and roof work.

Use of Harnesses

The use of a harness is part of fall protection. It was pointed out that bypassing the harness and tying off practices were more apt to happen when workers were in a hurry to get the job done or when the foreman was pushing the workers:

> *"On a ladder, they don't want to put their harness on because they consider it a hassle, basically, because it gets in the way as much as it is useful. And so that's probably the biggest issue for me, is getting them to harness off or to find something to harness to in our scenarios." (Non-Affiliated Managers)*

The harness is often considered a deterrent to work, although the electrician is required to wear one when on a high ladder. Another worker mentioned that the employer should have a harness available:

> *"… I still think it's the contractor's responsibility to supply their guys with their own harnesses. Everybody's a different size and …[no] one's going to fit you properly.*

A training manager indicated that there is usually a harness that is part of the lift and that most workers were likely to use the harness correctly in a lift:

> *"I haven't seen it as an issue when the equipment is already installed on the lift." (Training Center Representatives)*

Some participants thought that the problem might be that the harnesses were not always the proper size, and that owned lifts were less likely to be maintained with a harness in place than rented lifts.

Putting a ladder on top of a scissor lift was recognized as a safety hazard and practice that is illegal, but something that has been done anyway.

One person described an injury that happened due to a faulty weld on one side of a lift. When it collapsed, the user was hurt. Afterwards, the company made a policy that users should inspect their equipment daily before using it.

Solutions to Problems with Use of Harnesses

One worker felt that electrical contractors should sponsor a fall protection/ladder hazards update for workers, including updates on company policy and the OSHA policy:

> *"…Because after the apprenticeship – at the apprenticeship at the school we get great training, extensive training on that sort of thing. But once you're not an apprentice anymore and you're out in the field five years later, ten years later, things change but you may not." (Union Workers)*

Solutions for finding anchor and tie off points included the need for management to plan and communicate to workers where and when to tie off:

> *"I think it goes back to the supervisor or the person, the estimator that's looking at the job, to plan that and then communicate that to the workers and make sure that they follow through on it. I think if it's left to the workers, the vast majority of the time you're going to find that they do nothing and they ignore it." (Non-Affiliated Managers)*

> *"… We keep different harnesses, different lanyards, different anchor points … from different manufacturers …[in] stock that work well in different applications. … And we've found that that's been real helpful in getting people to utilize safety equipment in general." (Non-Affiliated Managers)*

Roof Edge

One hazard concerning falls that was mentioned by several of the managers and workers was roof work. It can be difficult to get workers to wear harnesses when working on flat roofs. One company had a solution for this problem:

> *"On one of the jobs I was on, the contractor put a cable and it was ten feet from the edge and basically the rule was, if you worked on the inside of the cable, no harness. But if you stepped an inch over the cable, [you had to have on a] full body harness." (Union Workers)*

Others said it was important for the contractor (manager) to provide a harness set up at building edges or roofs where workers might be receiving materials.

Back Injuries

One problem described in most of the focus group sessions was back injury from lifting. The main reasons perceived for back injuries included, 1) people have not been taught correct lifting procedures, 2) attitude of the person lifting ("macho" attitude about their abilities), and 3) fatigue. Some participants felt that older workers were more likely to be "macho" and less likely to be trained in proper lifting techniques. A few participants thought that younger workers would be more apt to want to show their strength.

Managers recognized that back injuries resulted in a lot of work time lost, and resulted in light duty:

> *"Strains and sprains—those are the ones that tend to cost the most…that costs us the most time loss and light duty." (NECA Managers)*

The main solution offered for the lack of knowledge about how to lift properly and save one's back was better training. A couple of managers suggested having one or more special training sessions taught by a local chiropractor for their workers:

> *"Currently what we're doing is we have a group that has a chiropractor that is giving the training on back safety. And basically it's trade-specific for the construction industry and teaching them the proper lifting, the neutral spine positioning, ergonomics and how to be proactive in the back injury…it's about once a year--on the backs. Yeah, it's mandatory." (Non-Affiliated Managers)*

In regard to the effectiveness of this type of program, two participants shared their views:

> *"We've seen a decrease -- we have an extensive safety training program that is specifically back injuries and we've seen since we've started this program a decrease. In fact, I don't think we've had a back injury probably in two years." (Non-Affiliated Managers)*

> *In the retro program, the reason we're doing backs this year is 18% of the claims in the whole group were back injuries last year. And there hasn't been a single one this year since this has been implemented. (Non-Union Managers)*

Another manager encouraged workers to stretch and warm-up before performing strenuous work. He was also trying to change the mindset of the workers by equating the work to athletics:

> *"The kind of work that we do, the local commercial construction, from my company, for the most part electricians don't do a great deal of strenuous work throughout the day. They have spots of strenuous work. … And so they go from mild activity to strenuous activity for a short duration without properly warming up for it. And that's the biggest thing. No stretching, flexing, warming up. It's like hitting something cold. And I've tried*

to encourage -- I've sent out a great deal of information on stretch/flex exercises, the value of warm-up. Try to get those little mindsets - you know, your athletes? 'Cause your job requires your physical dexterity, your ability to throw a curve ball is important here. So, but you warm up before you throw that curve ball. You're a construction athlete, 'cause that's -- without your physical ability, you can't do your job." (NECA Managers)

However, participants thought it was important that the General Foreman (at the job site) encourage workers to stretch in order for the program to be effective:

"If I can convince the general foreman that this is a good thing and during his pre-job get-together in the morning assigning work, if he asks people completely voluntary to stretch and flex, it works. But without that GF wanting to encourage people to do it, it doesn't work. We haven't made it mandatory. Just highly encourage it. And I've got two or three guys that are pretty religious about making their crews stretch and flex before work starts. Now, that's before work starts. It doesn't mean that they don't work three hours doing minute stuff and then all of a sudden pull some 500 MCM cable." (NECA Managers)

Solutions to Prevent Back Injury:

Other ideas that emerged from the focus group sessions included:

- Two managers thought that it was important to encourage workers to take time off when they have a pulled back muscle, or light duty if a worker has an injury so that they can heal.
- One of the companies supplied back belts for the workers when they needed to lift heavy objects. Another participant shared his views that he did not think back belts were a proven prevention strategy.
- A few respondents indicated that they used posters to remind workers about proper lifting and stretching: One indicated that L&I has "free posters on back lift safety." The other used posters that illustrated proper stretching in conjunction with the chiropractor training.
- Back injuries also occurred from pulling wire, carrying a heavy tool belt, bending over, always bending forward, or twisting on a ladder. One company said they currently used buckets and hand carriers with wheels more often than tool belts. Regarding wire pulling, there were machines that help to pull wire, although they may not always be available.
- One manager suggested having a safety program with weekly meetings (topics such as how to lift a ladder, using a buddy system so workers don't overstrain or work alone, correct lifting, weight limit, and use of safety belts when certain weights are exceeded).

Energized Work and Failure to Lock-Out/Tag-Out

There was discussion in almost all groups about energized work. The main issues discussed included decisions about working de-energized, failure to lock-out/tag-out, things to consider when working energized, and arc flashes.

Working De-energized

Much of the discussion revolved around decisions about whether to work with energized or non-energized electrical systems. Careful scheduling, communication with the client, and management commitment (through enforcement measures) were mentioned as things needed to work de-energized:

- One participant mentioned that a temporary energy source such as a generator could be used to supply electricity to the jobsite while the electrician is doing the wiring (for new construction).
- Schedule work so that the needed repairs occur when all energized sources can be shut off:

  "If it's not life safety, if it's not an alarm system, if it's not part of a critical process, it don't have to be worked hot. And it all can be addressed with scheduling. Simple scheduling. You can work a midshift and probably work it de-energized" (NECA Managers)

- One of the most frequently mentioned problems was that some of the veteran electricians felt that working on energized circuits was a sign of their experience and expertise.

  "Enforcement is a major key. Major key to this…Yeah, you gotta be able to -- in my experience we have this problem with the machismo where everybody thinks they're going to work hot. You gotta be able to let the guy go. You gotta be able to let your #1 foreman go. And then it gets back to what you said earlier. You gotta have management behind you in order to let that guy go." (NECA Managers)

- One group mentioned the need to educate the customer about issues around energized work. Another group mentioned the importance of working with the customer to establish the proper policies:

  "The customer is a big part of it. Here was a customer that says, "Don't work anything hot." Most customers want the cheapest price, [other voices agreeing] and they won't pay for the time and effort for suits and time to put them on, and they go -- …"I'll just find another company that will." And so the competitive pressure there is a tougher one to deal with maybe. (NECA Managers)

  "Yeah, there's one customer who, they've had enough problems that, … "Absolutely nothing can work hot," is the way they start. …And the way we had to do it is we had to bring in the people that wrote the policy, and say, "Okay, this is the policy, this is the situation, what do you want to do?" And it ends up being, "Well, I guess you'll

have to work it hot." "Okay, how do you want us to work it hot?" And it worked out. But it was like a two-week process on that." (NECA Managers)

Failure to Lock-Out/Tag-Out

In order to safely work de-energized, the proper lock-out/tag-out procedures must be followed. The consequences of failing to safely lock out a system are considerable. It is possible that other trades on the job site may turn on the electricity at the box when the electrician has failed to lock-out the energy source:

"Other trades, especially laborers on some smaller and remodel projects, if they want something hot, they find the panel, because they've got keys to everything and they just start flipping stuff. I've blown up a few pairs of T-5s from that…in some cases...they weren't locked out. They were just placed and set screwed style. And then in other cases, there's blue tape…It's just as much a problem with the electrical contractor if he's using blue tape over a breaker and putting "no no" on it instead of locking the darn thing out." (Union Workers)

Participants made comparisons with industrial construction and noted that in some settings electricity is fed from multiple sources. This is an issue in that locking out one source may still leave an energized circuit. Several participants had had the experience of having the electricity turned on unexpectedly because there were multiple sources of electricity that were not controlled at the breaker.

It was suggested that multi-source boxes should always be labeled to indicate the various sources of electricity.

Several union workers mentioned instances where they had encountered multiple sources of electricity:

"I was an electrician in the Navy for six years and when we went to lock something out—because you've got stuff that can be supplied from multiple sources—one person would write the tag out and …every source on there where you'd hang that tag. He would go hang the tags, and a second personal individually all by himself would go verify it on the drawings, what's powered and he would go and double check it."

"And also in industrial [construction], there's what they call soft transfer. You may shut down one source of power to a device and somewhere the operator will see that it's off and feed it with another source without you even being aware of it…You can't just necessarily shut off a breaker and think that you've killed the thing off."

"We recently lost an apprentice down here in Portland from that very thing. There was a control circuit and they turned off the power to it—to the starters thinking it was dead, but when that 480 control circuit kicked on, our apprentice was hit. So checking for multiple sources is huge." (All from Union Workers)

Proper Execution of Lock-Out/Tag-Out

Although these situations may call for more thorough measures, in most cases the goal was to be sure that standard lock-out/tag-out procedures were followed. The training center representatives mentioned the type of training that they do regarding safety with respect to energized or non-energized electrical work:

> *"Well, we do comprehensive arc and electrical safety training. I know that lock-out, tag-out which is …in the rules as far as electrical safety goes. So we have a video on the different scenarios and what should be done and what kind of damage can be done to people. We've had people who have gotten burned come in and talk to the apprentices. So the employers all have lock-out/tag-out policies involving, if it does not need to be worked hot, you turn if off. And there are very few instances that need to be worked hot…. If you don't have to work it hot, don't work it hot…that's what causes the shocks, the electrocutions and the arc flashes." (Training Center Representatives)*

- One of the practices that ensured good lock-out procedures was to supply the electrical contractor or worker with a wide variety of types of lock-out devices.
- Written tags should be used that show the dates, so that other workers will know whether or not the tag is current.
- Some contractors also put up signs that say there is a lock-out in place.
- Have two independent people check to make sure all power sources are shut off.

Besides locking out the current, there was discussion on the procedure for verifying whether or not there is current flow. Tick tracers are used to determine whether the wire is live or not. Some respondents said that these pocket voltage testers run on batteries and are not always reliable. There is a need to test the tester:

> *"You've always got to check it against something hot first, and then go to what you're doing." (Non-Union Workers)*

At one company, the foreman provided tick tracers and reminded electricians to use them, stressing the importance of verifying the tick tracer with a known source because the reading may be false if there were problems with the battery.

- It was suggested to keep two tick tracers on hand because sometimes there is not a known test source.
- It was mentioned in most groups to "*always work like you're working hot*" (i.e., always wear gloves and glasses and test frequently) to protect yourself from surprise energy releases.

One practice discussed in a worker focus group session concerned dead fronts on electrical boxes. Dead fronts are sometimes removed or not installed yet (in new construction) so that the workers may be dealing with exposed wiring coming into the box. One worker explained how this causes problems on a jobsite:

"They just want to take that dead front off the panel, want to walk away, and they want to go down the hallway and pull the circuit, and they leave that dead front, and Mr. Taper comes along and has his taping tools. And so my rule of thumb is you can't walk away from that panel, you can't leave the site of that panel without the dead front on it…(it's a covering that covers just the breakers)…no that's the frame, that holds the door, all of that." (Union Workers)

Removing the panel cover while work is underway makes it difficult to lock-out. One way that some contractors dealt with that situation was to put cardboard over the open panel, and write "hot panel" on it. In one focus group session, an electrical contractor talked about temporary dead fronts that were inexpensive, made of non-conductive material, and easy to place over an open panel when one works on it and has to walk away. While these covers may be convenient for electricians, they do not prevent access by unqualified persons to a live panel. Such temporary dead fronts need to be used in conjunction with physical restriction of the area to qualified employees only.

Working Energized

It was pointed out that if you are going to work on an energized line, a hotwork permit is necessary: A plan must be submitted ahead of time and approved by the supervisor. The plan includes flash calculations and determining the level of personal protective equipment needed:

"… They have an effective hot wire program, an energized circuit work program. Your people have to be trained, you got a written program, you have two journeymen, you gotta have insulated tools, you gotta have protection … Well, face shield and the flame-retardant clothing, because the energy released from an electrical explosion is tremendous high temperatures over a short period of time." (NECA Managers)

One manager facilitated carrying out energized work safely by having "hot work" kits available. The kit is stocked with PPE (insulated gloves, arc flash shield, etc.) and has insulated tools. All journeymen know that a written plan is required to use the kit, and that a competent person must be present.

One company manager preferred to schedule energized work (or the most hazardous jobs) at the beginning of the workweek, rather than at the end of the week.

When trouble-shooting a system that is energized, the following suggestions were given:

- After the job is over, give feedback to workers who performed the job.
- Use an ohm meter instead of volt meter.
- Use two or more persons to determine the plan of action required for the job (use 2 people because 1 brain alone is subject to mistakes, use cross-checks).
- Communicate plan of action with fellow journeymen and others at the site.

Arc Flashes

Arc flash was another type of safety and health hazard that was mentioned with respect to working on or near energized circuits. It was expressed that arc flashes are not that common, yet the extent of the injuries sustained can be significant:

> *"Well, arc flashes, it's not what makes them more prevalent than it is what – it's the damage that they do. An arc flash essentially is a fireball. And that fireball has molten metal in it, copper, aluminum. It does damage to the skin, the eyes, the lungs, it's worse than the shock could ever think of being. It's what you see. The physical damage that's done to people…it melts clothes to people, you know, they spend time in burn centers. It's very, very ugly." (Training Center Representatives)*

Participants mentioned that the best way to avoid arc flash injuries was to not work on an energized circuit unless necessary. If one had to, then specific procedures needed to be followed, and the electrician should wear face, eye, and hand protection. It was necessary to have another worker standing by and observing when hot work was carried out. The "buddy" would need to be trained in CPR and first-aid.

Eye, Face, and Hand Protection

Eye Protection

Eye injuries were considered a major health and safety concern for electrical contractors. Some potential hazards included sparks or arcs of electricity affecting the eyes and metal or other objects flying into the eyes when drilling. The main protection against eye injuries was to wear safety glasses. However, the barriers to wearing safety glasses included the following:

- Some workers did not like to wear safety glasses.
- The safety glasses often got scratched and became difficult to see through.
- The safety glasses were frequently misplaced or left in the service truck.

The best practice mentioned by a couple of managers to encourage use of safety glasses was to allow the workers some choice in the glasses and to offer some that were appealing style-wise:

> *"We don't require…all of our employees to wear the same glasses. One thing we've been successful at is we bring a catalog in. We have about 30 different options and we'll say, 'Pick one that you like,' and then make those available to the employees." (Non-Affiliated Managers)*

> *"I'll tell you what we did and it's really worked well for us. We bought -- I don't know if you're familiar with the brand called 'Cudas' and they're a real stylish-looking safety glass. They're real streamlined. And you can buy 'em -- they come in a kit where it has almost like a little tiny fanny pack that goes right on their belt. And it's made out of a*

real tough material like a Carhart material, has a Velcro. And in this kit there's three different-colored lenses; there's a clear lens, there's a smoke-colored lens and there's a mirror-colored lens. Guys like the mirror-colored lens for obvious reasons. But with each one of these - and we give everybody one -- with each one of these we'll give them a half a dozen of the Croakies. You know, the little Croakies that you hook on there? We call 'em Croakies. They're the little deals that go on your glasses that go around your neck." (Non-Affiliated Managers)

The "Croakies" would keep the safety glasses from getting lost when workers take them on and off frequently. Another manager suggested providing some type of case for the safety glasses to keep them from getting scratched:

"The reason why they [the glasses] only last a week is because the chances are they're kicking around in a tool bag with a bunch of other tools, or they're riding around in a van unprotected. If they're in some kind of protective case or something like that, they're going to have a much longer lifetime, usually." (Non-Affiliated Managers)

Suggestions for promoting the use of eye wear included:

- One person thought it was easier to buy large quantities of inexpensive safety glasses, and replace them as often as needed.
- A buddy system was recommended in which one electrician would remind the other when it was necessary to wear the safety glasses.
- One company had labeled power tools with the words, "Eye Protection Required," so that the user would be reminded to wear their safety glasses with each use.

One company manager mentioned that even with eye protection, workers sometimes get things in their eye. The company stocked eye wash bottles in all of their service vans and job trailers, and they made it known to the electricians that the wash bottles should be used immediately (rather than rubbing) when particles got into the eye. The eye wash bottles have become the most frequently used item out of their first aid kit:

"And these [wash bottle] kits, they're fairly inexpensive. They hang right on the wall. And there's two bottles in there, one that already has the little cup on the end for washing your eye and then there's a refill for it. And we've seen -- 'cause you get out on a jobsite, sometimes there's not water out there, other than what's in an ice chest or there may not be any water out there. And if a guy can get to the job trailer, whatever, flush out whatever's in his eye, it can come out before it can scratch his eye or cause a problem. That seems to help a lot, too." (Non-Affiliated Managers)

Face Protection

Face protective gear (face shield) was mentioned most often with respect to doing hot work. The face shield is a requirement for working with energized circuits or boxes.

Hand Protection

The main concerns about hand injuries were cuts or punctures from sharp metal edges of materials such as insulation or conduit. Burns from working on live wires were also mentioned as a concern. Wearing appropriate gloves for hand protection was considered the safe practice. However, some electricians reportedly did not find it practical to wear gloves to perform a number of necessary tasks. Having a good flexible glove that still protected from cuts was recommended:

> *"What we found through our research is that electricians traditionally don't like wearing gloves because they need their fine motor skills to get a hold of a wire. And with gloves on they're cumbersome and they don't have the ability to do their job. So we tried different types of gloves to see if certain types were more conducive to them to be able to continue with their work. We found a really good set and I don't know what they were. They were fairly expensive. They were more form fitting to their hands and the coating on them you couldn't cut with a straight razor." (Training Center Representatives)*

In another group, one manager preferred cotton gloves, because the hands did not sweat and because they were inexpensive. However, others thought they might need a glove with some "grip" to the surface so that things would not slide out of their hands. One respondent pointed out that some electricians wore gloves but cut the fingers tips off of the gloves for greater dexterity. Another manager described "mechanics' gloves" that have grip and that look nice so the workers would wear them:

> *"They're kind of like motorcycle gloves. They're fairly light. They've got a design on them. They look pretty neat." (Non-Affiliated Managers)*

Several other managers indicated that they used that type of glove and that *"the guys like 'em."* Some thought the use of these gloves was already a standard practice.

Another type of hand injury occurred when the electricians were driving in ground-rods with a 20-pound sledgehammer. The quick solution that a couple of respondents found was to buy an attachment bit (driving rod) for the roto-hammers. It was reportedly easier to use and less likely to involve injury.

Housekeeping Hazards

Improper housekeeping was a safety hazard that was discussed in several groups. The major issue mentioned was dealing with housekeeping at a job site that employs different trades. Thus, the electrical contractors would not have control over the cleanliness of a site, though they could influence others to help keep it clean:

> *"All of us are customers to general contractors for the most part, particularly commercial construction—I can speak for commercial construction. So we're customers of the general contractor that run a project. And one of the—we'll see if everyone agrees—one of the keys to a safe workplace is good housekeeping. That primarily falls under the responsibility of the general contractor, and the contractor's attitude towards a clean worksite reflects pretty strongly on how safe the worksite is. And so you gotta start somewhere, and the people running the site primarily are the trigger as to how safe a site really is. We all work— (have an impact on housekeeping) … and we're often times tasked with providing labor to do like composite crew cleanups. We have a direct impact on our own areas, we do a great deal of work in our own space as electrical rooms or where we can keep our materials picked up and clean, and continually complain about housekeeping conditions to the general contractor, that sort of thing. So we do have a part in the overall cleanliness of the site, but you want to start somewhere with what makes a safe worksite, I think every trade is exposed to the hazards of poor housekeeping." (NECA Managers)*

There was consensus that the General Contractor on a construction site has influence over housekeeping:

- Companies need to have enough dumpsters and a system to regularly empty the dumpsters. Dumpsters are not adequate on most sites. Also, the General Contractor needs to provide a disposal route for recyclables, garbage, etc.
- The General Contractor needs to have a job-wide housekeeping policy from the beginning. In one company, the General Contractor had given warnings to subcontractors that did not clean up. When the problem persisted, the General Contractor sent in his own crew to clean up. The subcontractors were then back charged for the clean up time.
- One participant knew of an effective practice used at an industrial site -- the "Board of Shame." The General Contractor took Polaroid photographs of all of the messes (not the people, just the debris piles, etc.). The photos were then posted on a board for everyone to see. While no individuals were in the photos, everyone could identify their own mess. This made a big difference in housekeeping at that site because nobody wanted their area to be on the board. The photos were taken on a random basis so workers would keep their area picked up to avoid having a photo on the board. Initially there were *"just tons of pictures"*, then as housekeeping improved, photos were more rare.

Other housekeeping solutions included:

- Employers paying workers for 15 minutes of clean up at the end of each day or a half hour at the end of the week.
- "Tidy Friday." While pick-up should occur each day of the week, Friday was for thorough cleaning.
- Making garbage bins or dumpsters readily available on the jobsite.
- Putting away extension cords when they are not in use.
- Removing cut conduit out of the way to prevent slipping.
- Having a box or a 60-gallon waste can readily available can encourage quick clean up on a regular basis.

Some workers thought it was better to clean up as you go to keep the environment safe throughout the day. Nevertheless, others were happy to have a set time when they were allowed to clean up for the day or week. One problem specific to the electrical work was that people could trip or slip on conduit pieces that were left on the floor:

> *"One real common thing is pieces of conduit that you cut. The moment you step on it, [you are on] your butt. So a good practice is to cut conduit and either kick it over against the wall or throw it in the box as you're cutting it." (Non-Union Workers)*

Overall, keeping nails and slippery material off the floor was recommended:

> *"I don't know that this is necessarily innovative but whenever I work I usually have a teacart and I keep a large box, say a caddy box or whatnot around to stick all wire and conduit scrap mainly in that box on that cart and stow it away. And I empty it every night so it keeps your loose slippery material away. We kind of have a policy that make it look like you weren't there." (Union Workers)*

Housekeeping is about more than just a tidy workplace:

> *"It's got to be part of their daily activities, as important as anything else they're doing…it expands to everything a person does. I mean, if you're keeping your worksite clean you may be actually organizing your mind, too, planning, thinking, and doing things sufficiently." (NECA Managers)*

Additional Topics Discussed

In the context of discussing the above-mentioned hazards and injuries, additional topics were raised. These topics include employee training, incentives to promote safety, hazard analysis, worker involvement, enforcement of safety rules, and management commitment.

Employee Training

Managers acknowledged that the cost of training workers was high. One manager estimated that it cost at least $1 a minute per person for training. Another manager gave the example of one training session on lock-out/tag-out that included 40 workers for an hour. It cost $3,500.

Managers expressed a desire for standardization of training for electricians (both journeymen and apprentices). The state was suggested as one possibility:

> *"Something that would be helpful from my point of view is a standardized or centralized training resource that when I call a guy out of the [Union] hall that used to work for [company name], I'd know that he has at least the same kind of training I would require him to have on a scissor lift." (NECA Managers)*

> *"Standardized training and a training resource, even a central clearinghouse for training records, something like that." (NECA Managers)*

When the training center representatives were asked about providing standardized safety training for apprentices, they seemed to think that would be reasonable. Some commented that they already incorporated safety training into their programs:

> *" I don't think anybody within the apprenticeship program would balk at the idea of the apprenticeship section developing safety training that is mandated at each year whatever has to be taught at each level of apprenticeship. I don't think any of us would balk at that as long as everybody had input and it was great safety training. But I don't think it's necessary. I think that we all take safety very seriously and do extensive safety training within our own individual programs." (Training Center Representatives)*

There was some reservation about having *"a government agency that deep in what we teach."* It was observed that WISHA and OSHA rules and guidelines constitute enough involvement of the government.

On the other hand, there was agreement that electricians needed training in CPR and first-aid. Some groups thought this training was available from other organizations, especially for refresher courses among older workers. One group mentioned that better job safety orientation was needed --better initial safety training.

Regular company safety meetings were mentioned as another form of training. These meetings were seen as essential for maintaining awareness of safe practices among the electrical contractors/workers. They often picked a particular topic for each safety meeting, and some participants said that the topics should be project related:

> *"Safety meetings that we have routinely…if you actually discuss specific things at the safety meeting that are—and not from some book where today's this and tomorrow's that, but things that are actually happening at the job site, I think it makes everyone more aware and it adds to the overall safety of the job." (Union Workers)*

Most respondents acknowledged that safety meetings were an important part of their approach to safety and training. Most companies seemed to have morning safety meetings, weekly, monthly,

or quarterly. One company held their safety meetings on Friday when employees picked up their paychecks.

As a general comment, some respondents noted that training sessions worked better if there was some humor or fun interjected with the serious material. Also, a suggestion from one manager group was to do a post-evaluation of training efforts and of completed jobs to help evaluate their training programs. Workers suggested that training might be improved by providing statistics about where the common accidents were happening.

Several respondents mentioned the option of having someone from Labor and Industries come out to do a worksite assessment with the manager:

> *"Labor and Industries, especially on larger jobs, also has a [consultation] person who will actually come out to your job on request, and they will not enforce any—or they will not cite any violations they may see, but they will actually walk the job with you. You explain to them what it is that's going to be happening and they will prescribe some acceptable fall prevention measures for you at no cost. They'll show up within 24 hours of being asked." (Non-Affiliated Managers)*

Note: L&I does have a consultation service program that can provide safety and health assessments upon request. The consultation program operates independently of the WISHA compliance division.

At that point, the manager felt L&I was offering advice and suggestions for any problems noted. The managers that used this service seemed to appreciate it, and others in the focus group were interested in this idea.

Incentives for Promoting Safety

Several companies described rewards or monetary incentives as a positive approach to promoting safe work habits:

> *"We have an incentive program that gets crew participation to keep the crew safe, so that when I'm not there…there's the other eyes on the job, [because they] stand to lose if one person gets hurt…. We have safety bucks, [company name] bucks, that are just coins that we had minted with our founder's picture on them. It's a program that was developed to incent safe work practices. What you have to be careful of with incentive programs is not to incent non-reporting but to incent safe behavior." (NECA Managers)*

> *"We've got like [company name] Bucks. It's gift certificates so they can get stuff out of the catalog." (Non-Affiliated Managers)*

These safety bucks were used to purchase items from a catalog, with an extensive line of items that might interest the workers. The concern about non-reporting was raised by a worker and also addressed to some extent by a manager:

"I worked for (name of company) for a while and they had the safety bucks thing but what happens is they tend to get people to not report…if a guy gets a minor injury or something, he won't report it to L&I because he'll lose his safety bucks. And so I don't know if that's exactly the answer. It's a good thing to compensate people for being safe." (Union Workers)

"If there's a time loss injury, they get no bucks. So—[they've] been reporting because first day injuries, near misses don't cost anybody anything. An L&I claim says, 'Okay, you were in a position where someone got hurt, you weren't watching out for each other, so you don't get your bonus bucks.' But that time loss, that's very serious. If someone has to lose some time, the crew gets no bucks. So the crew has to watch out for each other because it's amazing that this program has been in effect about six years, since I've been doing this thing." (NECA Managers)

Another company that works in many sites with small or two-man crews felt the safety bucks program would not work in their environment. Instead, that company holds an annual banquet and gives awards for people who have exhibited safe work practices. Even workers that are no longer with the company may participate and receive awards. Along the same lines, another company passes out gifts quarterly to those who have had no accidents:

"Anybody that has not had any kind of a safety accident over the last quarter, we buy tools for them. And we always buy tools of the trade. This particular Friday, …we're giving them a 7-piece set of Klein screwdrivers. And we try to do this so it helps them in their trade. It's a tool they use daily, so they think about it. And it's also a reward for being safe. And then once a year, we buy a big prize that's maybe like we'll buy them all new jackets." (Non-Affiliated Managers)

The cost of this program for management is about $30 to $40 per safe person per quarter and $100 once a year.

Hazard Analysis and Worker Involvement

Several participants mentioned that when workers are involved and engaged in the safety process, their awareness is raised and the overall safety on the site can be raised. A few managers mentioned getting journeymen involved in safety by having them conduct safety walk throughs:

- At one company, twice a month the foreman picks one other person to walk through a job. They look specifically for things that could be a safety hazard. They write the hazards down, and when they go over safety issues in their regular meetings, they include these site-specific hazards that the foreman and worker has found.

- One company has a rotating task where workers look for safety hazards. The hazards and the hazard corrections are presented to all members of the crew at quarterly safety

meetings. It was mentioned that this type of worker involvement has raised the safety awareness of the whole crew:

"We have quarterly safety meetings at our shop. And we pick two volunteers out of the crew. We have them, over the next three months, whatever jobs they're on, they look for anything that might be unsafe. They write them down…then a week before we have our meetings, they come into the shop and sit down with me [safety manager] and we go over these things, things that they have found that they see personally that are unsafe. We come up with solutions, the three of us." (Non-Affiliated Managers)

Another method mentioned to engage the workers on safety was the "buddy system." One person observes and lets the other know if they are failing to follow any of the set safety practices. Just a friendly reminder is expected to make a difference in many cases.

One small company successfully turned safety awareness into "The Dollar Game." If one member of the crew observes another worker engaged in an unsafe act, such as standing too high on a ladder, or not wearing their eye protection, they can ask the person who has done the unsafe act to give them a dollar. This encourages the workers to watch each other, and to check their own behavior. In this small company, participation in the game is good natured and voluntary:

"Everybody is good-natured about it. I've seen more than one guy just sort of shake his head and pull his wallet out and hand a dollar over to the guy who caught him doing something. When someone does that, you never see them doing it again. So it's something that we like to do." (Non-Affiliated Managers)

To encourage worker involvement, one company explained the cost of injuries to their workers. When there were injuries, the workers' compensation insurance premiums go up. This increases the overhead for company and can affect the company's ability to give competitive bids:

"If you make them part of the company, where they understand that they're trying to [keep] overhead down by being safe; and they don't understand that being safe helps everybody. It helps them, it helps us get a job for them to work so that they can continue to provide for their families. They don't understand that unless you explain to them and make it part of it. It's part of getting them involved and finding the problems and coming up with solutions." (Non-Affiliated Managers)

Another company felt they encouraged worker involvement by quizzing their workers on various safety topics. The program involved using pre-packaged training materials from a private company. The workers' paychecks were placed on top of the training materials. The workers had to read the materials and sign that they had read it before getting their paycheck. Then, sometime later in the week, the workers were quizzed on the materials: For example, the manager would ask a worker, *"What do you have to be careful about with forklifts?"* The quizzing was done two or three times a year.

Enforcement of Safety Rules

One method of enforcement of safety rules and policies mentioned in one of the manager groups was to fire the employee after "three strikes." One safety manager particularly espoused this type of reinforcement:

> *"That when you use your disciplinary procedures…I've found it's the most effective way of dealing with these violations. You end up having to fire one or two guys off the job. It sets the tone for the job right away. If you don't put up with the violations of safety procedures right away, the job tends to go well. …." (NECA Managers)*

Management Commitment

Participants also emphasized the importance of top management safety and health commitment and attitude in setting the tone for a safe worksite:

> *"I think the bottom line, at least in my opinion, is start with a clean worksite, or with a safe worksite, it comes right from the president of our company. Because if the owners, whoever it is that has the final say on whether the company goals support the safety department, that allows us as safety people to perform our tasks the way they've hired us to perform them. I've worked with a company that has a difficult time doing that, and what happens is those kind of feelings just trickle right straight down, just as a direct conduit, right down to the workers. And if they don't—if they perceive that the company at the top does not really care, then you're just another one of these if you get hurt go home, you know that kind of an attitude, then their attitude goes down, and when that happens they don't take quite as good a care of their work, the tools, the workplace. So if the employees know that the owner of the company is genuinely concerned with their welfare, they'll take care of them, they can take care of [unintelligible] a little bit better all the way across the board, and it makes it easier. And then, from there on out it becomes a matter of training. You know, then you have to train them." (NECA Managers)*

> *"I know from personal experience it's even harder when you don't get support from the top. You get more injuries … and you get crummy work out of the guys." (NECA Managers)*

Another respondent felt that it was important for management to demonstrate concern for the workers and for safety:

> *"If the owner cares, then he demonstrates it by when someone is injured how to take care of that person. You know, whether they participate in their recovery and put them on light duty if it's possible, and all the rest of that makes a lot of difference in how many accidents you have." (NECA Managers)*

Others felt that communication was important in creating a safe and healthy workplace:

> *"It starts with the interest right from the top, and then good communication to everybody." (NECA Managers)*

DISCUSSION

Study Design

This was our third industry-wide study under the Healthy Workplaces Initiative. The focus group design for this study was particularly helpful in finding more in-depth information about health and safety practices among the Electrical Contractors Industry sector. This study approach differed from that used in the previous two Healthy Workplace studies primarily because of the mobility of the workplaces and workforce in the construction industry. Also, this study focused primarily on identifying the occupational safety and health strategies that companies used to reduce or control work-related injuries and illnesses, rather than on assessments of company organizational health.

Our methods for industry selection allowed us to set criteria for inclusion based on the number of companies as well as on the dispersion of size and workers' compensation claims for each industry in Washington State. The selection criteria for the study included companies with three or more employees in the year 2001, as well as classification in specific SIC and risk class codes. This was done to increase our chances of finding companies that performed similar work. It was important to create as much homogeneity within the focus groups as was possible.

We sought diversity among the focus group participants. We included members of the International Brotherhood of Electrical Workers (IBEW) and the National Electrical Contractors Association (NECA) as well as participants who did not belong to these organizations. We made the assumption that management approaches may differ between small and large companies, and work experiences may differ between rural/urban areas of Washington State. We wanted to include a mixture within the groups to gain a diversity of views that might be representative of the industry.

Overall the group composition for managers and workers showed good representation among small and large companies, dispersion across the state, and variation in years of electrical experience. However, we did not get adequate representation from the apprentices. This may be due, in part, to our recruitment criteria of at least two years on-the-job experience. We may have increased our sampling pool had we allowed apprentices with one or more years of experience.

We had hoped for more participation from the training centers. We made the assumption that the training center directors would be knowledgeable about the occupational safety and health issues and practices of electrical contractors and of the industry. In our sample for the training center director's focus group, we did recruit all 10 potential participants (i.e., there were 10 different training centers in the state). As it turned out, representatives from only three training centers were available during the teleconference. Had more representatives participated, we may have received more information and insight into the health and safety problems/solutions from the training centers perspective. In retrospect, it may have been helpful for us to expand our recruitment criteria to include not only the training center directors but also instructors or other top managers involved with electrical training, perhaps two or three from each center. This

would have established a larger sampling pool (~20 or 30 people, instead of 10) and we may have been able to get participation from all 10 training centers.

Study Findings

We made the assumption that the safety and health professionals/managers have or would know of solutions, recommendations, and successful strategies used in occupational safety and health management. It appeared from the focus group sessions that *attitude* and *commitment* of top management and of the General Contractor were key to a successful safety program. Both workers and managers agreed that the General Contractor set the tone for the importance of safety at the job site.

We made the assumption that electricians would have an interest in promoting safety and health in their industry, and that they would have experienced a variety of health and safety programs or management strategies throughout their career. We found workers were both interested in the topic and had diverse work experiences. Workers provided several interesting solutions and suggestions for ways to improve health and safety.

Ladder hazards and lack of fall protection was discussed extensively, as it was identified as a priority in most groups. Some of the issues had to do with standing too high on a ladder, poor ladder condition, improper use of ladders, and use of lifts. It was apparent from the discussions held separately between management and workers that both groups need to work together to address ladder hazards. Workers tended to find fault with the type, availability, and quality of the ladders. Management tended to mention inappropriate worker behavior while on the ladder. There was confusion over when and how to use a harness on a ladder. The use of aerial lifts in place of ladders was one topic frequently discussed in both worker and manager groups.

Back injury and other musculoskeletal injuries were discussed in most of the focus group sessions. Strategies that companies perceived to be successful included education and training programs, and practices of stretching before work. The discussions about a particular back injury prevention program, where health professionals taught workers about injury prevention, piqued the interest of a few other company managers. Perhaps the most convincing information came from the two managers' testimonials about having had no back injuries since implementation of the program (i.e., for the past two years). This program warrants further investigation as to how managers implemented it and what the barriers were, if any. Participants infrequently brought up strategies that actually *reduce* or *eliminate* the hazards associated with back injury. Two strategies that were mentioned included the use of handcarts rather than tool belts, and using a mechanical wire-pulling machine when possible.

Energized work was another serious concern mentioned by respondents. There was much discussion about whether work should be done energized. Currently the regulations prohibit work on energized lines except when this: 1) introduces or increases a hazard, or 2) is infeasible. It was expressed that many seasoned journeymen believe that working a system hot is what being an electrician is all about, the risks are accepted as part of the job. Some managers expressed that the frequency of working hot can be reduced, but that it takes careful scheduling, education of the client, and a commitment from top company management to do this.

Employee training was repeatedly brought up as a major factor in preventing injuries. Two ideas that were suggested in the groups included weekly or monthly trainings, and holding special training sessions at the start of a big project. However, there was not much comment on whether these training efforts were effective. The discussions about standardized training raises an interesting issue for the entire industry, and has potential policy implications for the industry, the training centers, and L&I.

Several companies mentioned that getting the workers personally involved in conducting site-safety walk throughs has increased the overall safety awareness of their crew. In addition to regular safety meetings, some companies are walking the site several times each month and documenting safety hazards. When these site-specific hazards are addressed with the crew, the safety message is directly relevant to their work and experiences, and the crew, whether they were the observer or the one who was observed doing an unsafe act, understand what is acceptable behavior and what is not. Several participants mentioned that humor and good nature were key to not offending workers and getting them to change their behavior. Conduct of site safety walkthroughs, or hazard analysis, is one strategy that can bring variety and realism to safety meetings and can be successful in raising safety awareness.

When controlling for occupational hazards, the preferred approach is widely known as the hierarchy of controls. In this hierarchy, the first approach to controlling a hazard is to eliminate it. If the hazard cannot be eliminated, it should be controlled with engineering methods. If it cannot be engineered out, then administrative controls, such as worker training, can be used. Finally, the use of personal protective equipment is the last approach to use when controlling for an occupational hazard. In the focus groups, it appeared that more often discussions were related to administrative controls or protective equipment, rather than on hazard elimination. The issues of energized work and musculoskeletal injuries are two examples of this. Working de-energized eliminates the hazard of electricity, however it is recognized that the prospect of working de-energized can be difficult and may take additional effort and planning. However, much of the dialog in the focus groups was concerned with safely working energized. Similarly for back injuries, much discussion was focused on back education and training versus elimination of the hazards that can cause back injury. While the discussions that did occur were valuable, the industry does need to be encouraged to think about hazard elimination rather than accepting and coping with hazards. More dialog on how to work de-energized and how to eliminate musculoskeletal risks are needed.

In Table 2 on page 9, the broad list of health and safety concerns raised in all of the focus groups are listed. There is one hazard that is noticeably absent from this list, as it was brought up in only one group. The hazard is noise. Electricians can be exposed to noise during certain tasks (use of pneumatic and powder-actuated tools) and from other nearby trades on commercial construction sites. One study conducted in the Seattle area measured 174 full shift noise samples on electricians at five different commercial construction sites over a four-month period (Seixas, 2001). They found that 24% of the samples exceeded the Washington State Permissible Exposure Limit of 85 decibels. Electricians may not be aware of their risk for hearing loss, and because they do not perceive themselves as making a lot of noise, they may be less likely to wear hearing protection devices while on a commercial construction site. While it can be rationalized

why noise was not a frequent topic in the focus groups, electricians can be exposed to high noise and they do need to be aware of their risk for hearing loss.

CONCLUSIONS

The focus groups that were held were an effective way to learn about the safety and health issues, concerns, ideas and potential solutions in the electrical industry. It is hoped that through discussion of industry safety and health concerns and exploration of solutions, the safety performance of this industry can be raised.

The focus group discussions identified industry strategies that were used to reduce occupational injuries and illnesses. The groups identified the following top hazards and injuries: ladder hazards; lack of fall protection; back injury; energized work and failure to lock-out/tag-out; eye, ear, face, and hand injuries; and housekeeping hazards. The following summary highlights some of the strategies used to address the top safety hazards and injuries.

Ladder hazards and lack of fall protection were discussed extensively in most groups. Some of the issues included: standing too high on a ladder, poor ladder condition, improper use of ladders, and proper use of lifts. Highlights of some of the perceived successful strategies used by companies included:

- Provide ladders with a variety of heights so that the correct size could be used, and dispose of unstable ladders or those in disrepair.
- To avoid having workers stand on the ladder top and top step, place a "dunce cap" over the top, or use rails or wood panels as a barrier for stepping in this area.
- Use aerial lifts when feasible.
- Use a checklist to inspect all ladders daily.

Back injury and other musculoskeletal injuries were discussed in most of the focus group sessions. Managers recognized that back injury resulted in work time lost and light duty assignments. Strategies used by companies included:

- Educate workers about how to take care of their back and to treat strains before they become a serious injury. Some participants used training programs that included instruction by a chiropractor or physical therapist.
- Use buckets and hand carriers with wheels in place of tool belts to reduce the load on the back.

Energized work and failure to lock-out/tag-out were serious concerns mentioned by respondents. Strategies to control or reduce electrical events included:

- Do not work on an energized circuit unless necessary. Management commitment and enforcement of a company's hotwork policy is key to working hot only when necessary.
- Educate the customer about issues around energized work. Work with the customer to establish policies that are safe for everyone.
- Have two independent people check to make sure all power sources are shut off.
- Never walk away from a hot panel. Secure the hot panel with set screws, or restrict the area to qualified persons only.

- Stock a variety of locks in the electrician's toolbox for locking out different types of power sources (such as lines and boxes).

Injuries to the eyes, face and hands were brought up as concerns in the focus groups. Some of the strategies for reducing eye injuries included:

- Label power tools with the words "Eye Protection Required" so that the user would be reminded to wear their safety glasses with each use.
- One company felt it was easier to buy large quantities of inexpensive safety glasses, and replace them as often as needed. Another company felt that buying nice, streamlined stylish glasses that come in a kit with a belt pack was needed to encourage electricians to wear the glasses.

Poor housekeeping was recognized as a safety hazard in several groups. It can be difficult to keep a clean work area on construction sites that have multiple trades using the same space.

- It was expressed by one manager that when you go about keeping a clean worksite, a person may be organizing their mind at the same time, planning, thinking, and doing things efficiently.
- One participant recalled the "Board of Shame," a tactic used by a general contractor to promote housekeeping. Polaroid photos of messes were taken and posted on a board for everyone to see. No one wanted their mess featured on the board; initially there were tons of pictures on the board, but as people starting keeping their areas neat, the photos became more rare.
- Garbage bins, dumpsters, and recycling cans need to be readily available throughout the site and emptied frequently to promote housekeeping.
- One electrician mentioned using a caddy box on their teacart to put scrap into as they completed their work.

In the context of discussing the hazards and injuries listed above, topics such as employee training, incentive programs, hazard analysis, worker involvement, safety rule enforcement, and management commitment were discussed. Highlights of these subjects include:

- Safety meetings are a common venue for safety training. Journeymen mentioned that when safety training incorporates actual safety issues that are current on the job site for that week, it makes everyone more aware and adds to the overall safety of the job.
- At one company, twice a month the foreman picks one other person to walk through a job. They look specifically for things that could be a safety hazard. They write the hazards down, and when they go over safety issues in their regular meetings, they include these site-specific hazards that the foreman and worker has found.
- Disciplinary procedures can be used to deal with safety violations and sets the tone for safety on a jobsite.
- Without the support of top management, integrating safety into the work is much more difficult.

It should be stressed that the ideas generated during the focus groups were solutions that the participants perceived to be successful. All companies are different, and there is variation in the kinds of work performed by electrical contractors. It is hoped that some of these strategies will appeal to other companies and that they may try them with some success.

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APPENDIX A

IDENTIFYING ELECTRICAL CONTRACTORS

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IDENDIFYING ELECTRICAL CONTRACTORS

Before we could begin the focus groups, we needed to identify the electrical contractors in Washington State. To be eligible for participation companies had to have an active Uniform Business Identifier (UBI) with the Employment Security Department (ESD) in at least two quarters of the year 2001 (3rd quarter 2001 was the latest available data at the time of the sample draw). Initially there were 1,969 companies that comprised the Electrical Contractors Industry. However, to be eligible for the study, companies had to meet the following criteria:

- Have three or more employees in 2001, and
- Have been classified in ESD's Standard Industrial Classification (SIC) code 173 ('electrical wiring in buildings').

After applying these two criteria, there were 959 electrical contracting companies eligible for the study. Because we were interested primarily in commercial and residential electrical work, including electrical wiring, hook-up and installation activities, we applied one final inclusion criterion using the Washington Department of Labor and Industries' (L&I) Risk Classification system. Companies were included in the sample if they had reported hours worked in any of the following Risk Classes:

- 0601-00 Electrical wiring in buildings and electrical wiring, not otherwise classified.
- 0601-07 Electrical machinery and auxiliary apparatus installation and repair, including incidental wiring.
- 0601-15 Television cable installation in buildings by contractor, including drop line connection (pole to house hook-up).
- 0608-01 Electrical alarm system including smoke alarms – includes installation, service, or repair.
- 0608-02 Intercom or audio call box – includes installation, service or repair.
- 0608-04 Telephone equipment and/or building prewire by contractor – includes installation, service, or repair.

After this criterion was applied, there were 774 electrical contracting companies that were eligible for the study.

APPENDIX B

CONTACT CALL LISTS

APPENDIX B
CONTACT CALL LISTS

The independent research group telephoned potential participants from contact lists. Two different lists were obtained for company managers. The contact list for company managers/NECA members was obtained from the Washington NECA chapters' web sites (there are 111 Washington NECA companies). In addition, the NECA safety committee provided names and phone numbers for the 11 companies that have representatives that serve on the NECA safety committee. The contact list for the non-affiliated managers was obtained from the L&I database (i.e., from the 774 companies eligible for the study, minus the NECA companies).

The contact list for journeyman electricians was obtained from L&I's Specialty Compliance Division, which licenses journeyman electricians in Washington State. Certified journeymen are required to renew their certification every three years. To ensure that we had the most recent addresses, we restricted our sample to include only those journeymen that had renewed their certification/license within the past year -- a total of 3,699 certified journeymen. From this list, we randomly selected 101 names/addresses from Seattle, 141 from Spokane County, and 101 from the remaining cities in the state. We attached telephone numbers to the sample of names/addresses by looking up the information on the Qwestdex website. Certified journeymen for whom there was no known phone number were excluded from the contact list.

The contact list for apprentices was developed with the assistance of the Joint Apprenticeship Training Committee (JATC) training centers, as well as the non-union training centers in Washington State. All of the training centers in the state were contacted and asked to post flyers at their facilities. The flyers announced the upcoming focus group sessions, provided general information about the topic and what would be expected if they participated. Potential participants were instructed to list their name and phone number on a sheet of paper. The training centers then faxed the list to the survey research firm for screening and recruitment.

The contact list for the electrician training center directors was developed with the assistance of L&I's Specialty Compliance Division. This division holds a list of all electrical apprenticeship training centers in Washington State. There are a total of 10 training centers, including union and non-union training centers. All 10 were included in the contact list.

APPENDIX C

SCREENING AND RECRUITMENT OF FOCUS GROUP PARTICIPANTS

APPENDIX C
SCREENING AND RECRUITMENT OF FOCUS GROUP PARTICIPANTS

Manager Groups

We targeted the following group composition for company managers (Table A1):

Table A1. Managers' focus group composition

Company Size	Target # of Participants
3 to 10 employees	3
11 to 49 employees	4
50+ employees	5

Up to 12 participants were recruited (one per company) for each focus group session, with the assumption that a few would cancel leaving a group size of about 10 participants. To qualify for the focus group sessions, participants had to meet the following criteria.

Criteria for Managers Focus Groups

- Must provide electrical contracting services in Washington State.
- Must be an owner or person responsible for safety and health.
- Company must/must not be a member of NECA -- recruited 12, each group.
- Must have at least 1 year on the job experience.
- Must work "low voltage" (600 volts or less).
- Must do residential or commercial electrical work.
- Must have a clear opinion about occupational safety, and articulate it to the recruiter.

Worker Groups

A screening questionnaire was developed and administered to potential journeyman electricians and apprentices. We had a target goal of recruiting 4 apprentices and 8 journeymen for each group. Apprentices needed to have been enrolled in the apprenticeship program for 2 years in order to participation. We established the following criteria for journeymen (Table A2):

Table A2. Journeymen participation.

Journeymen were sought in the following categories:	Target # of Participants
Experience	
2 to 5 years of experience	4
6 to 10 years of experience	4
Over 10 years of experience	4
Employer Size	
3 to 10 employees	3
11 to 49 employees	4
50+ employees	5
Employer Safety Culture	
Employer has good safety practices	7

Criteria for Workers Focus Groups:

- Must work in Washington State.
- Must do residential or commercial electrical work.
- Must do low voltage electrical work (600 volts or less).
- Must have at least two years of on-the-job electrical experience.
- Must work for a company that employed 3 or more employees.
- Must (be/not be) a member of a Washington IBEW chapter – Recruit 12, each group
- Must have some concern about safety on the job.
- Must have a clear opinion about a safety issue, and articulate it to the recruiter.

Training Center Director Group

For recruiting training center directors, all 10 training center directors were eligible for the telefocus group session. For training center directors that could not participate in the telefocus group session, a representative was selected to participate in their place.

Recruitment Screening Questionnaires

Copies of the recruitment screens for managers, workers, and training center representatives are included in the following pages of this Appendix C

APPENDIX C
MANAGER RECRUITMENT SCREENER

GROUP 1 In-person, (Seattle) NECA Company Managers
GROUP 4 Telefocus, Statewide, Non-Union Company Managers
GROUP 6 Telefocus, Statewide, Non-Union Company Managers

(Brief introduction)

1. First, let me just verify, does your organization currently provide electrical contracting services in Washington State?

- ☐ Yes
- ☐ No **TERMINATE**

2. Does your company have a person that manages occupational safety and health?

- ☐ Yes
- ☐ No

(If yes: May I speak with that person? Yes/No. If company has a safety manager, ask for that person. If they do not, ask to speak with the owner. – Repeat introduction.)

3. What is your exact title?

_____

PROBE: Must be owner OR person who manages safety and health.

4. Is your company a member of NECA?

- ☐ Yes **RECRUIT 12 (Group 1)**
- ☐ No **RECRUIT 12 each (Group 4, Group 6)**

5. How many years of on-the-job experience, in total have you had where you were responsible for managing safety and health?

___ Enter number of years experience

- ☐ Under 1 year **TERMINATE**
- ☐ >=1 years **RECRUIT 12**

6. [For non-union companies ONLY] Do your employees belong to a union?

- ☐ *Yes* ***TERMINATE***
- ☐ *No* ***RECURIT 12, each non-union manager group***

I just have two additional questions that I need to ask you. It will only take a minute.

7. Would you say you…

- ☐ Primarily work on Low Voltage jobs **CONTINUE**
- ☐ Primarily work on High Voltage jobs **HOLD**
- ☐ Work ONLY on Low Voltage jobs **CONTINUE**
- ☐ Work ONLY on High Voltage jobs **TERMINATE**
- ☐ Work on both equally? **CONTINUE**

8. Do you do residential, commercial or marine work? **(CHECK ALL THAT APPLY)**

- ☐ Residential
- ☐ Commercial
- ☐ Marine **TERMINATE IF MARINE IS ONLY ONE MENTIONED.**

9. The purpose of the focus group is to understand successful safety and health practices in your industry. Our goal is to identify safety and health concerns in the electrical contractor industry and to hear about strategies and ideas to address those concerns. Do you think you would have something to contribute? (any experiences or management strategies that you would like to share or experiences others might learn from)?

_____

_____

RESPONDENT MUST HAVE A CLEAR OPINION ON ANY OCCUPATIONAL SAFETY AND HEALTH ISSUE.

Additional Recruiting Quota:

From SAMPLE (i.e., contact list) - Number of Employee's

3 to 10 employees	**RECRUIT 3**
11 to 49 employees	**RECRUIT 4**
50+ employees	**RECRUIT 5**

_____

AT ANY TIME … RECRUITER REFER TO 'QUESTION AND ANSWER' FACT SHEET IF RESPODNENT HAS ANY QUESTIONS.

APPENDIX C
WORKER RECRUITMENT SCREENER

GROUP 2 Telefocus/In Person (Seattle) Union Workers
GROUP 5 In-person, (Spokane) Non-Union Workers

(Brief introduction)

1. First, let me just verify, do you provide electrical services in Washington State?
   - ☐ Yes **CONTINUE**
   - ☐ No **THANK AND TERMINATE**

2. Do you do residential, commercial or marine work? **(CHECK ALL THAT APPLY)**
   - ☐ Residential
   - ☐ Commercial
   - ☐ Marine **TERMINATE IF MARINE IS ONLY ONE MENTIONED.**

3. Would you say you
   - ☐ Primarily work on Low Voltage jobs **CONTINUE**
   - ☐ Primarily work on High Voltage jobs **HOLD**
   - ☐ Work ONLY on Low Voltage jobs **CONTINUE**
   - ☐ Work ONLY on High Voltage jobs **TERMINATE**
   - ☐ Work on both equally? **CONTINUE**

4. Are you an Electrical Apprentice or Certified Journeyman Electrical Contractor?
   - ☐ Apprentice **CONTINUE RECRUIT 4 per group**
   - ☐ Journeyman Electrical Contractor **CONTINUE RECRUIT 8 per group**
   - ☐ Neither **TERMINATE**

5. How many years of on-the-job experience, in total, do you have as a Journeyman Electrical Contractor or apprentice?
   - ☐ Under 2 years **TERMINATE**
   - ☐ 2 to 5 years **RECRUIT 4**
   - ☐ 6 to 10 years **RECRUIT 4**
   - ☐ 10 or more years **RECRUIT 4**

6. How many employees work for the company you work for?
   - ☐ 2 or fewer **TERMINATE**
   - ☐ 3 to 10 **RECRUIT 3**
   - ☐ 11 to 49 **RECRUIT 4**
   - ☐ 50+ **RECRUIT 5**

7. Are you a member of a union?
   - ☐ Yes **GROUP 2**
   - ☐ No **GROUP 5**

8. Is the company you work for a union shop?
   - ☐ Yes
   - ☐ No **INFO ONLY**

9. Does your company have a safety committee?
   - ☐ Yes **CONTINUE**
   - ☐ No **SKIP TO 11**

10. Are you a member of your company's safety committee?
   - ☐ Yes
   - ☐ No **INFO ONLY**

11. Have you worked for a company you feel has exceptionally good safety practices?
   - ☐ Yes **RECRUIT 7 or 8 per group**
   - ☐ No

   Has exceptionally poor safety practices **HOLD- Not sure we want these**
   Or neither, my employers have always fell somewhere in the middle.

12. When it comes to safety while on the job, please tell me how concerned you are with safety issues? Would you say you are:
   - ☐ Very concerned with Safety **CONTINUE**
   - ☐ Somewhat concerned with Safety **CONTINUE**
   - ☐ Somewhat unconcerned with Safety **TERMINATE**
   - ☐ Not at all concerned with Safety **TERMINATE**

13. The purpose of the focus group is to understand successful safety and health practices in your industry. Our goal is to identify safety and health concerns in the Electrical Contracting industry and to hear about strategies and ideas to address those concerns. Do you think you would have something to contribute? (any experiences or strategies that you would like to share or experiences that others might learn from)? Please give me an example of a safety issue facing your industry that you feel strongly about. It could be an example of something your or another organization is doing well, or an improvement that needs to be made?

_____

_____

RESPONDENT MUST HAVE A CLEAR OPINION ON ANY SAFETY ISSUE.

APPENDIX C
TRAINING CENTER RECRUITMENT SCREENER

Group 3 Telefocus, Statewide, Training Center Representatives

(Brief introduction)

First, I need to confirm, are you the training director or manager for your training center?

- ☐ Yes **Continue**
- ☐ No **Ask to speak with the Training Director or Manager**

We are assembling a discussion with 8 to10 professionals such as yourself to participate in our upcoming focus group. Your participation includes discussing your ideas about safety issues facing your industry with other members of your profession.

(Invitation made)

Can we count on your participation?

- ☐ Yes **CONTINUE**
- ☐ No **THANK and END CALL**

Great, I just need to get your contact information so I can send you a confirmation letter and instructions.

Thanks.

APPENDIX D

FOCUS GROUP DISCUSSION GUIDES

APPENDIX D
WORKER DISCUSSION GUIDE

Introduction
Moderator introduces self, unbiased third party, and then explains purpose of focus group.

Purpose of the Focus Group Sessions
We're conducting groups among electrical contractors across the state of Washington for the SHARP Program. As you may know, SHARP stands for the Safety and Health Assessment and Research for Prevention program. They are not involved in enforcement and/or claims issues, so that is definitely not our focus for today. We are here to learn from you what your primary occupational safety and health concerns are. We also want to find out whether any companies have come up with **interesting** or **unique** solutions to address these concerns. The goal is to develop educational materials that can be shared throughout the industry.

Ground Rules/Disclosures
People from the SHARP program may be listening.
Taping, audio only for the purposes of the few people involved in writing the report and/or education materials.
Use first names only for anonymity.
Can only hear one at a time; speak up at same level as I am.
We want your candid ideas, perceptions, and suggestions.
We don't identify individuals when we quote ideas, but present the information in a combined form.

Respondent Introductions
First name?
What are the main types of electrical work your company does?
What is your position there?
How long have you been employed there?

Background/Warm-up Questions
What does a safe and healthy workplace mean to you?

What are the top safety and health concerns you see in the industry?
Note: examples could include things like communication, training, commitment, etc., in addition to work-related hazards, injuries, or illnesses.

[Moderator writes the top concerns called out from the group onto a wipe board]

Discussion of Top Safety and Health Concerns:

From the concerns written down on the easel, each person is asked to privately write down their top three concerns. The moderator identifies the top three concerns of the group by having each person refer to their private list and then "vote" as each topic is called out. Three top concerns are identified and addressed separately, in turn, using the following general question format:

General Question Format
[Example: Ladder Hazards]

1. How do the injuries/problems occur? [Example: regarding ladder hazards]

2. What do contractors do to address these?

(WRITE ON PAPER a Best Practice related to [Ladder Hazards]. Can you give examples of any solutions/"best practices" that would help to prevent them from occurring?

3. Would you say that this practice is standard in the industry or is it a unique/novel approach?
(IF ANY UNIQUE BEST PRACTICES MENTIONED, ASK:)

4. How did you decide to create or adopt this "best practice"?

5. What did it take to put those strategies in place?
   - What was the process?
   - What were the pitfalls/barriers to acceptance?
   - How did you overcome them to get a successful practice in place?

6. Do you think this "best practice" has made any difference? If so, how?

7. How has it paid off? (Or has it?)

8. What would it take for another company to adopt this practice? Do you think other companies would be likely to adopt it?

9. Let's just brainstorm for a minute, and think about what "best practice" you would devise to promote health and safety with respect to…

10. How would you implement that plan or practice?

Rush Jobs/Special Circumstances

When a general contractor puts a "rush" on the job, what, if anything, can you do to ensure the safety of your electricians?

What other circumstances might cause your electricians to divert from their regular health and safety practices?

How would you overcome those circumstances or situations to assure that the electricians remain safe in the work environment?

Review/Missing Anything/Wrap-up

Let's just look back at all of the health and safety concerns that we discussed and the best practices you have described.

We're interested in learning about successful and innovative approaches to protecting the health and safety of electrical contractors. SHARP wants to put something together that can be shared throughout the industry to promote any practices that seem to be working.

- Did we miss anything? (Reporting mechanisms?)
- Did these remind you of any other concerns or best practices that we did not mention here? If so, what are they?

If someone has an idea that we would like to hear more about, may we contact you again—maybe put you in touch with SHARP?

THANK AND CLOSE

APPENDIX D
MANAGER DISCUSSION GUIDE

Introduction
(Moderator introduces self, unbiased third party, and then explains:)

Purpose of the Focus Group Sessions
We're conducting groups among electrical contractors across the state of Washington for the SHARP program. As you may know, SHARP stands for Safety and Health Assessment and Research for Prevention program. They are not involved in enforcement and/or claims issues, so that is definitely not our focus for today. We are here to learn from you what your primary occupational safety and health concerns are. We also want to find out whether any companies have come up with **interesting** or **unique** solutions to address these concerns. The goal is to develop educational materials that can be shared throughout the industry.

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Use first names only for anonymity.
Can only hear one at a time; speak up at same level as I am.
We want your candid ideas, perceptions, and suggestions.
We don't identify individuals when we quote ideas, but present the information in a combined form.

Respondent Introductions
First name?
What are the main types of electrical work your company does?
What is your position there?
How long have you been employed there?

Background/Warm-up Questions
What does a safe and healthy workplace mean to you?

What are the top safety and health concerns you see in the industry?
Note: examples could include things like communication, training, commitment, etc., in addition to work-related hazards, injuries, or illnesses.

[Moderator writes the top concerns called out from the group onto a wipe board]

Discussion of Top Safety and Health Concerns

From the concerns written down on the easel, each person is asked to privately write down their top three concerns. The moderator identifies the top three concerns of the group by having each person refer to their private list and then "vote" as each topic is called out. Three top concerns are identified and addressed separately, in turn using the following general question format:

General Question Format
[Example: Ladder Hazards]

1. What are the/your safety and health concerns? [Example: regarding Ladder Hazards]

2. How do injuries/problems occur?

3. What do contractors do to address these?

(WRITE ON PAPER a solution related to [Ladder Hazards]. Can you give examples of any "best practices" that would help to prevent them from occurring?)

4. Would you say that this practice is standard in the industry or is it a unique/novel approach? (IF ANY UNIQUE SOLUTIONS/BEST PRACTICES MENTIONED, ASK: How did you decide to adopt this "best practice?")

5. Do you think this solution/"best practice" has made any difference? How?

6. Let's just brainstorm for a minute, and think about a solution (or what best practice you would devise) that would promote health and safety with respect to…

7. How would you implement that plan or practice?

8. What do you think it would take for electricians (journeymen?) to adopt this practice (or the brainstorm solution)?

9. Can you think of any barriers to acceptance of either the "best practice" or the brainstorm ideas?

10. What would it take for others to adopt this practice? Do you think other companies would be likely to adopt it?

"Best Practices" In Depth

How did you decide to create or adopt this "best practice?"

What did it take to put those strategies in place?

- What was the process?

- What were the pitfalls/barriers to acceptance?
- How did you overcome them to get a successful practice in place?

How has it paid off? (Or has it?)

Do you think this "best practice" has made any difference? If so, how significant?

What would it take for another company to adopt this practice?

Rush Jobs/Special Circumstances

When a general contractor puts a "rush" on the job, what, if anything, can you do to ensure the safety of your electricians?

What other circumstances might cause your electricians to divert from their regular health and safety practices?

How would you overcome those circumstances or situations to assure that the electricians remain safe in the work environment?

Review/Missing Anything/Wrap-up

Let's just look back at all of the health and safety concerns that we discussed and the best practices you have described.

We're interested in learning about successful and innovative approaches to protecting the health and safety of electrical contractors. SHARP wants to put something together that can be shared throughout the industry to promote any practices that seem to be working.

- Did we miss anything? (Reporting mechanisms?)
- Did these remind you of any other concerns or best practices that we did not mention here? If so, what are they?

If someone has an idea that we would like to hear more about, may we contact you again—maybe put you in touch with SHARP?

THANK AND CLOSE