

# **Ergonomics: Effective Workplace Practices and Programs**

## **Transcripts of Presentations**

**From the Conference Held January 8 and 9, 1997, Chicago Illinois**

**Conference Sponsored by:  
the National Institute for Occupational Safety and Health (NIOSH)  
and the Occupational Safety and Health Administration (OSHA)**

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***At the conference, over 1,000 attendees shared practical experiences in all aspects of workplace ergonomics programs. Dozens of presenters described real-world efforts aimed at preventing work-related musculoskeletal disorders. Each conference session focused on a specific industry or an important ergonomics program element.***

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The conference co-coordinators were Chris Gjessing (NIOSH) and Margo Daniel (OSHA). Other members of the conference planning team included Cherie Estill (NIOSH), Larry Fine (NIOSH), Sean Gallagher (NIOSH), Sandy Kasper (NIOSH), Mark Kitzmiller (OSHA), Jim McGlothlin (NIOSH), Matt Miller (NIOSH), Brian Moyer (NIOSH), Gary Orr (OSHA), Vern Putz-Anderson (NIOSH), Jennifer Silk (OSHA), Frankie Smith (NIOSH), and the meeting planners of Visions USA, Inc., Atlanta, Georgia.

# Ergonomics: Effective Workplace Practices and Programs

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# Welcome Session

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Sandy Taylor, Deputy Regional Administrator, OSHA Region V

MS. TAYLOR: Welcome to the conference.

I'm Sandy Taylor. I'm the Deputy Regional Administrator for the Chicago Regional Office of OSHA.

I was asked to give the welcome, the warm welcome to this group, being the host city. When I heard that, I kind of cringed, thinking January, Chicago. I can give a nice welcome, but to try and make it warm and make you feel warm, I don't know. And I was a little bit more worried when Monday the weather was about 10 degrees, about 20 below wind chill. Today we've warmed things up for you. It's going to be 30 degrees, I understand no wind chill, no snow today. So that's about as warm as we can get for the winter.

I'd like to welcome you to this conference, Ergonomics: Effective Workplace Practice and Programs. We are pleased to host such a distinguished group for such an important event. This is an unprecedented gathering of leaders in the field of ergonomics.

We are joined today by business, labor, management, government, and academia. NIOSH and OSHA are pleased to sponsor this first ever conference of this kind, one where a tripartite approach was used throughout the entire planning process.

This conference will provide a forum to share practical experience and workplace programs designed to reduce and prevent work-related musculoskeletal disorders.

We'll hear from professionals in businesses throughout the country that have instituted a variety of innovative and effective ergonomics programs that have cut rates of musculoskeletal disorders, reduced associated absenteeism, turnover, and lost time, saved workers comp costs, and improved productivity and product quality.

This morning we will start out with a welcome panel, and it will be followed immediately by a keynote panel. There will not be any formal break until 10:15, even though we will be changing panels up here at some point. So please realize that, that we will not be having a formal break until 10:15.

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Linda Rosenstock, Director NIOSH

MS. TAYLOR: At this time, I would like to introduce the first member of our distinguished welcoming panel.

Dr. Linda Rosenstock, who is currently the director of NIOSH and professor of the departments of medicine and environmental health with the University of Washington. Prior to becoming NIOSH's director, Dr. Rosenstock chaired the United Auto Workers, General Motors, Occupational Health Advisory Board.

Dr. Rosenstock has been active internationally in teaching and research in occupational health and has served as an advisor to the World Health Organization.

Please join me in welcoming Dr. Rosenstock.

DR. ROSENSTOCK: Thank you, Sandy.

For those of you standing in the back who would prefer to sit, there are actually seats scattered about in the front rows here, and we welcome you to come forward now.

It is great to be here. When we started planning this conference, there were some real concerns voiced that it would be very hard to get an active turnout. We were thinking then about 200 to maybe 500 people in Chicago in January, and I'm delighted to say we proved the skeptics wrong when we started to turn away interested individuals about a month ago as we exceeded our capacity of 1000.

So welcome. We are glad you're here.

One of the things I'd first like to do is again give recognition to our conference cosponsors. This has been a collaborative effort from the get go. It has certainly been an exemplary one of OSHA and NIOSH working together and, in addition, we'd like to thank the many individuals and organizations who made this possible.

I'd also like to give special recognition to the many individuals within NIOSH who have worked so hard on the issues of ergonomics in general and specifically in planning this conference and particularly to Larry Fine, who wears many hats in NIOSH but has done a superb job coordinating our ergonomics effort throughout the Institute.

I'm going to talk about roads a little bit in the next few minutes. The long and winding road is one way to talk about dealing with ergonomics issues. Some folks may be talking about high and low roads. I'll try to avoid that characterization for the moment.

I think one of the important things to note from the perspective of an Institute whose primary mission is to do research in this field is that we've been accumulating research over two decades that identifies the relation between work factors and upper extremity, low back, and musculoskeletal disorders.

As the evidence has accumulated, telling us more about the magnitude and scope of these problems, the controversy associated with this area has been raging on.

Part of the controversy has been how big a problem is this and how much of it is work related? I think the important role for all of us here who have been active in our various capacities in the organizations we work for, is that we recognize there may still be fine points to the debate about the exact scope and the exact relation to certain factors but at the same time we know the problem is a large one, and it's a large one both in health costs and economic costs, whatever numbers you use.

The numbers vary because our statistics are not perfect and often are systematic underestimates. But whatever statistics you use, the problem is large. For example, if you use a case-based example of workers' compensation claims for upper extremity musculoskeletal disorders, each cost about \$20,000 using California data. The Bureau of Labor Statistics data point to several hundred thousands of cases of upper extremity musculoskeletal disorders. Certainly a far larger number of work-related low back disorders occur annually using National Health Interview Survey data. Overall, health-related costs are somewhere between a low estimate of approximately \$2 billion to estimates of \$11 billion or more.

And related costs -- lost productivity, other kinds of associated lost wages and the like, really start getting to the hundreds of billions of dollars.

Now, despite the debate going on, we know that workers and employers have recognized the scope of this problem for a long time, and they're trying to do something about it, and we're here to share the stories and success stories about what's being done.

Let me just share some recently reported data which looks at reports of relatively large companies, earning \$500 million or more annually in revenues, and you get a sense of two things:

One is that most of these companies are identifying that even in a one-year period the problem is increasing, and we've certainly seen this trend over many years, in the last ten or so, when we've been tracking it.

The other thing is that companies are doing something about it and that's partly why we're here. Large percentages of companies are already working to modify jobs and equipment, analyzing work stations and jobs, investing in new equipment -- as we'll learn about, with the hope of reducing this serious problem -- as well as training workers and trying to get appropriate medical

care.

These numbers really speak to the fact that whatever the controversy, there is a need to move past it and move on to solving this problem.

NIOSH's own experience is consistent with what we've seen nationally and actually globally in terms of a recognition of increasing reporting and risks for musculoskeletal disorders. Just looking at our 1-800 number alone we are now at over 3,000 inquiries a year related to musculoskeletal disorders with the breakdown as shown here.

As you know, we have a Health Hazard Evaluation Program that can come in at the request of employers or employees, or other pertinent interested parties, and we have several hundred of those a year that we undertake. We're getting about 10 to 15 requests a year that are directly related to musculoskeletal problems.

Let me give you an example of just one.

Several years ago we were requested both by the company and by the workers to look at a problem area in a Harley Davidson plant. They had a problem in one particular department where they had both high workers' compensation costs and high injury rates. It was a very high skilled department, and they were having trouble keeping a critical process staffed because of musculoskeletal problems.

NIOSH came in and made some recommendations. They were implemented, and the bottom line, and I think we'll hear this bottom line repeatedly in the next few days, is that the health outcomes were improved, the rate of injuries decreased, and the economics of the situation improved.

These are win-win situations. We can make workers healthier and we can make productivity increase when we work together to apply these kinds of solutions.

Let me tell you a little bit more about what NIOSH is doing, and you've seen some of this in your packet. We expect in the next two months to finalize a comprehensive review of the science and scope of musculoskeletal disorders that has been extensively peer reviewed by some of you in the audience and many others.

We have provided for you in your packet a primer which is in draft final form, based on our own experience within NIOSH, doing these kinds of evaluations that are really targeted to those working or involved in small and medium businesses. The primer will provide some tools about how to implement an effective ergonomics program.

We continue to do research. Another document in your packet identifies about 80 research projects that are either being done in house or funded by NIOSH, specifically related to

musculoskeletal problems. One such research project conducted in house identified some issues that are relevant in terms of alternative keyboard and exploratory studies actually showing for short duration that alternative designs did not have the intended benefit of reducing discomfort.

This is exploratory because it doesn't mean that when used over a longer period of time or in some populations alternative keyboards would not be helpful, but it's this kind of research that we need to keep doing, so that as we implement these changes we can evaluate whether or not they're effective.

Where are we going? Let me just identify an activity that many of you helped us with. NIOSH and its many partners, over 500 individuals and organizations, identified recently the top 21 priorities for the nation for occupational safety and health research.

Relevant to ergonomics let me identify two of the eight priority areas in the Disease and Injury category as ones we'll be dealing with here -- low back disorders and upper extremity disorders. Other priority areas are very directly related to ergonomics, and we are working with our partners in implementing this agenda to try to leverage resources, activities, and attention to these areas with the goal that increasing research and especially prevention research will result in reduction of illnesses and injuries.

The endorsement of these as priority areas has been extraordinarily strong. This gives you a flavor of the consensus for just one such category.

Five out of five expert working groups rated upper extremity disorders as a top priority. So did our Corporate Liaison Committee Survey, as did a survey of International Occupational Safety and Health Institute Directors, and many, many others.

The same high endorsement was provided as well for low back disorders. We all recognize this problem and recognize the work that needs to be done.

In addition, we know that once we've identified these priority areas -- and I give you here an example of low back disorders alone -- that we'll be able to work with others who are doing work within economic sectors.

Those who have done very effective work, for example, in agriculture or mining or construction or the service industry, know that of these 21 priorities, no surprise, musculoskeletal disorders will be a priority within almost all employment sector research. Such focus will help the research and prevention actions accordingly.

So, in summary of where we are and where we're going, I think the message you'll hear probably undoubtedly many times this morning is this is a large problem, no matter how you count it, and even if the numbers vary.

Yes, there are research gaps and certainly our role is to continue to fill those as fast as we can, but we know enough to take effective preventive action now, and we shouldn't be waiting for more research to take those steps. That's what this conference is about.

Seneca, a Roman philosopher and politician -- probably in reverse order -- talked about the "rough roads that lead to the heights of greatness." If this is at all true in the field of ergonomics, perhaps we're on our way to greatness now.

We are pleased to have you here. I hope we will all look back on this conference as a watershed when we started to change the way we talked about and solved this enormous problem in our country.

Thank you.

MS. TAYLOR: Thank you, Dr. Rosenstock.

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Greg Watchman, Deputy Assistant Secretary for OSHA

MS. TAYLOR: Next, I'd like to introduce Gregory Watchman, who is currently the Deputy Assistant Secretary for OSHA. As some of you may have heard, Joe Dear has accepted a position outside of the Agency. This is his last week with the Agency. So as of next week, Greg Watchman will be our Acting Assistant Secretary. He was asked by Secretary Reich to fill that post temporarily.

As Deputy Assistant Secretary, Mr. Watchman has been responsible for regulatory, policy, safety, and health standards, legislative, and interagency affairs. Previously, Mr. Watchman served as chief labor counsel to the Subcommittee on Labor with the United States Senate Committee on Labor and Human Resources.

Please welcome Mr. Watchman.

MR. WATCHMAN: Thank you, Sandy.

Good morning. It's great to see so many people here. I was really disappointed that we only had 1000 people coming to this conference in the dead of winter in Chicago, Illinois. It is wonderful to see all of you here, and I know that you share our commitment to try to address the problem of musculoskeletal disorders.

First, I do want to express Joe Dear's deep regrets at not being here. As Sandy has told you, Joe received a wonderful offer from the Governor-Elect of Washington State to be that governor's chief of staff. He's the first person brought on board, and it gives Joe and his family an

opportunity to move back to their home in Washington State.

He is, though, very committed to the issue of ergonomics, was very strongly behind this conference, and we will continue his efforts as we move forward in the next few months. This conference reflects the best of President Clinton's government reinvention effort. It reflects a partnership between workers and employers, safety and health professionals and academics, and the government, to work together to find solutions to this very serious workplace health problem.

I want to thank Linda and the NIOSH staff that have helped with this conference, as well as the OSHA staff -- in particular Margo Daniel, Gary Orr, Jennifer Silk, and Mark Kitzmiller -- for all of their many hours of effort to put this together.

I also want to thank the cosponsors, including the National Safety Council, ASSE, AIHA, and many others, as Linda noted, who helped to put this event together.

Mostly, I want to thank you all as participants for taking time out of your busy schedules. I'm sure you have a lot going on at your jobs, coming back from the holidays, and trying to get back to work. This is an important issue, and I really appreciate you coming and recognizing the importance of it.

The conference also reflects the President's and the Vice President's recognition that government doesn't always have all the answers to the problems of our society. The President and the Vice President recognize that there are times when government should listen rather than telling people exactly what to do.

This is one of those times, when we are here for the next two days, to hear what all of you are doing, to recognize the problem of musculoskeletal disorders in the workplace and to find effective solutions to it.

We are going to hear a wide range of case studies over the next two days. We are going to hear case studies ranging from assembling automobiles to disassembling chickens, from handling patients to handling packages; from UAW to University of California, from US West to Unite, from 3M to GM.

We are going to hear a very broad range of studies focusing on workplaces, small and large, in many different industries, many different industrial processes, and many different occupations. I'm very excited by this turnout of 1,000 people for this conference. It certainly reflects the commitment that all of you have to this issue, but it also has a very serious side to it. It reflects the nature of the problem and the scope of the problem.

We are here because this is America's biggest workplace health problem.

We are here because every year hundreds of thousands of American workers suffer repetitive stress injuries and other types of musculoskeletal disorders. Currently, these account for one in every four lost worktime injuries on the job. That's a staggering number.

These are conditions that arise from a mismatch between the physical demands of a job and the physical limitations of the human body. As we know, there are major risk factors, such as repetitive motion, force, awkward posture, and heavy lifting that are the primary causes of musculoskeletal disorders.

Now, how serious is this problem? In the last Congress, it was said on the House floor that no one ever died from ergonomics, and that may be true. But we also know that when workers suffer from musculoskeletal disorders, they have severe pain, they lose time at work, they often have extended disability and sometimes even permanent disability.

It doesn't just prevent a worker from doing his or her job. It also affects their ability to perform basic life functions, like driving, writing, or brushing their teeth, or even lifting a child.

Let me give you an example.

Betty was a worker at a chicken processing plant in Magnolia, Mississippi. She spent seven years separating chicken filets from the bone. She performed this task 18 times a minute for hours at a time without a break. She complained about the pain in her arms and her wrists, but her supervisors took no action to help her situation.

Ultimately, she was diagnosed as having torn rotator cuffs. She had to undergo two surgeries, and she was transferred to light duty work responsibilities, and ultimately terminated from her job.

As I said, there are hundreds of thousands of American workers who are suffering these kinds of consequences every single year in this country, and I'm glad to see you all here, to take responsibility, to try to do something about this problem.

We are also here because these disorders are causing a tremendous cost to our society and to our economy. We estimate that musculoskeletal disorders cost up to \$20 billion a year just in workers' compensation costs alone. That's one in every three dollars of workers' compensation costs.

We estimate several times that figure for indirect expenses such as employee turnover, training, et cetera.

So we know this is a problem in many different industries, many different processes, many different occupations. But the most important reason we are here for the next two days is that we know that most of these incidents are preventable.



We are here because all of you -- corporate representatives, worker representatives, safety and health professionals, government workers, and academics -- are deeply concerned about this problem. We are here because you've learned through your own experiences that there are effective solutions that are economically and technologically feasible, that can often be implemented at low cost and that, in many cases, actually save employers money while, at the same time, achieving the goal of reducing repetitive stress injuries and other musculoskeletal disorders.

I look forward to hearing the stories in the next two days and to moving forward with you as we work to find these solutions.

Let me take a minute to talk about OSHA's own response to this problem.

The President's May 1995 New OSHA Initiative includes three themes. One is to offer responsible employers a choice between partnership with the Agency and traditional enforcement.

A second theme is to instill common sense in our regulatory activities and our enforcement activities.

A third theme is to focus on results and improving worker safety and health, rather than red tape.

These themes are all reflected in this conference and in the Agency's response to the problem of musculoskeletal disorders.

First: For responsible employers, many of you are here today. For responsible employers who need help, we are offering outreach and education through events like this conference. Second: We are offering compliance assistance materials, such as the technical assistance manual we are currently putting together, and we will make that available on the Internet and through trade associations.

Third: Through targeted training grants we will help workers and employers learn more about the nature of this problem and the solutions that are available.

Fourth: We offer free consultation visits through our state- run consultation programs in all 50 states to help, small and medium-sized companies, deal with this problem.

On the second theme of common sense, we are reserving the regulatory and enforcement actions for areas in which the problem is the worst and where the solutions are known. We want to use consensus-based approaches to these activities whenever possible and develop rules that are flexible and are consistent with common sense.

Lastly, we are focusing on results. That's why we're here today and tomorrow, to hear the

effective solutions that you have developed in your own workplaces that are not only achieving real reductions in injury and illness in the workplace, but are also saving employers money. Again, I look forward very much to working with you, hearing these experiences over the next two days, and moving forward together with you to address this problem. Thank you.

MS. TAYLOR: Thank you.

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Peg Seminario, AFL-CIO

MS. TAYLOR: Next, I'd like to introduce Margaret, commonly known as Peg Seminario. She is the Director of the Occupational Safety & Health for the AFL-CIO, where she's been since 1977. Her responsibilities include handling their activities on safety and health and environmental matters.

Peg has worked extensively on a wide range of regulatory initiatives in OSHA and legislative initiatives on the Scientific Advisory Committee.

Please welcome Peg Seminario.

MS. SEMINARIO: Good morning. Thank you very much, Sandy.

I am happy to be here this morning on behalf of the AFL-CIO and the labor movement, to be part of this welcoming panel, to welcome all of you to this conference on Effective Workplace Practice and Programs for identifying and controlling ergonomic hazards.

Hank Lick, who is also on this panel, and myself, as members of NACOSH, the National Advisory Committee on Occupational Safety and Health, have been working with OSHA and NIOSH over the last number of months on this conference and providing advice and counsel on how it should be constructed and putting together a program that, with your help, will hopefully provide a base of information that will allow us to move forward on ergonomics problems in the workplace.

But, more importantly, I am very happy that so many of you are here. As you've heard, over 1000 people from business, from labor, from government, and from academia have come to participate in this conference, to share experiences, to learn from each other about the problems that we are facing with respect to ergonomics but, more importantly, the solutions that have been put in place to effectively deal with these hazards.

This is a very important meeting. As Sandy said, I have been with the AFL-CIO now 20 years, as hard as that is to believe, and I've been to a lot of NIOSH conferences, I've been to a lot of OSHA conferences and meetings. This, in my view, is perhaps the most important meeting, the most important conference that the government has called on workplace safety and health matters since OSHA and NIOSH began back in 1970.

As we heard from Linda and Greg, musculoskeletal disorders caused by work are, indeed, the most significant safety and health problems that we are facing today, causing serious injury to more than hundreds of thousands of workers every year, costing employers billions of dollars in workers' compensation costs. More importantly, causing workers tremendous pain, suffering, and disability.

The good news I think that we all have to focus on, however, is that, indeed, work is being done, has been done to address these problems. Employers are taking steps, in many cases in concert with their unions, in a joint effort, in identifying hazardous jobs, identifying workers who are at risk, instituting control measures, redesigning jobs, redesigning equipment and tools, and putting in place medical management for the early detection of these problems so disability doesn't occur.

There are training programs going on with workers involved in those efforts, where workers, employers, and unions are working jointly to address these problems.

So I think for this conference that what we should be focusing on is indeed those practices, what has been done to effectively deal with these problems, and this conference will provide a very important forum to do that.

This conference, hopefully, is important for another purpose. That is, indeed, to move the discussion and consideration about ergonomics, about work-related musculoskeletal disorders, out of the political arena and back to the safety and health arena where we can have a discussion, where we can have a debate about the issues that we are facing, and where we can come to agreement on solutions.

All of you who have worked on this issue, who are involved with this issue, are aware that ergonomics has been the subject of controversy and debate. Some in industry have questioned whether or not it is, indeed, a work-related problem.

Questions have been raised about the extent of the problem, whether there are indeed measures available to control the hazards, and that controversy has been played out in the political arena, most recently in the context of the 104th Congress.

For over a year there was a restriction in place, a rider on the OSHA appropriations measure, which prevented OSHA from moving forward and issuing proposed standards or issuing guidelines on ergonomic standards.

There were efforts made to broaden that prohibition, to prohibit the collection of data as well. As of October 1st, 1996, that prohibition was lifted. There no longer is a limitation on OSHA's ability to move forward on this issue. That does not mean, however, as we all know, that there is not continuing controversy around this particular issue.

But despite the controversy, what has not stopped are efforts of employers, efforts of unions,

efforts of safety and health professionals to move forward to address this issue.

What has not stopped are workers continuing to be exposed to the hazard and continuing to be put at risk.

We in the labor movement hope now, with the lifting of the rider on the OSHA appropriations measure, that we can get back to addressing the issue of ergonomics, addressing the issue of musculoskeletal disorders as a safety and health issue and not as a political issue.

That we can focus the discussion about measures to identify work-related musculoskeletal disorders and ergonomic hazards. That we can focus the discussion on effective measures to control these hazards.

This conference will help provide a forum to focus on the real problems and focus on real, effective solutions.

There is another conference which is being discussed and being planned now under the leadership of Hank Lick, by the American Automobile Manufacturers Association and the Center for Office Technology, to look at some of the science and policy issues around ergonomics. That conference is planned for later this year.

So, hopefully, with this conference, with that meeting, we will have forums where we can come together and talk about these problems. We can spend the next two days here learning from each other, listening to each other and use this as an opportunity to figure out how to move forward on this issue.

So I would again welcome everyone here and ask that we do spend the next two days listening to each other, learning from each other, and let's look at leaving this conference with a commitment, with a dedication, that 1997 will be the year that we in labor and management, we as a safety and health community, that we as a nation move forward together and make great strides to prevent workers from being hurt, disabled, and crippled by ergonomic hazards at work. Thank you very much.

MS. TAYLOR: Thank you, Peg

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Hank Lick, Ford Motor Company

MS. TAYLOR: Our final speaker on the Welcome Panel is Dr. Henry Lick, who is currently manager of Ford Motor Company's industrial hygiene department. He has in excess of 30 years experience, 28 of those years with Ford, in occupational health, safety, and environmental issues.

Dr. Lick has corporate and divisional responsibilities for domestic and foreign operations for

Ford. He was recently selected as Michigan's safety professional of the year for 1996 by the Michigan Safety Conference.

Please join me in welcoming Dr. Lick.

DR. LICK: Well, that's what happens when you accept the position of being the last speaker, a lot of your material gets used up, so you're going to hear some things that are repetitive, but Peg and I are here because we have a commitment to ergonomics.

We at NACOSH have looked at this issue and said, it's time for the rhetoric to stop, it's time for us to be health and safety professionals again. So if you wonder why Peg and I are here, we have a very strong commitment to get this thing moving again, get it off dead center.

I want to also extend my personal welcome and that of the Ford Motor Company and the other American automobile manufacturers to you, and also thank NIOSH and OSHA for putting this meeting together.

I must admit, I was a bit skeptical whether it could happen in such short notice and get it together, but obviously it's quite a success. It's really gratifying to see so many people here, imagine a thousand people to discuss best practices in ergonomics.

Well you've heard all the Chicago jokes already. This is Chicago in January, and we could have had 20 below and two feet of snow on the ground, but we didn't.

I thought that the auto companies were brave when we put together our ergonomics conference a couple years ago in Cleveland in February, and I thought I'd never live that one down. But NIOSH and OSHA have really gone one up on us in bravery.

They have really proven that people will go anywhere, anytime, to discuss ergonomics, and so we're here.

So, personally, I'm here because I'm committed to health and safety and ergonomics. It's a good thing to do. Likewise, Ford is committed to health and safety and ergonomics.

Moreover, one thing that needs to be realized is that health and safety and ergonomics are good for business. In fact, they are really good business.

As Linda has told you, many companies have been doing things in ergonomics for a long time. At Ford, we've been involved in ergonomics for at least the last 20 years. For the last 10 years, the UAW has been our partners in the Ford ergonomics process.

You'll hear about the UAW/Ford process over the next two days. That's only one story that you're going to hear about, though.

This is a conference about best practices in ergonomics, and you're going to hear several success stories. Hopefully, people will share them with you openly and honestly. People approach ergonomics in different ways, so there's different solutions. Therefore, it's really foolish to pretend that there's no debate around ergonomics. There is, especially when we talk about the science, how big the problem is, how to measure it, and how to fix it.

But whether you believe that ergonomics is 10 percent, 25 percent, or 60 percent of occupational injuries and illnesses, how you measure it doesn't really matter. What really matters is you can't walk away from ergonomics. It's an issue to be dealt with.

Peg quite eloquently has said that it is an issue in the workplace, so we really have to deal with this.

For the next two days you're going to be talking about essentially best practices. As Peg has mentioned, the time has come to debate, the time has come to get all of our issues on the table, and to resolve this, to talk about the science and the scope of the problem. So mark on your calendars June 17th through 20th, for that is the conference that will discuss what we would like to call the policy and the science issues relating to ergonomics. It's going to be in Cincinnati.

The primary sponsors for the symposium will be the American Automobile Manufacturers Association and the Center for Office Technology.

One of the things that perhaps you can understand that is changing in ergonomics is that all of the parties that have diverse opinions have been planning this symposium, and we will get out all of the issues. We will discuss them frankly, and we will come to some sort of conclusion as to where we should go.

There's a lot of folks, in addition to those that you'll come to know later. Pick up the blue flyer on the AIHA table just outside the door and you can get additional information on the symposium that's coming up.

Now, importantly, everywhere I go you talk to your colleagues and then say, well, my staff is being reduced, this is being reduced, business is doing this and that, business is getting leaner and meaner. There are getting to be less things to compete over. There's less that separates the successful company and the failure, except for the people. The people are the things that companies can really compete on.

I just want to say that ergonomics can give you a competitive advantage when you're talking about survival. People who are hurt, people who are in chronic pain, and people who are fatigued cannot deliver a quality product.

If they are not in these conditions, they can deliver an extremely quality product. Ergonomics can be a road to help people cooperate. It can be, as we found in Ford, a very good thing for getting the employees and the company management together and focus not only on the health

and safety in the workforce but on other things that are of joint concerns for us.

I'd like to thank you all again for coming, and I hope that we have, and I'm sure that we will, a very successful and productive conference. Thank you.

MS. TAYLOR: Thank you, Dr. Lick.





## Plenary Session 1

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Patrick Tyson, Constangy, Brooks, & Smith

MS. TAYLOR: Well, if any of you had any doubts before you came to this conference about what the agenda was, I think after listening to our representatives from government, business, and labor, you should realize that the agenda is to address the serious issue of ergonomics in the workplace, to do it together, and to handle it as a safety and health issue, and see what we can collectively do to solve this problem.

I'd like to ask you to join me in thanking again our Welcome Panel. As they exit, I'll ask Pat Tyson and his panel to come up.

Thank you.

I'd like to introduce Mr. Patrick Tyson, who will be the moderator for our keynote presentations this morning. Mr. Tyson began his career as an attorney with the Department of Labor in the '70s, and later served as OSHA's deputy assistant secretary and acting assistant secretary throughout the '80s.

He is currently a senior partner of the law firm, Constangy, Brooks & Smith. He brings to this keynote panel his vast experience in dealing with a myriad of employers in developing and implementing ergonomic programs throughout the country. His distinguished career and involvement in national safety and health policy has helped shape the direction of ergonomics as we come to know it.

I am pleased to present Mr. Pat Tyson.

MR. TYSON: Thank you, Sandy. And let me add my welcome to all of the many welcomes you've already heard this morning.

What Sandy said in a nice way is I've been in this game for very long time, and I've been in the ergonomics game for a very long time from a number of different perspectives, both at the Agency when we first started to deal with the issue and since then with a number of clients who have either been forced by the Agency to get involved in the ergonomics issue or who, on their own initiative, decided that it would be the right thing to do.

What we want to do with this part of the program is really get down to the nitty-gritty. We're going to start with presentations from two speakers here next who will give you, from their

perspective, a success story, both from the standpoint of a company that has an excellent record with respect to ergonomics and with a union official who can talk to activities that his union has been involved in.

We will then move into breakout sessions and a number of other sessions. As I was going through the program, it occurred to me that maybe the way to look at this is as follows.

I, as a lawyer, push paper around and go to meetings a lot and don't ever really accomplish anything. What I like to do when I'm not doing that is to work with tools. You will find, if you do that, if you're the handy person, that you can never have enough tools. You can never have enough screwdrivers in your workshop. You can never have enough wrenches and pliers.

What we're going to give you for the next two days is a whole bunch of wrenches and pliers, a whole bunch of tools and a whole bunch of plans that will apply to lots of different workplaces and lots of different situations.

I urge you to take advantage of that opportunity. There's a tremendous amount of expertise on the program the next day and a half. These folks have got a lot to share. It's very nice of them to come forward and do that, and I really think that you can gain a lot from the experience, and we certainly hope that you will.

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Thomas Albin, 3M

MR. TYSON: Let me start by introducing the first speaker, Tom Albin, from 3M. Tom is a senior ergonomics specialist with 3M. He's a licensed professional engineer and a certified professional ergonomist. He's also a member of the committee that revises the ANSI human factors engineering standard for computer workstations and was a member of the Cal-OSHA expert advisory committee during the development of the ergonomic standard.

At 3M, Tom has led the office of ergonomics effort as well as coordinating a team responsible for implementing ergonomics efforts in 3M's manufacturing facilities.

Please join me in welcoming Tom Albin.

MR. ALBIN: Our first reaction when we heard that there was going to be an ergonomics conference in Chicago and being located in Minnesota was to say, well, at least it'll be warm.

I'd like to practice a little ergonomics now and acquaint you with Tom's First Law of Ergonomics, and that is that the mind can absorb only as much as the bottom can endure. These are not the world's greatest chairs for long-term seating, so if you'd like to stand up during my

presentation, I would strongly encourage you to do that.

I'm going to be talking today about six years of ergonomics at 3M.

This is just a brief introduction to 3M, or it will be in a minute. 3M has approximately 37,000 employees in the United States. These employees work in more than 100 locations in 34 states. These are generally small facilities, in the neighborhood of 200 to 300 people per facility. What I'd like to do today is go through a description of why we developed an ergonomics program, how we've approached it, what we've learned, and some of the results that we've achieved.

Late in 1988, we developed and implemented a corporate-wide injury and illness data base. In 1990, the analysis of the data base showed that 35 percent of all of our OSHA recordable cases were ergo-related. By the way, when I use the term "ergo," I'm meaning musculoskeletal disorder.

Fifty-three percent of all of our lost-time cases were ergo related, and 55 percent of all our lost workdays were also ergo related. This quantified a previous belief that ergo cases were a significant health and safety issue at 3M, and we were a little bit surprised, though, at the scope of the problem.

A first question that I think everyone should address is, first of all, do you have a problem. For 3M, as a corporation, the answer to this was a definite yes.

Now, a subsidiary question that you may want to address is, is it an issue of sufficient seriousness to warrant a special emphasis or can it be dealt with as part of a comprehensive health and safety program? Again for 3M, it seemed that a special emphasis program was appropriate.

Once we were satisfied we had a problem, a major health and safety issue, we did two things. First of all, we alerted our management to the magnitude of the issue and began development of solution strategies.

Now, our previous approach had been to take the ergonomic expert to each problem, whether it was large or small. What we started to move to was to conceptualize a system to transfer ergonomics information to a much wider base within the company, and we also began to prioritize our efforts within the area of ergonomics.

We did an informal Pareto analysis which showed that manufacturing and offices accounted for most of our problem.

We have a wide variety of manufacturing operations. We've produced more than 65,000 products, ranging from roofing granules to heart-lung machines. The process that we were developing needed to be adaptable to this wide variety of operations.

When we tried this new concept out and a small number of demonstration plants and the resulting decrease in the incidence of ergonomic cases within those plants, suggested that we had a viable approach to dealing with the issue of manufacturing.

This is a chart that shows a best fit line for the demonstration plants, which is the upper line. I'm not sure how well that's in focus. Can you see that? It looks out of focus to me.

In any case, the upper line is the demonstration plants, and you can see that there's a nice decreasing trend there towards the rest of the corporation.

Within offices, we thought we had a slightly different issue, much more homogeneous type of work than what we were seeing in manufacturing. We felt that effective solutions to the problems within the office were known and that the issue was more one of delivery of service.

At this point, we began to strategize about how do we make the case for implementing a corporate-wide program, so one of the things that we looked at is who has a common interest in addressing these issues. Within our organization, these went by names, such as loss control, medical disability management, and engineering.

I'd like to talk just a little bit about what some of these common interests were.

If we look at loss control, the insurance people, the people that deal with our medical insurance and our workers' comp costs, it was real apparent to them and to us that ergonomic cases had associated costs. Just for reference, I've put up some Liberty Mutual data. \$8600 average cost for an upper extremity case, and \$6800 for a back case.

As we all know, there are indirect costs associated with these.

The message that we try to make and the agreement that we try to establish with the loss control people was that decreasing the incidence of ergonomic cases was in line with their goal of reducing case costs.

Second group with common interest was our corporate medical department, our occupational medicine people. One of the things that we've constantly talked about is that early reporting facilitates better treatment, it's easier to do, less costly, more effective.

A second point was that by addressing hazards we move from treatment, a reactive approach, to prevention of problems.

With the disability management people, some of the issues were more successful, return to work if workplace issues are understood and resolved, and certainly more guidance for the modification of jobs for people coming back.

When we look at engineering, this may be a little bit different to think of engineering having a common interest, but we worked with some of our project engineers. When they looked at different lines, they were trained in ergonomics issues and they looked at the line, both from an ergonomic standpoint and from a production process standpoint, and they made an interesting statement that I've quoted here.

One of the engineers said, ergo problem points were the same as the process bottlenecks. So they saw this as an opportunity to facilitate production.

We stirred this all together and took it to management, and this is the approach that we took. First of all, we said we have a problem. We know how to begin to address it. Here's the plan. The benefits are spread across the business, and we need your support to implement this.

Then we started a strategy of building momentum. Pick some low-hanging fruit to build some successes. Look for additional information to strengthen the case, increase productivity and morale.

In some of the plants where we've implemented ergonomics, we have consequently seen an increase in morale.

Finally, I think this is extremely important: You need to publicize your successes and your activities, whether that's as simple as posting before and after pictures on a bulletin board in a plant or whether you're putting articles in company newsletters, you need to get the information out there, but things are happening.

Plan for the long term. Keep in mind that what you're doing is an iterative process, that you're not always going to get it right the first time, that you're going to need to keep turning some things over.

You need to not be afraid to try new things. Use the Shewhart cycle: The plan/do/check and act.

Finally, this is the slide that was out. We'll skip that.

This is a chart that shows our manufacturing, OSHA recordable ergonomics cases as a percent of 1990. I'd like to do just a little bit of discussion about this.

We began to put our program in general implementation between 1991 and 1992. Between 1990 and 1996, we've seen a 22 percent decrease on all OSHA recordable cases. Now, what we've done here is we've expected to see only a small decrease in OSHA recordable cases because we wanted to encourage reporting. We didn't want to necessarily drive that particular data point down.

The next slide looks at our lost time cases in which we see an approximately 58 percent

reduction from 1990 to 1996.

This shows some results that we saw. We observed a slight initial increase in recordable cases, then a gradual decrease. This is, I think, something that a lot of people have seen. What we did see almost immediately was a decrease in the number of lost time cases.

Here we have a chart that shows the OSHA recordable cases and the lost time cases superimposed so that you can see there's a time lag there between the OSHA recordable cases and the lost time cases.

Immediate decrease in lost time cases, somewhat of a lag in OSHA recordable cases.

Here are some other results that we've seen. We tend to initially think in terms of case incidence, but these are some results from manufacturing, in terms of cost savings. These are three lines that we've pulled out as examples.

One line spent \$85,000 on improvements and achieved \$225,000 annual savings.

The second line spent approximately \$350,000, initial cost, and again realized approximately \$350,000 in annual savings.

The third line spent \$5000 and achieved a \$10,000 annual savings.

So here you have approximately four month, one year, and six-month payback periods on some of the investments made for ergonomics.

Within offices, the strategy we took was a combination of training and evaluations to adjust work situations and install extra equipment, such as keyboard trays, document holders, wrist rests, et cetera.

We did this, we did a follow-up survey on symptomatic individuals seen for office ergonomic consults, and we found that approximately 90 percent had improved or completely resolved symptoms at the time of the follow-up survey.

So as a quick review, what did we do?

We set up an initial program that had two main components. One was reactive, one was proactive.

The reactive component, based on the red meat guidelines, management, commitment, employee involvement, hazard analysis, and abatement, medical management and training.

Proactive is a little bit different. One definition that's been put out for proactive is to look at

existing jobs for hazards in the absence of cases associated with those jobs.

We have a slightly different spin on that. Our definition is to design new processes and equipment, ergonomically correct from the start.

Here's what we're doing currently: We've prioritized implementation, highest incidence plants first. We've saturated the organization with knowledge, whether that's engineers, office workers, or line workers. We're trying to get the ergonomics word out to them, and I think we've been reasonably successful doing that.

We've repositioned the ergonomist as a consultant to a problem solving group rather than acting as the primary problem solver, and finally we've put ergonomics in as part of our new equipment design process.

Quick review: first question to address is do we have a problem? If yes, how severe is it? What are you going to need to do to address it?

Develop information you can use to measure the success of program efforts. If you don't have that it's very difficult to convince people that what you're doing, or it may be very difficult to convince people that it's worth doing.

With regard to that, don't rely on a single data point, such as the incidence rate. As we saw with our OSHA recordable rate, the time lag there may really confuse you and suggest to you that what you're doing isn't effective when it really is having an effect. You just need to look at a little more data.

Finally, when presenting the plan, pitch the presentation to different target groups and tailor that. Whether you're going to management presented in terms that they're going to want to hear business terms; if you're going to line management, talk about more utilization, less turnover, less absenteeism, whatever.

Be flexible. Test new approaches in small manageable chunks. I think one of the experiences we had was we may have tried to bite off too much at the first.

Trust your data.

Again, saturate the organizations with knowledge.

Give the process time to work.

Finally, keep in mind that it's a culture change, a change in the way you think and not just another program. Thank you.

MR. TYSON: Tom, thank you very much.

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James Frederick, United Steelworkers

MR. TYSON: Next, it's my pleasure to present Jim Frederick. Jim is an industrial hygienist with the United Steelworkers of America. He's part of the health and safety and environmental department there in Pittsburgh.

Jim came to the Steelworkers following the merger of the Steelworkers and the United Rubber, Cork, Linoleum, and Plastic Workers of America Union. His position with the prior union, which I won't try to say again because I barely got it out the first time, was the director of industrial hygiene.

Jim works extensively with local unions and companies for whom they are there in the development and implementation of effective ergonomic programs.

Now I think it would be useful for us to hear from Jim with a perspective from the other side.

MR. FREDERICK: Thank you, Pat, for the introduction. I'd like to steal a little bit from what Peg said, talking about prohibition on ergonomic issues. I guess what I'm going to speak to today is ergonomic bootleggers.

I also thank Tom for your presentation.

I'd like to express my appreciation for the opportunity to speak this morning. I'd like to also thank the staff from both OSHA and NIOSH for organizing this conference.

Additionally, I want to thank all the management and safety representatives from several tire plants who provided me with much of the information and the slides that I'm going to be using this morning.

The Steelworkers Union, as well as all of organized labor, values the importance of the gains which have been made by our members supporting safe and healthful workplaces. The Steelworkers Union represents about three-quarters of a million members in the United States and Canada. Many of our members of our union work directly in the basic steel industry, but the majority of our members work in other industries, such as rubber and plastics, chemicals, nonferrous mining, transportation equipment, general manufacturing, health care, and the public service industries.

As the diversity of these industries dictate, our members face a multitude of occupational safety and health problems, including ergonomic issues.



Our union, through its health and safety and environment department, as well as a network of district staff and local union health and safety advocates, works closely with our members, providing technical assistance to address workplace occupational health and safety hazards. The steelworkers provide health and safety related training and education programs to our members to provide them with the means to correct hazards at their plants.

My associates in the health and safety department and I spend much of our time working directly with our constituents at their factories or workplaces, as well as at their local union halls to address workplace health hazards.

Health and safety hazards existing in our plants vary as widely as do our workplaces. Local union representatives contact our office concerned with ergonomic issues as frequently as any other safety problem. For every ergonomic concern that is brought to our attention, many, many more are addressed at the plant level by hourly and salaried employees. Often, safety and health concerns, in particular, ergonomic hazards, are best addressed by the employees working with, on, and around them.

This process of floor level problem solving has always occurred. It occurs daily in the workplace and is often done without notice. In many workplaces, the seniority of the hourly employees is far greater than that of supervisors. In these plants, workers may have some additional insight to their workplace, to the companies they experience.

Some of the floor-level fixes that may alleviate the ergonomic stressor may not be recognized by management or the workers as ergonomic hazards but rather making the operation more efficient and/or comfortable to the operator.

Workers can always contribute and often correct ergonomic hazards in the workplace. Ergonomics can be defined as the science of work or fitting work to the workers. I believe ergonomic issues can best and very effectively be addressed by workers.

A union member once summed this up very well to me when he stated the ergonomics is simply workers fitting work to ourselves.

A local union president from a steelworker plant contacted me in December with some questions about ergonomic issues. During the course of our conversation, he explained to me that in 1995 there are 18 cases of carpal tunnel syndrome recorded by his employer. This plant employees just more than 200 people. Over that 12-month period, one out of every eleven workers suffered an OSHA-recorded cases of carpal tunnel syndrome.

This rate of incidence indicates to me that workers at this plant are in need of some ergonomic help. Obviously, not every plant which employs members of the steelworkers union experiences ergonomic-related health and safety problems to this extent, however, we strongly encourage every workplace to approach this issue in a proactive manner. Many workplaces that our

union represents do have sophisticated and proactive occupational safety and health programs that are inclusive of ergonomics. In some cases, this is addressed as a separate manner, while in other places, ergonomics is inclusive in the other safety and health programs.

It is in these workplaces within the union we find cooperative, proactive, labor management, health and safety, and our ergonomic programs working effectively.

As I mentioned, the Steelworkers Union works with an immense variety of employers who approach ergonomic issues with a vast array of methods. I'm going to describe one example of a facility level ergonomic program.

This program is from a tire manufacturing facility and is inclusive of floor level input and participation. I am also going to show several examples of workplace improvements made to reduced ergonomic stresses. These improvements were made with the involvement of hourly employees from several facilities throughout the US.

Management in the local union at a relatively small tire plant recognized that a problem existed with an excess of ergonomic illness.

This was particularly apparent in their workers' compensation costs. The nature of tire manufacturing includes much material handling, as well as tasks requiring excessive, repetitive motions.

This plant initiated an ergonomic program to complement their existing safety and health structure.

The goal of this facility's ergonomic program is to reduce work-related injury and illness by systematically eliminating their causes through education and awareness modification to the workplace and work practices.

Management at this plant hoped to improve upon the problems associated with the ergonomic hazards through the actions of an active ergonomic committee. The configuration of this Committee includes, hourly and salaried employees representing a cross section of the plant. Everyone concerned at this facility wanted to take advantage of the ability of the workers to fit the work to themselves.

The Committee benefits greatly from the experience of the workforce.

An Ergonomic Committee was established. Management at this plant states that the committee is designed for success. Also, a management ergonomic coordinator was named. This plant addresses specific problems with this established committee.

Some of the Committee members rotate on to the team from those areas or departments currently

concerned or involved with projects. These rotating positions are imperative to effect the changes that will work in their respective departments.

The Committee is represented by an equal number of hourly and salaried employees. Each member of the Committee has an equal vote in all of the decision-making. The Committee meets on a regular basis.

The Committee at this plant operates in both a proactive and reactive manner. They regularly review information contained in the employer's reported injuries and illnesses to react and assess areas which may have a problem. Data such as this also provides them with indications about departments and their jobs for which the Committee has already performed improvements.

The Committee relies heavily upon this data. For example, the Committee may review data for a department of concern from the Plant OSHA 200 lot.

This slide shows injury by body part for the plant. They also review injuries by job task within their plant. Through this strategy the Committee believes that they are able to effectively focus their efforts in areas which are problematic. By focusing their efforts, the Committee is able to justify expenses associated with some of the solutions that the Committee recommends because the injuries and illnesses experienced by these workers are costing the employer money today, not to mention the cost on a personal level.

As I mentioned earlier, this Plant Ergonomic Committee works in both reactive and proactive manner. One example of their proactive actions is their regular performance of plant walk-through audits and surveys. The members of this Committee also make themselves available regularly, both individually and as a group, to listen to concerns from the shop floor.

One factor that this Committee stresses is that some kind of response or feedback should always be provided to employees, hourly or salaried, who raise issues. If no response is provided, the employer is less likely to provide additional input.

Another item mentioned by some of the hourly members on this Committee is that salaried employees often approach them to comment on ergonomic concerns.

This slide shows a sample checklist utilized when this Committee performs a type of a job hazard analysis in conjunction with ergonomic walk-throughs.

With the assistance of the workers, supervision, and this checklist, the Committee members begin to analyze specific hazards associated with job tasks. After the job has been analyzed and the problem has been identified, the Committee attempts to improve or correct the tasks associated with the problem. While the Committee proceeds with the project, they continually provide feedback to workers in an area of concern.

Many times a project will take weeks or months, but the feedback process informs the workers of the timing. Throughout the process, the Committee documents are steps for their records.

The Committee members, as well as the facility employees, have received ergonomic training as a result of the Committee's efforts. The ergonomic coordinator received initial in-depth training, and continues to receive regular training. This person, then, brings some of the experience and knowledge he gains back to the rest of the Committee and shares it with them at their regular meetings.

The Committee members have also received some outside training. On a plant-wide basis, the Committee members are provided most of the training through their existing educational safety programs.

Let me now discuss a few examples of ergonomic improvements, changes, or fixes made at several tire plants. These alterations involved input of floor level employees. Some of the input from the floor level was minimal, while other scenarios were almost totally handled amongst hourly employees.

Material handling is a major concern for most workers and tire manufacturing facilities. Throughout the process, workers are handling materials and product many, many times a day. Rubber and other raw ingredients are compounded together to create rubber stock used to produce tires. Natural and synthetic rubber arrives at tire plants on pallets. A bundle of rubber weighs about 75 pounds.

For years, compounding operators would manually lift bundles of rubber, along with bags and bundles of other materials on to conveyor scales to be charged into a Branbury mixer. The compounding area was a very dirty and labor intensive area in the plant to work.

Vacuum hoists have been installed in compounding areas in most tire plants. This example was not initially received well by the entire work force. The lift or hoist was thought to be a slower process to move stock and material from Point A to Point B. Many operators and supervisors were initially convinced that these devices slowed the production. Today, however, if a hoist in a plant Banbury area is not operational, workers don't want to work on that line. This engineering device required a period of time for workers and supervision to become familiar with its use and function. Over the time, workers became comfortable with the operation and using the lifting device and are now able to keep up with their production rates and their speeds while using the lift.

The vacuum lift or hoist, provides the Banbury operators with the means to handle the material without the manual manipulation.

In addition to bundles of rubber arriving on pallets, many tire plants receive bulk materials in railcars. This operator is using a tool called a rail car inch to move a railcar of carbon black into

position to be unloaded. The lever is appropriately named because it literally moves a car about one inch at a time. The distance that the operators are required to move this railcar at this plant would range from 10 to 20 feet.

Obviously, this operator had a heavy, highly repetitive task every time the carbon black railcar arrived. This operator faced serious potential problems with repetitive motion injuries. It didn't take too much to persuade upper management at this plant to make a capital investment for a motorized rail car motor. This purchase eliminated the task which was targeted as being problematic.

This example depicts a scenario which some people express in an initial concern of an Ergonomic Committee of the chance that they may eliminate some jobs. It's important to express that at the facilities that I have these examples from that no jobs have been lost as a result of implemented ergonomic solutions for a problem.

In fact, one safety committee chairman expressed to me that the solutions at his facility have allowed the affected workers to perform their work much better. I think this is a real key in ergonomic issues for the buy-in of the workers is to have that understanding and that assurance.

Tire beads become the rigid rim of the opening of the tire. This operator is moving beads from the area that they are made to a storage rack. These beads for large tires weigh between 30 and 40 pounds each. This powered industrial truck is now used to move the beads at this plant. This allows the worker to place them onto the truck at a comfortable level.

This truck allows the operator to place the beads into the storage racks without being required to lift them up over their head.

The operators working in these areas are called tire builders. Tire builders experience many repetitive operations in the course of their work. Normally in a tire plant, tire builders experience a higher rate of repetitive motion type illnesses than any other job class in the plant.

In this plant, a stool was used to stage tires during the building process. The stool that was used in this plant was too low to the ground and rather awkward to use.

Operators in the tire room implemented a temporary or quick fix to assist this task. The stool is placed under a crate to allow the tire to be at a better working level. This improved the task from an ergonomic standpoint for most of the operators, however, the stool continued to be in an awkward position for some of the operators and it could potentially tip, causing other problems.

The floor level improvement was considered by the plant, joint labor management, safety and health Committee. The Committee determined that a new stool could be manufactured in house by the employees. This new stool is height-adjusted at very stable at the base. This is a very good example of workers fitting the process to best fit themselves.

The employees in this area are very pleased with this improvement. This example demonstrates the effectiveness of simple in house engineering design and manufacturing.

After a tire is built or assembled, it is cured. The curing process, essentially, bakes rubber, giving its final shape and durability. This slide demonstrates the process of curing operators placing tires onto curing stands from the floor. The curing press in this photo picks the uncured tire from the stand and places it into a mold to be cured.

The operator job entails keeping many of these presses in operation. Due in part to production requirements, the workers would place the tire next to the stage, onto the ground next to the stand. This task required the operator to remove green or uncured tires from a rack, place them onto the ground next to the press, then move from the ground onto the curing press stand when it became available.

Curing operators worked on a hard-surface floor for an entire shift, and they're constantly moving back and forth along a row of curing presses to keep them stocked with tires.

Contact with the floor also caused some impurities to sometimes affect the quality of the tire.

Engineers and operators working together agreed that multiple rotating arms would allow the curing press operators to efficiently place multiple tires. This provides better quality assurance for the product.

It also allows the workers to keep up with the production requirements. This improvement reduces excess bending and lifting to complete the task. It also does not increase the amount of movement required for the operator up and down the row of curing presses.

After the tires have been cured, they are inspected, stored, and shipped. Operators working as inspectors check tire quality. This worker removes tires from this conveyor. The side rails, or skates, keep the tires from falling off the side of the line. The operator lifts the tire up and over the side rail. This task places the operator into some awkward positions. The suggestion that was implemented to improve this task was to modify the side rail so that it could be flipped down to allow the operator to pull the tire straight from the conveyor.

This allows the worker to remove the tire from the line without lifting vertically.

In the next example, operators handle finished tires. They are moving them from waist or chest level to floor level. Think about changing a flat tire. Lifting a flat tire into your car trunk is not an easy task. Imagine lifting hundreds of tires into your trunk for an 8- or 12-hour shift.

A lift was placed at this workstation to assist the operator in moving the tire from the conveyor level to the shop floor. This lift, like the first example I discussed, created a time period which operators found difficult to keep up with their production quota. However, over time, operators

have adapted to utilize this tool and maintain the quantities.

The worker in this photo is turning a tread tray. The tray is loaded on one side, then rotated 180 degrees and loaded on the other. A manual lift is used to assist the rotation. The conveyor line which feeds the strips of tread to this area continually feeds.

There are nine employees between three shifts assigned to this operation. In the late '80s, these operators were reporting to the plant medical department at a rate of 1 employee per month. The workers were experiencing back, shoulder, and/or elbow injuries.

In 1989, several representatives from the Plant Safety Committee, both hourly and salaried, attended some ergonomic training. Following the training course, the employees returned to the facility and, working with the Safety Committee, identified this job as problematic.

The Safety Committee reviewed the job. As a result of their review, a motorized list was placed into operation. Since this lift was placed into operation, none of those nine employees working on this job have reported back, shoulder, or elbow injuries to the medical department.

This lab worker cuts pieces of rubber samples for testing. Here, she is using paramedic scissors to cut samples. She was experiencing pain in her thumb when cutting the samples. As you can see, she is wearing a doctor-prescribed support.

A pair of spring-loaded Fiskars were purchased for this task. These reduced the stress on the worker's thumb enough to allow her to function without the support.

Once again, the message that I hope I have relayed today is that floor-level input is invaluable to the employer addressing ergonomic issues. Additionally, the employees who work on the shop floor are imperative to the success of the program.

The examples that I've shown this morning vary in almost every aspect, however, they all involved input from the workers. The experience and hands-on knowledge provided by the union members cannot be replaced. I think that those of us in this room can agree that there is a prevalence of ergonomic problems in the US workplace. This problem does not appear to be diminishing.

The cost at several levels associated with this problem have brought ergonomic related issues to the forefront of occupational safety and health and brought all of us to Chicago.

More and more workplaces are implementing ergonomic programs of some manner, however, the specifics of these programs are varied. We at the United Steelworkers Union look forward to the continuation of the OSHA process. This process provides all of the stakeholders with the opportunity to continue meaningful discussions on this topic.

An OSHA standard will provide some continuity between workplaces and create an even level for workers.

Thank you, again, and I'll turn this back over to Pat.

MR. TYSON: Jim, thanks very much.



# Manufacturing 1

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Welcome by Bradley Joseph, Ford Motor Company

We have three speakers. I am going to be the last. I know the agenda says it a little bit differently, but I think it makes more sense because I can kind of wrap things up. And then we will go into questions and answers.

What we are going to try to do is, we have an hour and a half. We will take a little break in the center where we can kind of stand up and talk for a few seconds, but not very long. And then what we will do is, at the very end we will have questions. If you have immediate questions for the speaker, just please get up and ask them. We will have a couple minutes of that, depending on how long they go.

But at the end we would like to have a round table. And if you have specific questions about some things that we have done, that would be a good time. So we are going to try to hold our talks to around 20 minutes or so, which is what everybody agreed to.

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Larry Kreh, PPG Industries

Dr. Joseph: The first speaker is Larry Kreh. He is the manager of Ergonomics and Loss Preventions at PPG Industries, in particular the coatings and resins group.

A little background about him. He graduated from West Virginia University with a degree in mechanical engineering. He was hired directly into PPG out of school and had several positions, a couple distinctive positions in production and process engineering, and then kind of switched gears here and went into the loss control side, which I think is an interesting thing, because most of the time our people from health and safety don't come from the engineering side. You don't see that as much. This is kind of nice.

I think what triggered him was this seminar he attended at the University of Michigan with Gary Herrin and other folks. And he got into ergonomics and said, "Hey, this is a match here. There's something here I can deal with." And so he started to fit his mechanical engineering background to some of the issues of safety and health and found there was a good match. And I think that's one of the issues that's a best practice. I think that's some of this theme you heard this morning.

At any rate, there was an opening that occurred in that group, a coatings group. And he got it and became manager of the ergonomics group and also the loss control group.

So Larry, would you please come up here? Please welcome Larry.

MR. KREH: Thank you, Brad. I can't see any of you in the audience right now due to the bright lights I have in my face. I would like to thank Jennifer Silk from OSHA for inviting me to give this presentation today. When she called me up about three months ago, she invited me to Chicago to a conference that was supposed to be about 300 people, and we were going to have a breakout session that would be about 70 people.

You can imagine my surprise last night when I arrived at the presenter's stand and asked to see the room that I would be presenting in and was brought into this room with 1,200 chairs. Quite intimidating, but I'm glad to see that you are all here.

I would also like to recognize our moderator today. Brad probably doesn't realize this, but he has been instrumental in our training at PPG over the years. In addition to providing Dr. Gary Herrin with information that we use at each one of our training sessions, when we are talking about contact stress at PPG -- could I have the projector, please? -- we frequently refer to Brad as the person at the bar.

Brad over the years has been the subject of a lot of comments. We talk about contact stress and why bars put that padding at the bar. At each one of our training sessions somebody says no, that's so you don't hurt your head when you fall down.

So Brad, thanks for that.

A little bit of background information about PPG Industries. We are a global company employing 31,000 employees. We have 90 manufacturing sites worldwide, 50 of which are in the United States. This session is on manufacturing, but I will mention that our ergonomics process extends far in the organization.

Our research and development facilities, our office complexes have ergonomics processes. And we are also getting our sales and service people involved as of the last month or so. We are putting together some videotapes for the sales/service organizations because they are quite exposed out there in our customer facilities.

There are four major groups within the PPG Industries. I am in the coatings and resins group. Coatings involve more things than just paint today. We have electro-deposition products, powder coatings, surface pretreatments, and then some of the conventional products that you would think of. Some might call it paint. I have heard it said within PPG that paint costs \$10 a gallon, coatings cost \$100 a gallon; we sell coatings.

Within the fiberglass group, there is an organization which makes fiberglass, obviously, which used to be part of the glass group, which has now been broken off. These organizations have some unique problems in that the heat involved at these locations is quite extreme. When you have molten glass flowing as part of the process, the heat exposures can be very high. And then finally, our chemicals group.

The coatings and resins group, which I work for, is a batch operation, whereas the fiberglass group and the glass groups are for the most part continuous line operations. And then the chemicals group is a combination of both continuous line and batch operations. So they do pose unique problems and opportunities. Although we are one company, our problems are very unique and different because of the manufacturing process, as well as the products.

As far as the history of ergonomics at PPG, one of our facilities in Greensburg, Pennsylvania, got their first taste of ergonomics back in 1987. The glass group saw a lot of opportunity as a result of that study and embraced the ergonomics process in 1989. And then the coatings and resin group followed shortly thereafter in 1990, which is when I was hired into the group to manage the ergonomics process or really facilitate the ergonomics process.

The chemicals group followed in 1991. And then in 1992 our management was so impressed with what was going on at some of these facilities that they wanted to post an ergonomics commitment statement within our locations, which showed our commitment to the ergonomics process.

And the commitment statement is basically: PPG will provide associates with a safe and healthful workplace. The objective of PPG is to perform all tasks in accord with sound ergonomic principles, including without limitation the NIOSH lifting guidelines or their equivalent.

In addition to the NIOSH lifting guidelines, we also have many other resources that we currently use within the organization as well, which I will talk about a little bit later.

As far as the implementation guidelines go, you have heard earlier today the meat packing guidelines was an excellent document. We embraced what was in that document, and we feel that management commitment and employment involvement was the foundation. Fortunately within my organization, management commitment was not a problem. They were more the driver of the ergonomics process.

And then obviously the program elements, as defined, the meat packers guidelines works on analysis, hazard prevention control, medical management and then training and education. The training and education within our organization is done by outside consultants, as well as internal experts. We have used Ohio State University, Bill Marras, Dr. Gary Herrin from the University of Michigan, CLMI, some physical therapists, Carol Stuart Buttle, and many other of the organizations that are represented here today, as well as I said before internal experts.

Our ergonomic committee members all attend a three-day session put on in Pittsburgh by Dr. Gary Herrin. This is really the foundation of the education that we give our committee members. You can see the content of the training is quite extensive. It goes far beyond the NIOSH lifting guidelines, includes things such as heat stress, office layouts, controls and displays, and how to implement a process within our organization.

The attendees that come to this meeting, are a good cross-section of the organization, including union representative, production employees, and medical. And you will see the last two items that might be a surprise to some of you, suppliers and customers. The suppliers attending might be fairly obvious, because they are providing equipment, services and products to our facilities. But we have a lot of customers now coming to this training session as a value-added service that we provide to our customers.

I noticed in the list of attendees that many of you are in fact customers of PPG, and I will offer today for you to come to this session. And the way you need to go about doing that is to contact your sales representative from PPG and ask that they sponsor you to come to this class. It's a three-day class that is held in Pittsburgh twice a year. We are very proud of this training session. We feel it would be beneficial to our customers, and we feel it is a value-added service which you can benefit from.

As far as the prioritization of efforts within PPG we look at OSHA recordable cases. We look at that. That's in most cases a reactive mode, but we also look at it as a proactive mode and look at those individuals which have not been injured, which are performing those tasks where others are being injured.

So instead of just focusing on those that are being injured, we also take a look at the survivors and find out what body mechanics they are using or what techniques they are using that are unique that are enabling them to perform the job without becoming injured.

And then we use the NIOSH lifting guidelines. Obviously the job, where the lifting index is greater than three, require immediate attention, and then we work our way down to the lower lifting indexes.

Some of the other ways that we get notification of a need for an ergonomic intervention would be associate complaints or discomfort surveys, production or quality problems, and finally, customer requests. We have had numerous customers come to us and request packaging changes or modifications in the way that we deliver products or services to their sites.

We already talked about injury and illness prevention being both reactive and proactive by using the OSHA 200 logs. The second stage was to integrate the ergonomics process into the engineering services that we provide. At existing facilities, when modifications are made to facilities, part of the authorization for capital requires that a form be filled out to make sure that there are not ergonomics problems being created or there is not an opportunity to correct ergonomic problems that exist.

New construction projects involve a detailed review to make sure that all ergonomics principles are being followed prior to construction.

We really see this as a value-added service to both our customers and internally. And we see this

as a strong competitive advantage currently.

Let us now review initial challenges, fortunately PPG management commitment was not one of them. Management actually forced the process. Employee involvement was difficult at some facilities. Process versus the project. We heard that earlier. Why didn't we have these problems before, if we can't afford ergonomics? And then the injury reporting and classification.

Whenever you implement an ergonomics process, you will see an increase in the reporting of OSHA 200 reportable cases. I believe that the current record keeping guidelines need to be modified, as was proposed in the last draft of the record keeping guidelines to include things such as predominant cause being work related, and also that the injury and illness classification scheme be the same. Currently they are not.

One size does not fit all; lesson learned. Management commitment and employee involvement, the foundation of any process, whether it be ergonomics, quality, safety; continuous versus batch operation, differential needs to be made up front.

There is a tremendous resource commitment made, and I am not sure that small or even mid-sized companies have the resources that we had available when we started the process, although I am not saying that small companies can't do something that would be equally effective, given their current structure.

Workers' compensation claims is something that people like to look at as an indication of what is going on. This is a claim count. These are not dollar numbers, although the dollar number chart is equally impressive. You can see that back in 1987 we were experiencing 2,500 workers' compensation claims a year. And in 1996 we are down to 1,000. A dramatic reduction, and we foresee that continuing in the future.

Ergonomics is not just about work-related injuries. We feel that the ergonomics process can also bring benefit to away-from-work safety of our employees. For every dollar that we spend on workers' compensation costs, we spend in excess of \$10 for health care insurance for our employees. We see this as an opportunity to reduce health care costs as well.

I don't want to leave you with the impression that ergonomics is the only thing that has driven workers' compensation costs down. We have also implemented a very aggressive behavioral or observation safety program, which is showing benefits. And we also have a very aggressive case management system in place to get people back to work as quickly as possible, even if it is in a restrictive activity capacity.

There are so many variables in this question about how effective the ergonomics process is that we have Dr. Gary Herrin under contract to perform a detailed analysis to try to find the correlation, if one exists, and how strong that correlation is. Those results will be available in about one year.

As far as PPG's OSHA recordable case rates, 1987 is the last change in the OSHA recordable case structure. And in 1996 PPG will be down to an OSHA recordable case rate of three. And I will tell you that at PPG we count everything. I talked to the Dave Schmidts and the Jim Maddoxes down in Bureau of Labor Statistics almost on a weekly basis to get clarification. There are very few people that understand all the interpretations that OSHA currently has in place for the record keeping guidelines. Once again, I support the changes to the record keeping guidelines.

This is a particular case study involving our Berea, Kentucky facility. The facility was constructed in 1990. In 1991 an ergonomics process was put in place. You can see the dramatic rise in cumulative trauma disorders being reported initially. And then the cases have progressed down through 1996. To make this chart even more impressive, the number of workers at this facility have doubled in the same period.

How much did things cost? Sixty-seven percent of the improvements made in the Berea, Kentucky facility cost \$500 or less. The other part of the pie chart that might cause some attention is the one that goes up to approximately \$1 million, the 12 percent. In this particular, there was only one project that was over \$100,000, and that was to install a robot in an area that was not suitable for people to be working due to the heat exposures involved in glass plants.

I would like to give you some real quick examples of before and afters. Fortunately, this is a before. This is a 1940 vintage picture of how we used to manufacture paint. These gentlemen are lifting a keg that weighs 400 pounds and dumping it into a tub for mixing.

This is an activity called breaking a drum. This drum weighs approximately 600 pounds. You can imagine the stress to the shoulders and the backs involved with this. Then he would do what we call chime the drum across the floor. In addition to the strain and sprain injuries we were experiencing, quite frequently we would have amputation of fingers involved with this job when the employee would lose control.

The first stage of the intervention was to provide four-wheel drum trucks to provide breaking the drum much easier and also moving the drum across the floor, although there is still present some shoulder and upper body problems.

This is a drum mover. It is actually a pneumatically driven unit which picks up a drum just by the flip of a switch. And this has removed all the stressors. It is very easy to move drums around in our plants at this time. And we actually have a later version of this being developed.

At our facilities we handle a lot of five-gallon pails, as you might expect in the manufacturing of liquid products. Previously many of these pails were paletized manually. Obvious problems with this, strain and sprain type of injuries. But we were also having quality problems with the package. The labels were being damaged during this operation. A very easy fix to this problem was to install five-gallon pail manipulators, which improved the productivity and the quality of

the employees and the products.

We still have a major problem with five-gallon pails, as do probably many of you. The Department of Transportation has put in some requirements regarding the crimping of the lids on pails. And we have had to install pneumatic crimping devices to seal the lids on all of our pails. That's fine where you are making the product, but where you are using the product, you can imagine how difficult it is to get a lid off where it has been pneumatically crimped on, especially given the fact that most of the time the employee is using merely a screwdriver or what I will call a church key device to open the pail. If anybody has a solution to opening five-gallon pails, I would love to hear about it.

In one of our production facilities, this is a line filling what we call F-style containers, this is an improvement made by an employee. It is just a fixture he has attached to avoid basically a very long pinch grip for stacking cans and placing them on a conveyer. It was a fixture made by an employee one to two days after he attended an ergonomic training session.

When you are making paint, you have to tear valves apart continuously, because if you have made red paint before, now you are making white paint, you end up with pink paint unless you clean everything out perfectly. So our valves are continually torn down, rebuilt and cleaned.

This employee was experiencing shoulder and hand problems. Once again, after getting a little bit of training, he just manufactured a small jig device which eliminated a lot of the problem and also got an in-line tool instead of a pistol grip tool.

That's Pittsburgh, a wonderful city. I would like to see you bring the conference there next time. What I would like to do in closing is just read you a statement by our current president and soon to be president of the board, Mr. Ray LeBoef. This is from a video that he is making for all PPG employees to see and all new hires in 1997 to view upon being hired.

He is talking about somebody who recently visited a PPG facility as he states, "'Safety is a way of life at PPG,' arecent visitor said. Here, safety is more than just signs and rules. It is fashionable to be safe at PPG." He's right. The health and safety of those that work for the company, those that work with the company, and those who buy from the company have always been of utmost importance. It's a proud part of the PPG tradition, a tradition that hasn't come about accidentally. Safety at PPG is tradition by design.

Ergonomics was implemented at PPG to improve safety, but we have seen many other benefits through the result of our ergonomics efforts. Thank you.

Does anybody have any questions? I can't see a thing, so just get up there and talk, if you would.

MR. : Yes. I would like to ask if you could explain a little more about the observation and behavioral safety as it reduced your workers' comp claims.

MR. KREH: We are still in the early stages of that process, but we do see some initial trends at facilities that implemented that process. Tom Krause from BST is doing some of our behavioral-based work, but we are also using a management observation training process.

I really think it is too early to draw conclusions from that, but I think that process is very much like ergonomics. We are seeing many other benefits, other than the safety and workers' comp reduction.

MS. : I was wondering if your company has come up with any ideas on what an ideal package weight would be for, you know, your customers as well as your own employees to be handling? Has there ever been any discussions about that?

MR. KREH: That depends on so many factors, I really couldn't answer that question. Package size, where its going to and from. Obviously a container should not exceed 50 pounds without some means of mechanical assist. But there are packages which are 10 pounds that might be too much weight given the circumstances. That's a very difficult question to answer.

MS. : Okay. Thanks.

MR. KREH: One more?

MR. : You mentioned that you had a rate of, what was it, three per hundred, cases per hundred? Is that your rate, your incidence rate, of total injuries and illnesses?

MR. KREH: That is as defined by the OSHA recordable?

MR. : Yes, sir.

MR. KREH: That is correct.

MR. : What is your industry standard?

MR. KREH: Industry standard through NPCA I believe in 1995 was 4.6. And I will state once again that we count everything. And I hope you know what I mean by that.

MS. : Could I ask one more quick question?

MR. KREH: Yes.

MS. : You talked about that three-day training program. Do all of your employees participate in that program, only a select group, or only your ergonomic committee members?

MR. KREH: Well, first of all, our ergonomic committee members rotate through the committee. We have had 1,000 of our 31,000 employees through that training session. So approximately 1



in 30 have been through that.

All members that are on the ergonomics committees eventually get to go through that program, but I would not say all employees get that training, although we do have many other training programs. All employees will be receiving or have received some level of ergonomics training as part of their employment with PPG, but not that three-day training session. No.

MS. : Thank you.

MR. KREH: Thank you very much.

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Sandy Le Sage, Hay and Forage Industries

DR. JOSEPH: Okay. There will be time also at the end for questions. As more come up, please stay on and ask. These are good questions for clarifications. We need to do that. But I will tell you a quick story about this ideal weight that came up at Ford.

I got a call one time from an engineer. He asked me a very quick question. He said, "Can you tell me the weight this package should be?" And this was one of my first days on the job, and I said, "Well, it depends," just like Larry said here. And I said -- he goes, "Well, what does it depend on?" I started asking him three or four questions, size, frequency of the lift, and all these kinds of questions.

He says, "You know, that's the trouble with you Ph.D.'s and all you ergonomists, you don't have a quick answer. I just want a quick answer." And he says, "This is ridiculous."

So I said, "Okay. Let me ask you a question." I said, "When is your machine going to break down?" He says, "Well, that depends." I said, "And what does it depend on?"

He says, "It depends on how often you run it, how well you maintain it." I said, "Well, how come it's okay for you to have that data and us not to have the same kind of data and answer the same kind of questions?"

He says, "Okay. Point well taken."

So the point of it is, we need data like this. And, you know, there isn't easy answers. There are maximums that we could all probably agree on that says, you know, like no one should ever lift 1,000 pounds. We could start there and go down. But there is even some controversy on this weight with some of the service sector for box delivery. So as you get further and further down that line to the left side down to zero, boy, people start getting real crazy about it. So it is a very

difficult question, but it is a good question.

Our next speaker is Sandy Le Sage. Sandy has a very diverse background, too. She comes from Kansas as a certified emergency medical technician and a medical safety technician. She has been in occupational medicine and safety for nine years, and two-and-a-half years at -- I know I am going to kill this one -- Monfort Meat Packing Company as medical manager.

Now she is currently working at Hay and Forage Industries as the medical safety department and chairperson of the ergonomics peer team. Instead of calling it an ergonomics process team, they call it a peer team. So you are going to hear a lot of different terms for the same thing.

She is here to present some of her success stories, and I think she has a real interesting presentation, a little bit different than just a slide show. So please welcome Sandy.

MS. LE SAGE: Thank you, Brad. I would like to start today by telling you just a little bit about Hay and Forage Industries. We manufacture farm equipment, employ approximately 950 people, and we are located in Heston, Kansas. Hay and Forage is owned equally by two competitors, Agco Corporation and Case Corporation. Both are major manufacturers and distributors of farm equipment worldwide.

HFI started its ergonomics program in 1990. And in 1993 we hired Dr. Jeff Fernandez, an ergonomist with Wichita State University, to enhance our training and advance our ergonomics program. The video we are presenting today was produced under the direction of Dr. Fernandez. We chose to show our video today so that instead of me telling you about our program, you will be able to hear it straight from our employees.

If we could start the video.

(A videotape was then shown.)

MS. LE SAGE: We believe that we have a very successful ergonomics program. And some of the keys to our success first of all would be management support. If you don't have the support of your line supervisors, your production foremen or your general manager, your ergonomics program is not going to be as effective as it could be.

Second would be training for all employees. If your employees don't understand the ideas or the concepts behind ergonomics, they aren't going to be as willing to participate, which brings me to employee involvement. Your production workers out on the line know their job better than anybody at your facility, and they're the ones who are going to give you some of your best ideas on how to correct their work area.

That concludes my presentation. I will turn it over to Brad. Thank you.

DR. JOSEPH: Do you have any quick questions? We have time for about one. But we will still have time at the end, so --

We have a question. I'm sorry. Go ahead.

MS. : Did either of your companies find any value in using employee symptom surveys or employee questionnaires?

MS. LE SAGE: Yes. That's one of the first steps that we do when we do a job analysis. If somebody has a problem in their work area, a lot of times somebody will be having -- they will spot a problem in their area, and they might not be having any physical symptoms. Sometimes they are -- it depends, but yes, we find those very, very useful.

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Bradley Joseph, Ford Motor Company

DR. JOSEPH: Okay. By the way, that slide I was obviously a lot younger. That hair was darker in that slide.

I am Brad Joseph. I work for Ford Motor Company. You may have heard my boss up here earlier today. I am their corporate ergonomist. I work out of occupational health and safety and industrial hygiene, and my responsibilities are very similar to these folks' responsibilities.

And I have a corporate program. And recently we have expanded that to global, which is a real interesting exercise in itself. We are trying to expand into global, not to say that we weren't doing it before, but I think we are trying to look at a process.

I have to get a definition here. One of the themes of this conference is best practices, and I really thought about that quite a bit. And we are doing a lot in the company right now with things called lessons learned and best practices. And what we consider a best practice is a process or system that has been piloted and shows to add value to an existing process. Not necessarily you have to start all over. I know a lot of companies like to say, well, that doesn't work. Let's start over. Let's just crush what we have and rebuild the house. And that's kind of crazy.

And then once determined to be a best practice, it should be replicated throughout the company. And replicated has its points. Is it exactly replicated in Germany as it is in the United States or Canada? No, I don't think it is, but something, some elements, are replicated.

And I also think best practices in most processes are successful when they are small, incremental steps, not major -- just sort of an evolutionary process, not a revolutionary process. And that's going to be my theme today, as soon as I get this slide thing to work.

I want to start out with the logo, because I think it is kind of an important logo. You see our process is a joint process, and the theme of that logo is UAW/Ford ergonomics process. And I want to just give a little background into it and then explain some of the new or best practices that we are doing, some of the new things.

I think successful implementation of a process in ergonomics -- you have heard it up here and you heard it this morning -- involves a number of areas. You just can't look at one thing. You must look at both the technical or capital intensive part and the human resource and people part of the process. There is the people part of the fix.

You talked about the employee training programs, that look for problems in the workplace. We have a similar thing called guidelines, responsibilities and safe practices at Ford.

I think the bottom line of the program -- you have heard it here twice now, and the third -- I am going to say it a third time -- is people. And this is our mission values and guided principles. I know you can't see the unhighlighted part, but that was intentional. But one of the values of this company, of Ford Motor Company, is its people.

And as my boss and other folks said this morning, without people, you don't have a company. I don't care how much automation you put into the system; you still have to have people running it. And we find that a lot. Some of our engineers, some who are not adequately trained, don't think that way, but we are slowly moving that needle.

There are four basic personality types that I always like to talk about. These are the -- and I think this gets into the people issue. There is the people who think the glass is half full, the people who think the glass is half empty, the people who really can't decide and the person who really just wants a cheeseburger and doesn't really care.

And I think the bottom line of it is that we really need to look at our people we are involved with. And I think you saw in the videotape that those are people who want to be involved. I don't think these programs can run by elected people. I think they need to be people who want to be involved and are picked because of their involvement and their caring.

It also needs to look, quite honestly, at the plant operating organizations that we pull together. Ford's plants, if you look at it, are little cities in themselves or microcosms of the big company. In our plants there is -- this is a fairly generic organization chart, but most plants are separated like this. There are production areas and A, B and C. There could be more than that.

Then there is the support functions like quality control, finance, purchasing, engineering, employee relations and production. And really, a lot of times you focus your ergonomics programs on the employee relations side, and I don't think that -- I think that's a mistake, too. I think we could probably help run it, but we don't build anything in employee relations. We don't design jobs. We don't fix jobs. We tell people -- we tell the engineers when they have a

problem.

So we have really got to get out there and work with the production people. And that's what I think the big difference is in where we are trying to go.

Ergonomics is sometimes a buzz word. For example, the office chair. What is the office chair today? But even if you do get the best office chair -- and these are not office chairs, by the way -- even if you do get the best office chair, you need to train people in how to use it. So there is always another people component. I think there is later on this afternoon ortomorrow a session just on training, which I think is very important, because without training, you can't have a good program without a good training process involved in it.

And this is a slide I got from one of our folks in Australia. He thought it was kind of funny when I was down there. It says, "You've got one of these kneeling chairs. Yes, indeed, my friends, it's time we joined the 20th century. The Danes invented these chairs years ago, totally ergonomic, far superior to the regular chairs. All of Europe uses them." And then the next slide is the Danes talking. Underneath is the interpretation. "Those silly Americans, they'll buy anything. I know. Let's take the Mueslix we feed our goats and sell it to them as breakfast cereal."

And the bottom line is that, you just can't make this fix of the month. You heard a lot of consultants being brought in up here, but you notice the consultants were not the program. These folks were the program. The consultants were helping the program. That's a key issue.

This is a really tough slide to see. Ford has a strategy in place for the year 2000. On the left-hand side -- I will just read it to you. We have a proactive process that deals with product design. In other words, we want to design our products to be friendly; to build, -- that's proactive number one. I don't know if you can see that. But proactive process means that we look at our products to see if they are easy to build.

Product design really sometimes drives the manufacturing design. So one of our main efforts right now is to look at current products, see if we can fix those things to make sure they are easier to build. Once we do that, we want to lookat the process design, where we look at our manufacturing systems. And our primary focus here is the design and production systems, new production systems, so ergonomics solutions are into the design, its initial design. So we are like two years out before job one, talking to our engineers about that.

And the third and final is a reactive process. If you miss some issues, you also have to fix them. And we spent a lot of time the first five or six years looking at the current production process and finding and fixing those things. And you really have a limited amount you can do with that.

Our current process, this is our reactive process, was put together back in 1988. It had three major phases: process start-up, job improvement cycle, and long-term development. Process start-up was how to get the thing going. When you are launching 60 plants in the United States

simultaneously -- well, within a 6-week period -- you kind of have to have a blueprint for the plants. And what we did was we put together a system where everybody started the same way. And the first step was management commitment. The same thing everybody else said up here.

The second step was identifying the -- we call them our local ergonomic committee, sort of the plant committee. It is called a local ergonomic committee. We had to select those people; not voted, they're selected.

The third thing was training those folks. The fourth thing was writing a mission statement. Boy, that was hard for them to do. That still is hard for them to do.

And the last section was developing a teamwork process. Throwing people into a room does not make a team. If you don't believe me, take a look at some of the football teams that are out of the playoffs right now. They are still pretty high-paid athletes, and I am sure they are pretty good athletes, but a team is different. They are the ones who win. So that's the process.

The second step is a job improvement cycle, and I think this is the core to our whole system. And you heard actually one of the persons on the tape talk about their job improvement cycle, identifying priority jobs, evaluating job stresses, developing and implementing solutions, document and follow-up. So that's the process that we use.

So once something is identified -- and there are a number of ways of identifying things -- then they have to be evaluated. They have to go through the cycle and things are documented. I don't spend a lot of time on this. This is kind of old news.

Does it work? I will give you a couple case studies. Cleveland Engine One, this is a more reactive plant. Sixty percent of the time was spent on reactive changes. Proactive, new equipment reviews. All plants get new equipment on a regular basis, but this particular plant spent a lot of time on -- it had an older product line, building an engine that has been around for a few years. So they really spent a lot of time looking at the existing process.

And I think the outcome of this was, this is the results from the Bureau of Labor and Statistics, and everybody, you know, shows how the auto industry is going up. Let's look at this plant. The rates are going down.

Now, our numbers in our industry start out higher. I know someone in the corner over there asked about what your normal injury rates are for an industry. They are down to ten. Maybe that is our baseline. I'm not really sure. But I am real happy with progress, not necessarily the total number. And I think that is something that is pretty impressive, an 80-percent drop in a few years. So we are pretty happy with that one.

The other one was Cleveland Engine Two was primarily a proactive process. And in that particular case, they had an opportunity to pretty much gut an entire engine plant and start over.

They still had the four walls, but they had a lot of opportunities to fix it. And they are going to build a new engine called a Duratech V-6, which is a new class of engines used in the Taurus, Sable and the Contour. And they had pretty much total control over the new production systems.

They had a goal that was developed pretty early: develop a healthy, efficient and quality work method which provide the team members -- they didn't call their employees anymore -- team members with the proper tools to perform the job in an injury-free work environment. Interesting concept there.

The proactive approach. With the new facility, Cleveland Engine Two, CP2, developed and installed equipment with ergonomics as one of their prime considerations. Original equipment manufacturers were trained, just like PPG, trained in a two-day ergonomics course that we provided. And ergonomics check sheets, we have very simple check sheets, nothing fancy. It wasn't a 40-page check sheet, but it was about a 2-page check sheet that was really a reminder list. Some people call them a tickler list.

The idea is that they are reviewed at four different stages in the production development process. One is during the concept stage when the drawings are done. One is during design. Well, actually concept is earlier than the drawings. Concept is when you are just thinking what you really want to look like, howdo you want this plant designed.

One is during the design phase when you actually put the pencil to paper, one is during the run-off when the equipment is actually built, and finally at launch. And they still found some problems, but I think the interesting thing about it is a couple other areas.

Before equipment was designed and built, they identified 29 hourly employees that are skilled and production workers -- were picked, were trained in ergonomics and took the knowledge and their expertise and applied their simultaneous engineering. They were part of the team with engineers.

The V-6 engine, the local ergonomics committee was formed two-and-a-half years prior to job 1, and the team was trained and used their experience to use the paper and pencil approach. A lot of people get into high class computer systems. I have nothing against them. They are fine. But they just use a paper and pencil approach, just some quick check, because a lot of things are done very quickly. You don't have time to put together a huge simulation model or something like that. Although things are getting quicker in that now.

The results. In the first 18 months of production, they had, I think it was, one lost time injury. Actually no lost time injury. In the first two-and-a-half years they had like --I think they had three ergonomic injuries in a production plant that previously had, you know, ten per hundred per year.

An informed and educated work force. The team developed work methods described in a QOS fashion, quality operating system. The actual team designed their own work methods and focused on safety and ergonomics as a core element. So those were listed as part of the work methods. And the LEC continues their regular review of components. That doesn't necessarily mean that people aren't getting injured. They are not recordable injuries, and they are putting them back on the job because they are fixing them so quickly. And I think you mentioned the idea of medical management and management of these injuries.

Well, the issue was it is a very interesting way for us to think.

Could you lower that one down, because this one --actually, that's pretty good.

This is -- now we get into the best practices, and this is the Eskimo rescue team. And what happened is their igloo fell over, and this guy has a flame thrower. And they are telling the guy to scream when they feel the heat. That's not a best practice, by the way. I just want to let everybody know that.

This is not a best practice either. This is two ways to stop a runaway stagecoach. One way is you hop on the horses like John Wayne used to do and stop it. The other way is you shoot the horses.

And I don't know. You pick your best practice. I guess this way may be unsafe, but this way you don't have any horses left. So either way.

This is a process -- now you have to brighten it back up. I love these video things. Keep that guy busy up there.

This is a process that we use at Ford to define our system. And I just want to explain it to you just for a few seconds, because it really is the core of what we are doing. This gets into our best practices core elements.

If you look at a system, and ergonomics is a system, It has a box around it.

What you have is a system here, and the system --inside this thing could be anything in the world. It could be building glass in a float line. It could be building a car. It could be a body shop in a plant. It could be anything. But the system has certain outputs, and those outputs have customers, and the customers have a need and a want.

And the other thing is the process has an output. It is called a voice of the process and a voice of the customer. And the point of this system is that we can look at the system very directly and find out what is going on, what works and what doesn't work. And that is what we are trying to do in ergonomics. Ergonomics is one of the core disciplines of health and safety, and we want to make it one of the core disciplines in the engineering system.



One of the things we want to look at is outcomes. And a lot of people focus their programs on outcomes, and I don't have a problem with that. But I think we sometimes focus too much initially on outcomes. Outcomes are things like people outcomes, employee up time, injury and illness statistics, workers' compensation, sickness and accidents, and so on.

And those are very good measures. I think that is a measurement of success. But as some of the other speakers talked about, there are other outcomes of these programs we should be concentrating on, like the manufacturing process, quality control and throughput and scrap rates. And sometimes these indicators are quicker to identify a problem than other indicators, like injury and illness. Injury and illness and trauma takes time. Then there is the product outcomes, like manufacture, building the product, assembly, feasibility and so on.

The other side of the coin is the process, the voice of the process. And the voice of the process are things like ISO. Everybody probably thinks they either love this word or hate this word, but ISO 9000, say as you do, do as you say, and prove it. And I think -- to be honest with you, I think it is a great system. I know it is a paper-intensive system and it's a lot of work, but it really forces you to think about what you are doing and how you want to do it. And we have had a lot of discussion with the last contract with the UAW about where we are going with this.

My feeling is this is how these systems should work. Let's say you have resources, a limited amount of resources, devoted to some initiative. Tom Albin this morning talked a little bit about the initiative of ergonomics. Should we have gone with the current process of health and safety, or should we have its own initiative called ergonomics, a focused initiative? Well, Ford chose the same way, a focused initiative, as these two. And then as you design a system, as you design this system, you have a system development, you have a transition, and you have a stable system. And quite honestly, we spend a lot of time looking at outcomes initially when a system is being developed. My feeling is we should look at process more. We should pay a lot of attention to are we doing what we say we are going to do, because if we don't do that, your outcomes aren't going to happen.

So our feeling at Ford is that we want to look at the process itself, spend a lot of time on resources and focus looking at the process. And then as time goes on and the system becomes stable, we will look more and more at outcomes. And that is where we are. We are kind of crossing the threshold right now is where we think we are.

Now, don't hang me up on this. Is this line this way or curved this way? It doesn't really matter to me.

One of the ways we are measuring this is through a new process audit. We call it a process measurement tool, but it's an audit nonetheless. And we have an element in our health and safety system I will call element 21, which is ergonomics. Obviously there are 20 other elements in there.

And it has three sub-elements. One is developing global strategies, two is managing events, and three is prevention. And what we try to do now is develop stretch objectives --, every three years we are going to update this audit, and we are going to force our plants to get a little more involved, a little more stretched each time, push the envelope of where they are.

Right now with the old audit we had, they are all scoring 99 percent. Now they are scoring 50 percent, and the plants are going wild. What happened? Well, we are stretching you a little bit now. We are starting over from where we left off with the last audit.

That doesn't mean they are doing anything worse. It is just that we moved the target. There is nothing wrong with that, as long as they understand what that means, and leadership reacts appropriately.

So there are three elements: global strategy, managed events and prevention. What I want to do is just talk a little bit about these.

Our past audit was very output based rather than input based. We looked at a number of jobs that people fixed, reduction in CTDs in plants. And the current assessment is input based. Is there a written process? Are our actions effective? We really went to the ISO 9000 route, because that is the way we were going at Ford.

The ergonomic goals. Develop a measurement system that evaluates ergonomics process. We want to guide the facilities to the stretch objectives and document the global process. And that way, also, we have one document we are looking at globally. This document is used globally now, and the corporate ergonomics within our Ford production system.

I talked about the sub-elements within element 21. There are three, and these are the point totals. There are more points towards prevention and managing events than global strategies. There is a lot of debate. Should this be the highest? At this point, we said let's leave them equal to the managing events. We still have a lot of problems out there.

Let me give you some examples. Global strategies. There is a question that was asked in the audit: Is there a system for identifying and interpreting regulatory requirements that will impact ergonomics at the site? That is a question that is asked at the plant. And the plant goes "What do you mean?"

And we say, "Well, do you have a system in place? Do you have a system that when we send down information about regulations, you can't hide and say you never got it. Do you have a system to interpret that and look at it?"

And if the answer becomes a consistent no, that is a signal to corporate that we need to provide the system. If the answer is yes, the plants can do it on their own, and that is resources we don't need to spend at corporate. The plants have it handled. And that helps us define our next strategies. It has been really useful.

Another question asks “has a site development action plan to ensure that ergonomic goals and objectives are met.”; And we are not talking about these very high action plans like world peace and everything. We are talking about action plans that say: Can you measure it? And those are hard.

Managed events or managing events. An event is any job that exists on the plant floor. So this is our reactive process. Is there a systematic procedure, system procedure, to convey ergonomic concerns to the local ergonomic committee, which includes those three inputs.

Now some plants may feel that proactive risk analysis or assessments are more important than reviewing medical records. They have to have a good reason for it. That doesn't mean they are wrong. It just means that is their culture.

So we have -- we allow them that freedom, UAW/Ford, at a high level, but we just want to know why, and we want it done for the system. And that is a tough one. How do you do that? How do you prioritize? Boy, we have been spending some time on that one.

Managing events. By the way, the plants have come back to us on that one and said, "Could you come up with a scheme for us, because we are having trouble with it?"

Managing events. Are analytical tools used when conducting work site ergonomic analysis? And we kind of ask ourselves: What tools should we use? Should we come up with the toolbox, or should we come up with other -- or let them come up with their own? We decided to come up with a base toolbox and let other tools come into the system and we will review them. Some of the tools, as long as they are published, I think they are pretty good. But some of them are pretty hard to use.

The last one is prevention. Are ergonomic reviews conducted by cross-functional teams? This is on new equipment. Specific ergonomic teams for new products. And that is a good question. It is like, well, how do you judge that? That is actually a professional judgment question. You can't really say: Show us exactly what you do.

Is there a system which ensures that ergonomic reviews take into account historical data, analytical tools and worker input? What we want to see is how do they do it. And these are just a couple of the questions. There are several others.

Another best practice I want to briefly mention is our ergonomic action guide. This, I think, is a new phase for us, and this gets us back down to the plant floor. This is a little lower level. And what we did -- I know you can't see this because of this video thing. But what we did was we gave --employee training (GRASP) couple years ago. We decided to retrain, I should say, approximately 100,000 hourly employees in our ergonomics process.

So we are this year and late last year starting to redo it through another program called guidelines, responsibilities and safe practices. Basically, it's a refresher training. And one of the

things we launched during that process was in this action guide. In the action guide is a flowchart. And I think the neat thing about this flowchart is it tells the employee about how they need to get involved.

It was very difficult to contact 101,000 employees. I mean, I can be on the phone all day. So our differences were to really get down to the plant floor and let the plants tell them how to do it.

Give you some ideas. Basically it says we want the employee to look and listen to their job. We want them to ask is there a problem with their job? Not necessarily is there a medical problem. Everybody goes: Oh, my gosh. Everybody is going to say there is a problem, and we will have all these issues to deal with. It didn't happen.

And then what are you going to do about it? Can you and your supervisor fix it or are you going to send it over to the local ergonomic committee to fix it? If you decide to go ahead and fix it, we want you to improve your job, use it and ask yourself is it better. And we want you to be involved in that process.

If you decide you are not going to be involved, you are going to send it over to the local ergonomic committee, one of the things you need to do is report it to them. The ergonomic committee will prioritize it, and then they will fix the job. And if they do decide to fix the job, you need to stay involved. And we tell them how they need to stay involved.

A lot of times some of our employees are saying: Well, I told the guy, and now I'm just waiting for a solution. They can't do that. They need to stay involved. They need to be involved in the entire process.

One way is they need to work with the LEC representatives during the evaluation of the job. They need to talk to the employee. We don't necessarily take the employees off the floor with a videotape; sometimes we do. But they may have a team go out to the floor and ask the employee right on the spot what's going on.

When they implement changes or when a design changes, they need to be involved with their ideas. Maybe they have the idea already. Maybe they have a great idea. Why reinvent something?

And then, once the change is in place, I think one of our biggest problems is make sure you give it a fair try. Don't throw the thing out just because it wasn't totally your idea. We have had employees say, "Oh, I don't like it. I'm not going to use it." We could build a museum with articulating arms that aren't used out there. And I don't think that's right. That's resources that could have gone to other jobs. So we are really trying to work hard to get those people to try those things.

I think one of the greatest accomplishments of best practice we had in our process was the

integration of ergonomics into our Ford production system. A lean, flexible, disciplined, common production system defined by a set of principles and processes that employs groups who are capable and empowered people. Those are empowering people learning and working safely together in the production and delivery of products.

The audit you just saw is part of the Ford production system now. They actually help audit our plants, which I think is one of our biggest accomplishments over the last couple of years.

The last thing is risk assessment. Ford production system demanded that we look at risk. How do you define it? We define risk as severity times occurrence equals risk. So the occurrence times the severity equals a risk.

And we wanted to look at risk in a couple ways. The assessment of the risk of the health on the operator. Can we look at tools to assess the risk? And we are starting to just begin to do this now on all of our jobs.

And then we look at the occurrence, the likelihood that a health effect will occur based on that exposure. Based on that, we are looking at a risk priority numbering system, and we are piloting one right now.

So jobs that have high priority will be getting more resources quicker than jobs that have low priority, because there is always competing priorities out there. There is not enough money all the time.

This gets into the issue of surveillance. I am sure you will hear a lot about surveillance. Somebody mentioned the issue of checklists and symptom surveys. We have found that not one of them is the best. There are some that are better than others. This risk priority is where we think we are going and it's not going to be a complicated formula.

I think one of the last things I just want to mention very quickly, to get information out into the field at Ford, we have an annual ergonomics co-chairs conference. We invite all of our local ergonomic committees co-chairs and two alternates once a year to, they love this place, Detroit. And we talk about issues for three days. One of the days is devoted entirely to breakouts with their divisions. The other two days are general session and a concurrent session like you see today.

And what we found is ergonomics really isn't a rocket science, we don't really need to be rocket scientists. It's time we really face reality. I have heard enough of this. We can proceed with ergonomics programs with the information we have.

I think we have proven it. You saw two cases here. You saw a third case with myself. I think you are going to see about four or five other cases today, if you just go to any of the general sessions. It works. It helps your production systems. It helps your competitive advantage. And

more importantly, it helps the employee.

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### Question and Answer Session

DR. JOSEPH: Okay. Any questions? We have about ten minutes. I would like to kind of go over here now, and we will pull together any questions and answers.

Q : At the Ford Motor Company, I would think that your worker's compensation administrators and even the United Auto Workers' workers' compensation representatives would have a large body of knowledge about injuries. Are there any plans to get them active in the local ergonomics committees?

DR. JOSEPH: They are. They are involved in the ergonomics committees. In some plants they are more involved than others. The team has -- the original team members were eight people; four union, four company. And the workers' comp person was not initially involved in that. Now with the changes that have gone on in the process, we have had -- the teams have increased, and workers' comp or health and safety have been involved, other groups in health and safety.

Anybody else?

Q : Brad, do any of you, any of the three of you, see workplace stretching as a viable situation to enhance your culture?

DR. JOSEPH: Sandy, why don't you take that one?

MS. LE SAGE: He told me he was going to do that to me.

I think a lot depends on your work environment. When I was at a packing industry, stretching, I believe, helped. I believe it made a difference. We were able to do it there. It worked real well.

At Hay and Forage, because of the way it is set up and so forth, we can't really do it on -- you know, shut down the line and do it like we did it at the packing house. But we still give information to our employees about stretches. In our monthly communications meetings, we have covered back stretches, different hand stretches that they can do. And so they have the information, and I do believe it helps.

DR. JOSEPH: I would like to add to that. I think where you have a lot of control over day-to-day actions in the workplace, not an assembly line, basically like an office place, we find those systems work pretty well because people can stop the work, do something and do that kind of stretching. We actually have some videotapes for folks in the office that we are trying to work

out to see how those work.

In the assembly plants or places like that, where the work is pretty much driven by a line, it is a little bit different and is difficult to do. I know some of the Japanese plants have tried to institute it, Mazda being one down at Flat Rock. And they had some trouble. Again, it is a cultural thing with the employees or whatever. And I don't know the success of it.

I think ultimately, though, we are dealing with the issue of employee wellness. And I think there are wellness programs that fit real well into these things, which includes employees' wellness in terms of fitness and we have health. We are beginning to get on-site rehab centers at some of our plants. We are piloting those. We are also putting in exercise units in our plants so when people can -- you know, they can come in early or whatever, and they don't have to pay a fee to go to an outside source for a work out. And I think those have shown to be pretty successful, too. So it is there, but it is not directly, like stop the line and do an exercise. I don't know what the impact of that would be.

Yes?

Q : Have any of you come across a job that, despite your best efforts, you just could not relieve the stress to the employees, you know, a job that was really causing serious injury?

DR. JOSEPH: I will give that one to Larry. We are never going to admit that. Yes, we all do.

MR. KREH: Yes, we all have cases like that. The one that I have to deal with on a regular basis is the warehousing operations where we assembly orders, what we call order picking, where you have pallets of materials in racks, a and the employees have to assemble these orders. And there is really no opportunity at these facilities for job rotation, because 95 percent of the people there do the exact same job every day.

That has been an ongoing problem for us. And other than spending a tremendous amount of capital, I don't see that problem going away shortly. That is the one operation that we have where we have had some success as far as stretching and flexing first thing in the morning, our warehousing operations. That is one thing that has worked at those facilities, as well as some other training and education.

MS. LE SAGE: I was just going to say that I think any company who has an ergonomics program has run into that, that one job that everybody has looked at, maybe you put a fix in, it didn't work, you try something else. I guarantee there is going to be one that is going to give you a headache.

DR. JOSEPH: I think the answer is always yes. And I think the bottom line is why. Is it because you are going to change the job next year and it is too capital intensive to say let's do it and let's put some interim solution in now? Or is it just technically impossible to change it? And I am not sure where you are going with that.

I think there is always a solution out there. It may just be so expensive or whatever, it is very difficult to implement it. And you have to ask yourself the question: Is rotation going to increase exposure to more people or is it going to solve your problem, and other kinds of things to deal with it, because which is better, solving one big problem or solving 40 little problems? And I don't know the answer to that. I would never get up here and say which is better. But I would tell you that ask 40 employees, and they will tell you.

You had a question.

Q : What process do you have in place to ensure that information about different ideas and improvements that have been implemented is shared across the different units and divisions?

DR. JOSEPH: Do you want to answer that as a division person and I will answer it as a corporate person?

MR. KREH: That's fine.

We have annual meetings or semi-annual meetings with the people, as Brad indicate, with their ergonomics committees and get together. We call it success sharing meetings where we bring ideas together. And as part of those meetings, we also bring failures forward and see if anybody else is addressing the same things, so we can share resources to work to a common solution. So yes, we do have meetings where we share successes and work on common problems.

DR. JOSEPH: We did a couple things, one, the videos like you saw here. We have a video library that we are working on. That has been somewhat unsuccessful just because there is always a barrier because you have to have someone order the video up and all this kind of thing.

Ford recently has introduced the intranet to the company, not the internet. And one of the things we are doing is we are automating. We have a thing called an evidence book. Most of the things in that are audited are in the evidence book. And all those things now are being computerized. We hope to have it in next year -- this year, excuse me.

And there will be a process where those solutions go to a lessons learned system that already exists in the company. Like quality control has a lessons learned, like don't design these things again because they fail in the field. Well, we are going to do it for health and safety and especially in ergonomics. And then we are going to take those, and some of those become best practices. And a team of people we define as best practice people define what is a best practice.

And that's going to be done technically through a computer system. Non-technically, we do very similar things with the annual ergonomics co-chairs conference and things.

Yes, sir?



Q : Yes. I am wondering for all of you how your plants, companies, organizations have dealt with issues of work organization. Most of what we have talked about are issues of changing biomechanical stresses so far. And I realize that you are already addressing work organization issues by improving worker participation and having the teams and all.

I am wondering if the teams themselves find themselves focusing on the other issues of work organization: autonomy, skill use, social support. I am wondering if that comes up in the process of these activities that you are doing?

DR. JOSEPH: There is -- I think, first of all, all these programs have a work organization component to it. I think if you have technically changed a job, put a lot of capital, you still have to train the employees. So that's a -- in my mind -- this is a very simplistic view -- that is a worker organization issue right there because you are changing the employee's perception of the job and things like that.

The other thing you are going to need to do, I think, in terms of work organization is you need to have the employees involved in the decision-making process. So that is something we are doing with the employee involvement.

And the third and probably the most important component is to inform the employees of what the process is in terms of how they get their information to the right people at the right time.

I guess there is a fourth, and that is, once the system is in place, maybe work organization, like, for example, you talk about rotational schemes. There is pay for knowledge out in the plants, in some of our newer plants, where the people learn new skills. They are put together as a team, and then they can move around that line based on their knowledge and skills enhancements and things like that. So those are going on, too.

But we always concentrate on the technical side first. We want to eliminate the problem from a technical capital perspective and then worry about the organizational perspective, because we think the organizational thing can fail. Let's say somebody says: Well, I'm not going to rotate. Then you always have that person being exposed again. And that is easy to -- it is like putting earplugs in versus getting rid of the noise. It may be simple right now to put earplugs in, but then you have to go through the yearly hearing tests and all this other kind of stuff. And it gets more expensive as time goes on. Get rid of the noise, and it's gone. So that's -- you know, it's a marriage, but it is parts of each.

You were next, unless somebody else wants to comment.

Q : To piggyback on that, your thoughts about differences between union and non-union environments to try to do some of this, particularly with respect to issues like job rotation.

MS. LE SAGE: I really don't think that you will find much of a difference if you are union or

non-union. We happen to be a union plant. When we started our ergonomics program, our union was involved right from the beginning. The union vice president happens to also be a peer team member.

And like I say, coming from a union plant, we haven't seen any problem. Like I say, it is win-win for both sides, and there just really haven't been any issues.

MR. KREH: I have both union and non-union facilities. And as Sandy has indicated, you have to get the union representatives involved up front and get their buy-in much like you have to get employee involvement up front. The facilities which have succeeded are both union and non-union. When ergonomics processes fail it's usually not because of union problems or union issues. There are usually some other underlying problems that cause the ergonomics team to have problems up front. In most cases the union is asking for ergonomics. That has been my experience.

DR. JOSEPH: I will answer it as obviously most -- all the Ford facilities that I deal with in the U.S. are unionized. And we very early developed it as a partnership. And it's funny. Sometimes my partner actually usually makes these speeches with me. And occasionally we will sort of dress differently. He will dress as a union -- I will dress as the union guy, which, you know, you don't wear a tie, and he will dress as the company guy. And the people will walk up to him and say, "Mickey Long, as the company guy, what do you think?"

And I think that is intentional, because it is a win-win situation. And I think it is important that you understand that. There is not an easy answer. I don't think there should be any differences. You need to involve your employee representatives. There is always -- if you have a non-union plant, you still have employee representation of some sort. You couldn't run the plant without somebody who talks to the employees. So you need to get them involved up front. And I am a great advocate of employee involvement and empowering the employees. I think they know more about the job than I ever will because they do it every day.

One or two more questions. I think you were next, sir.

Q : Brad, this is one more directly to you, perhaps to the other two people as well. In the automotive industry you do an awful lot of work with suppliers supplying parts and materials to you. How do you partner with some of your suppliers? And what efforts are in place or taking place to help bring materials in that are packaged properly or in some fashion used to -- used in the plants.

DR. JOSEPH: There are two groups of suppliers. One is equipment suppliers, which I talked a little bit about, and then you are talking about tier one product suppliers, like seats and things like that. We work very closely with them.

In our assembly plant, which is the final destination for most of the products, because that is

where we are assembling the vehicles, there is a team generally in most of the plants that has to approve most of the packaging. I don't know. Maybe you have been part of the wrath of those teams and maybe not.

Obviously, the better we are in terms of moving it upstream, the better for the suppliers, because it is kind of silly for you to design or a supplier to design a bumper mechanism or something to hold bumpers, and then we say: Oh, we can't do that. That wastes everybody's resources.

So our goals have been to get the suppliers and move as part of the team as early as possible. And we are not 100 percent successful at all in that. There are just too many parts coming in. Even our internal suppliers, our own divisions within the company, are not. But we are getting better, and we have some really good case studies of that.

I guess the issue is yes, you want to partner with them better and better.

The last question, I think. Yes?

Q : You alluded to the fact that you have been trying to commit this program globally. What are some of the challenges that you have faced in implementing these programs globally, and how have you addressed those?

DR. JOSEPH: I think the first challenge is language. And that is, you need to have funding to translate it, and make sure it is translated accurately. And very, very close to that is culture. They do operate differently in Brazil or other countries. The people operate differently. They think of people differently down there in terms of how they work together and things. The structure, the family structure, is different. You know, everything. And it is not one big melting pot.

So because of that, you need to be very aware of that before you walk in. And when we have changed -- Ford Motor Company really changed its organization, and we had a thing called Ford Automotive Operations, FAO. The Europeans used to call us "for Americans only."

And the reason for it is because, you know, we thought we knew everything. You don't know everything. They have been operating successfully in Europe for years. And so you need to go in there and be a used car salesman, we find, for a number of years. And it took us a year to convince the Germans for example, this is a good process. But boy, once they were convinced, man, they ran away with it so fast, we are having trouble keeping up.

And that is what I think the deal is. You need to convince them like you convinced your own management initially. And talk -- I don't speak the languages, but you need to be aware that they -- they will try to speak English and work with you and things like that.

The other thing is commonality. Be ready to break some of the commonality but keep your core

processes in order and be ready to defend them with good facts. A lot of times they will say, "Why do you want to do that?" And you don't have a good answer. And so you need to have a good answers for why your core disciplines are kept intact, and then you let the variations occur on the periphery. And that has been very successful with us.

Have we been completely successful implementing it worldwide? No. But we are getting better. We are in Canada, Mexico, Germany, Britain, and we are just beginning to go into France and Spain now. And Australia is kind of getting close, too.

Well, thank you very much. I hope this was as good a session for you as it was for us.

If you have any questions, we will be up here for a few minutes right now before lunch.

(Whereupon, the session ended.)

# Construction

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Scott Schneider, Center to Protect Workers' Rights, Chair

MR. SCHNEIDER: Welcome to our construction workshop. Thank you for coming. My name is Scott Schneider, and I am the Ergonomics Program Director for the Center to Protect Workers' Rights, which is part of the Building Trades Department of the AFL/CIO. And our project is funded from a cooperative agreement we have with NIOSH.

When I first started speaking about construction ergonomics about four years ago, people were confused. It seems strange to use both words in the same sentence. Ergonomics was thought of as a meat packing problem, a data entry problem, but nobody really thought about it in terms of the construction industry.

Now there are a lot of researchers studying construction ergonomics, and more and more contractors are getting involved. And the industry as a whole has become interested, and this is not surprising. Just as an indication, let me tell you in terms of the research going on, we have 49 presentations on construction ergonomics planned for the International Ergonomics Meeting coming up in June.

One of the reasons people are in it, as you can see from the slide, about 37 percent of all lost workday injuries in construction are sprain and strain injuries costing billions of dollars a year.

Secondly, you can see that if you look at the sprain and strain injury rates, by industry, construction has the highest rate of sprain and strain injuries of all industries other than transportation. In other words, your chances are about 1 out of 50 each year if you work in construction that you will lose work because of sprain and strain injury.

We know the risk factors that are present in construction which cause injuries: manual lifting, repetitive use of hand tools, working in awkward postures like overhead or at floor level, exposure to vibration, whole body and hand/arm, temperature extremes and fatigue from production pressures and the pace of the work.

And we also know what some of the solutions are: using material handling vehicles, carrying handles, changing work postures, using scissors lifts for overhead work, changing the design of tools and equipment, better work organization, ergonomic training of workers and supervisors and personal protective equipment.

So the purpose of today's workshop is twofold; first to see what contractors have been doing to prevent sprain and strain injuries on their sites, and secondly, to look at how changes in the

industry may have an impact on reducing sprains and strains.

We are going to start by hearing from two contractors or contractor representatives and then hear from a panel of workers and researchers about individual trades. We hope to keep the presentations short, about 10 or 15 minutes each, to leave about a half an hour for questions and discussions at the end. So please hold your questions, and we will make sure we get to them soon.

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Stuart Burkhammer, Bechtel Corporation

MR. SCHNEIDER: Let me start by introducing Stew Burkhammer. Stew is the Vice President and Manager of Corporate Environmental Safety and Health Services for Bechtel Corporation. He is a 34-year veteran there. In January '93 he was elected Vice President of Bechtel, and in January '95 a Vice President and Director of Bechtel Construction Operations.

He is a registered professional engineer, certified safety professional, and occupational safety and health technologist, member of the American Society of Safety Engineers, and currently on the board of directors of the Board of Certified Safety Professionals.

He served for five years as chair of the National Constructors Association's Safety and Health Committee. He is also chairman of the board of the Safety Equipment Institute. And he is on his second term as a member of the OSHA Advisory Committee on Construction Safety and Health where he is the chair of their Ergonomics, Fall Protection and Standards Reform Subgroups.

With that, let me give you Stew Burkhammer.

MR. BURKHAMMER: Thank you very much. You are going to have to bear with me. I caught a terrible cold Sunday night, so mine will be really a short presentation. And it will be shorter if I lose my voice while I'm talking.

It is really an honor to be here today to talk to you about a problem that for a long period of time I've been addressing and talking about. It is a serious problem in the construction industry, and that is musculoskeletal disorders in the construction industry.

And early last year, when Assistant Secretary of Labor Joe Dear came to the ACCOSH committee and said, "We would like you guys to develop a construction ergonomics standard," and the chairman, Knut Ringen, looked around and said, "Get going, Stew. When are you going to start?" So I got stuck with the job as chairman of the work group, which was quite a challenge, to say the least.

The work group compiled a lot of studies and information and did a lot of research. When we made our first presentation to ACCSH on where we were going and the standard that we had been asked to draft, we got quite a response from the industry. Twelve people came in and asked to speak on the subject, and they did. And they basically told us that we were all wet and we had better go back and get it right or don't do it at all.

So shortly thereafter, Congress put a kibosh on ergonomics and the moratorium was set, and we couldn't do any more work. So we gave what we had at the time to OSHA. As Linda or Peg said this morning -- I think it was Peg who said that in October they lifted the moratorium, and the work group is back in business.

I am going to be sending out letters inviting a lot of people to participate and join us. Hopefully they will. I think the more people working on the problem and addressing the issues and helping develop the construction standard will make it better.

We are not calling it ergonomics because I think in construction it really is musculoskeletal disorders. Here is a cartoon that I found that depicts the problems that I think we face in construction: vibrations, bending, stooping, kneeling, lifting, squatting, twisting, wrist motions, shoulder motions, neck motions, knee motions, elbow motions, wrist motions, and the list goes on and on.

I know a lot of people who are not in construction are tired of hearing me preach this issue. But construction is different. It is not your average manufacturing facility. It is not an automobile assembly plant. It is not a chicken plucker plant. Every day is different, and every day we have different hazards. We have different tasks. We have different things that we encounter, so it's an ever-evolving environment.

When I think of ergonomics, I think of a somewhat static environment, an assembly plant, a manufacturing plant, or a semi-conductor plant, where the same things are done over and over again, and the same repetitive trauma injuries occur over and over again.

In construction we see a lot of different types of musculoskeletal disorder injuries. Carpal tunnel syndrome is a common one among rebar iron workers who do a lot of twisting and tying and rotations of the wrist. A lot of electricians who do terminations and sit there all day in front of cabinets moving their fingers and wrists have carpal tunnel syndrome.

We see a lot of shoulder rotation injuries on carpenters, elbow injuries on carpenters, wrists on carpenters from hammering and sawing and continually moving the right or left parts of their body. Laborers do a lot of tamping, and you get a lot of vibration. They do a lot of jack hammering and use chipping guns. From all that you get vibration noise. Lifting, all crafts lift everyday so there is a lot of low back strains.

That's where I want to center my talk today, on low back strains and how a program that we

implemented in Bechtel in 1993 made a dramatic difference in the low back injuries that we were seeing in construction.

If you heard Greg this morning in the opening session and his comment that they believe that one out of four injuries is musculoskeletal disorder related, I would think in construction it is more like one out of two. When you take a look at all the types of injuries that we see every day, every week, every month, and every year in construction, if you put them in categories, that it is about one out of two and a half. So in our industry we have a very serious problem.

They say that about \$11 billion is the projection for loss costs overall for musculoskeletal disorders and ergonomic injuries. In construction the number is also quite high.

If you look at our company, prior to implementing an ergonomics or musculoskeletal disorder program, our loss costs were extremely high and our insurance premiums were high. We did a lot of things to lower those such as the back injury prevention program that I will talk about in a minute. We implemented a computer program where all the people on our work stations, could view four times a day, a screen that automatically comes up and has a two-and-a-half minute exercise program so they can exercise their wrists and body positions. This has reduced our carpal tunnel syndrome injuries from several in a year to one last year, in 1996.

So I think that is quite an achievement in itself, and it hardly cost anything to buy one of these little ergonomics programs and stick them on the mainframe so everybody's computer can use it, and it gives them a break during the day. A lot of people don't take breaks in the engineering and construction industry, especially in the offices where they are doing rush design jobs, and they are busy 12, 14, 16 hours a day at their computer. So having these breaks and letting them move around and do small exercise programs certainly makes a difference.

We found that back injuries were about 67 percent of our injuries. And it accounted for about 47 percent of our loss costs. We had to do something about this.

We met with the unions, our union company, and we developed a task force with our non-union company to come up with a way to improve our low back injuries to prevent our people from getting hurt every day.

It is a four-part program. The first part is training and orientation. Every employee that comes on the Bechtel project anywhere in the United States -- and now we have moved the program to Latin America. We are starting it down there so I say the United States and Latin America and Canada -- goes through an extensive two- to five-hour orientation program, depending on what kind of project it is, whether it is a -- nuclear outage or demolition project. It depends on how many client requirements we have to discuss or for a particular problem. So the new hires range from two to five hours for any employee.

One part of the program that we discuss in detail is the back injury prevention program. Our



particular company uses mostly Ergodyne back support belts with the Velcro piece on the outside. That's very important because if you throw a box of back belts on the ground and say, "Help yourself," one, they are not fit to the individual; two, they don't know how to wear them; and three, they usually just put them on and cinch them up and wear them all day. That can do more damage than the program is worth.

Just wearing a back belt can probably cause a back injury, if you don't know how to wear it and you weren't trained in its use and what it does and what it doesn't do, and there are some things it doesn't do, the employee has to understand that and use it properly.

The third part of our program is stretching and exercises. Every employee on a Bechtel project, and that includes the site manager and every single superintendent and supervisor and office clerk and payroll clerk and timekeeper starts the morning by doing five minutes of exercise and stretching exercise.

This accomplishes more than just the employees getting out there, lining up and looking stupid every morning. We have a safety message that we give every morning to every employee, and we use this time to do that.

Also, if we are doing any particular type of work that day, like a heavy lift or some area that we want to keep people out of for a certain reason, we discuss that during this time. Then the site manager gets up, or the field superintendent gets up and gives a short, motivational talk in the morning. We do this every day, and if we have second shifts, we do it at the beginning of the second shift.

One particular project decided that just doing it once in the morning, then lunchtime comes, and everybody sits down and stuffs themselves and gets lazy, and the exercises don't do them a lot of good after lunch. They decided to do five minutes after lunch. Only instead of taking five minutes of the company's time, they take five minutes of their lunch break. So we do the five minutes in the morning on the company's time, and they do the five minutes at lunch on their time.

It has become quite a deal on that particular project. That job has also gone 2.5 million hours without a loss time accident. There is real camaraderie between the employees that have made that work on that job.

The last part of the program, and a very important part, is the retraining and follow-up training to make sure that we go out and talk to these people every day, answer questions or anything else they want to talk about, make sure they have their belt on properly, and make sure they are lifting properly.

Sometimes we issue rewards for people that do things right. If they know the safety message, if they have their back belt on, if they are doing the program right, we give them a little token of

appreciation occasionally.

This program has been a big success. We have reduced our back injuries by 50 percent, and we reduced our loss costs by 47 percent. That equates to over \$10 million in loss cost savings just by implementing this program.

We are also trying it on CM projects. We are requiring our subcontractors, and third and fourth year contractors, and other types of contractors on jobs where we have no direct tie, to try our program. We have been having some pretty good success, contractors are getting pretty excited about this. What we are selling is an overall zero accidents concept, and it really works.

I want to thank NIOSH and OSHA for the opportunity to be here today and for this conference. I think this is something that has been needed for a long time. I am excited about it. I am excited about ACCSH being involved and helping to move on with the construction ergonomics standard. I think with all of us working together we can hopefully achieve something like this by maybe - not at the end of 1997, but certainly sometime in 1998.

Thank you very much.

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Tony Barsotti, Technology Design and Construction

MR. SCHNEIDER: Next I want to introduce Tony Barsotti, who has nearly 25 years experience in mechanical construction trades. He also has a career in occupational safety and health starting with asbestos exposures in the pipe trades in the mid-seventies. His safety and health work over the years has included apprenticeship and journeyman training, legislative and regulatory activities. For the past three years, he has been Environmental Health and Safety Manager for Technology Design and Construction Company, an EPC firm constructing semi-conductor fabs for Intel. He has a B.S. in social science and ASP certification.

I give you Tony Barsotti.

MR. BARSOTTI: Good morning. We have overheads and also a handout which has additional documents that we are not going to go over, but they are there just for your reference. The handout also is pretty much the slides as well.

What I am going to speak briefly about is the results of the effort on this Intel project, that we have just completed. TDC is a joint venture, it's an EPC firm. We got the assistance of the CPWR with a NIOSH grant to support our efforts on trying to control sprain and strain injuries which we had been working on.

The intention of the grant and our efforts with it was to implement and measure the interventions.

The project had already begun. We were probably about 10 months into the project of about a 20-month to 22-month project before the grant activity started, although we probably only had about 500,000 or 600,000 manhours on a 3.5 million manhour project.

Our intention, in order to make this as effective as possible, was to utilize the project's existing communications system in a way to be able to access and get to the crews themselves. Since the project itself is a combination of both general contractors, EPC -- we are doing general contracting, and we did about 35 to 40 percent of the work with direct hires or our subsidiaries, and then the rest were subcontractors. But with this we had previously finished a project prior to this in the area, so we had some relationship with most of the subcontractors before and had established some expectations.

But what we had wanted to do with this was to do it in such a way that it was generally good for us, for the owners -- in this case, Intel -- for our subs and also to support the research efforts which were necessary to try to develop some measures around this.

In terms of the project itself, we had strong owner involvement in the environmental health and safety program generally. Associates of Intel know that the company likes to support and be involved with their people in a lot of ways, and in this way in particular.

Additionally, it was an owner-controlled wrap-up insurance program, so there was another level of vested interest in which they had a direct involvement.

Before we began on the grant, we had a structured and a well defined EHS program, which was similar to what Stew was talking about. We have a mandatory stretching program. We have some information about it and we will talk in a minute about it.

There is a strong commitment to training on this project as the general. In addition to a two-hour orientation session, we ran everyone on the project through fall protection and haz com training, which was an additional hour and a half for each of those sessions; and then through the project on different phases. We had introduction of chemicals, as we go to bring on chemicals, and install tools. We ran everybody back through another hour and a half to a two-hour session again with it. So this is just from the general's point of view in terms of the training that we were providing.

There is a strong emphasis on pre-task planning and housekeeping, a real commitment to drive housekeeping on an ongoing basis and not at end of the shift or at the end of the week.

With the involvement of the crews, in a number of different fashions that we have, including what we call the group leader program, which is basically a foreman who alternate run weekly meetings, and then we have interactions with them, so that on one week we have communication, project communications, which tend to be top down. Then on another week we have it bottom up more. And then we meet with those crews, and they have additional responsibilities and have

a separate incentive program for assisting us on that.

Then the other is similar to what Bechtel is doing and others in terms of moving to target zero or injury free or whatever these paradigm shifts are that are coming in the construction industry. We began over the last couple of years, and on this project that began about a year and a half ago, just prior to the grant, a commitment to an injury free workplace. We did extensive training around that as well.

All of which make some problems for the researchers in measuring the variables, where are they, how they interact.

In terms of the grant activities, our intentions were to, in terms of our limited time and resources, target the high risk trades and tasks. And partially we did that by seeing which subcontractors were willing to work with us on that. Because of the phase of the project and the subs that were involved, we utilized interior carpentry work -- most of the form and concrete work had been completed by this time -- the plumbers and pipe fitters, who were primarily self-performed or one of our subsidiaries, and electrical and the electricians.

With those we provided some additional ergonomic training and then worked with them on developing and implementing some specific interventions around some high risks tasks that they were involved in.

The second major area that we got support from the grant on was doing some evaluation of the project's programs, including the pre-cast planning, the effectiveness of it, the stretching program, and then continuing an evaluation of musculoskeletal injuries that we had on the project.

Any injury of any nature, including significant first aid cases and all recordables, we did a pretty thorough incident review, injury analysis of that, including the crews and the foremen and superintendents and project managers and gave them a lot of attention. When there were musculoskeletal ones, we were able to bring in, in most cases, the ergonomist, Billy Gibbons, who happens to be here with us today. He was on site one to two days a week for about ten months on the project.

Similar to what Scott had mentioned at the beginning in terms of the high risk tasks, all trades have the exposures around material handling, on the housekeeping, the loading from continuous standing or working on hard surfaces, particularly as the projects go on and everybody is working on the concrete slabs. We have a lot of tasks which are stationary tasks. Awkward and confined work areas, and then, as others have mentioned, working above the shoulder height or below the knees.

As we looked at the pipe trades in particular, there were the static loading issues in a number of tasks that they were involved with, in welding, both in stick welding to the block iron pipe, as

well as the high purity welding, and the orbital welding that goes on in the semi-conductor industry.

The electricians in handling the cable, both in terms of pulling wire from the spools, pulling it up in the racks or through the conduit, and then those working at the terminations in the panels, as Stew mentioned.

Carpenters. Again here we are looking at the interior and drywall-related, both in terms of getting the studs up and then handling the sheetrock are repetitive and forceful tasks and probably the highest incidence of repetitive work of any of the trades that we experienced.

In terms of the grant, some of the field implementations that we were able to get support from and actually implement in the field were utilization of stand stools for those with these stationary tasks, as well as anti-fatigue matting. It was an interesting thing there, because the researchers were looking for a good measure so they would have a control group of those who were using the anti-fatigue mats and those who weren't. But by the time the word got around, they all wanted them. And before the researchers could be involved with it, they were at all of the work stations that could be using them.

So it is one of those dilemmas in terms of research activities. If you have a good researchers have the need for these studies and the measures, but if you are out in the field and here is something that could make your life easier, you are not going to necessarily wait around for the result before you start utilizing it.

The sanding pole disks I think was European and this is actually one that we got from Scott. It's a great tool and is a device that clamps onto a pole. Instead of having to grab and hold the pole like this, you can push up against it. Painters and sanders have it and it was widely accepted. It is a very cheap fix, and they were appreciative of it.

Another issue had to do with the inertial forces on pulling the cables, the wire off of the spools, and especially we are looking at good sized cables that we are pulling that are maybe an inch and a half, two inches in diameter. This activity came from an electrician who sustained a hernia in the course of one of these pulls. He had an opportunity to really look at this activity itself and how it could be redesigned.

That last one there in the field implementation had to do with a task. In the semi-conductor fabs now, where the cleanroom space is very costly. The amount of equipment is minimized that has to be in the cleanroom, and below it you have a sub-fab. You know, the factories call the cleanroom the fabs. And the sub-fab below it is where you have a lot of the process equipment.

At any rate, there is cleaning around these pop-outs where the equipment utilities come up, laborers were doing a lot of stooping work, and these scooter prototypes really helped out.

The assessments that were done, including this flex and stretch, which is a stretching program

that we utilize. Through our group leaders we were able to do the surveys and have a high participation of response with it and found about 80 percent of the crews participating in this mandatory program. But it was primarily a function of the culture of that subcontractor, whether they were supportive, have bought into it, or – and not by trades, which is what we initially thought. Some wouldn't be supportive, iron workers possibly or something like that. But that really wasn't the way, as we looked at the data. And there is a great interest by the crews for a follow-up and additional training.

This next one here has to do with the -- and Tom Cook is here, not to talk about it today, but they had done a study, a survey, a perception survey, which had about 2,500 respondents. This is in your packets. We won't really go into this in detail, but they asked a series of questions. There were three particular questions: whether they had sustained job-related aches, pains or discomfort; if they were prevented from doing a day's work with it; and if they had seen a physician related to it.

The blue lines on this are responses to those questions and sorted out by the particular body parts. The blue lines are the University of Iowa group, and the red lines are the crews on this project, the D1B. This was taken pretty near the end of the project where more of these interventions had been in place.

I have just a couple quick graphs to show you as a wrap-up insurance and looking at everybody's claims on our claims experience. We had been tracking and probably looking at frequency more -- a lot through our emphasis with incentive programs on recordable rates and had tracked injuries. Once we started looking at the claims data, we compared the percentage of the claims against the percentage of claim dollars.

There you can see in the musculoskeletal and accumulative trauma injuries, although were about 40 percent of injuries, were over 90 percent of our claim dollars.

So we looked in particular at this 35 to 40 percent of the work, which was our direct hires. Here's what we have, the percentage of manhours on the project by -- that these people were involved in. And over here we have the concrete work, forming, this early work, and we see they are about 9 percent of the manhours on the project. There are about 12 or 13 percentage of the claims, and there are about at 32 or 33 percent of the claim dollars.

When we had looked at all of the direct hire subs and we had seen that these numbers were pretty even relative to the project as a whole. But when we compared what had happened in this phase of the project with what had happened here with our mechanical group, whose work actually began once the interventions injury free workplace and with the ergonomics grant activities, and a real strong culture in this mechanical group to pre-cast planning and commitment to the stretch and flex with it.

These claim dollars on here now include the blue line, which is the percentage of those claim

dollars which are ergonomic related or potentially ergonomically related. We are looking at strains and sprains, disk herniations and hernias in those.

And as you can see it points out what everybody has come to recognize, and there is a lot more than one or two. What Stew is talking about -- our experience there is - this is 90 percent of our claim dollars or over and are related to musculoskeletal injuries.

A last few last bullets about where we intend to be going with this, continuing these interventions on the multi-employer, on a single project level like this, continuing to support it on a multi -- with the multi-site employers that we work with. We know we need to begin this, what we saw with the concrete work. We need to get it started early and before the project begins, utilizing both our constructibility efforts tying in with the design folks, and then generally building on our relationship with our subcontractors so that we can be more effective with this.

There are a couple handouts that have to do with a policy that we developed around soft tissue injury. It is really the same musculoskeletal injury prevention that's in your packet. It's a way that we have approached that, talked with our subcontractors around it, train to it, and then an assessment sheet which we have developed which can help in an on-site evaluation.

Thanks for your time.

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#### Bill Buckley Roofers Union Local 96

MR. SCHNEIDER: Now we want to get trade specific and talk about a couple of trades. We couldn't get all 15 building trades represented up here, but we do have 3.

We are going to start with Bill Buckley, who is the apprenticeship coordinator for Roofers Local 96 in Minneapolis. He has been in the trade for 21 years and has been an apprenticeship coordinator for the past 7. He has done considerable safety training and helped the Roofers International rewrite their safety manuals. And he is also a member of the Minnesota Building Trades Safety Committee.

Bill.

MR. BUCKLEY: Well, there is no doubt that industrial and commercial roofing is very hard work and very dangerous at times. We have various problems with the industry because of the heights, the weather, as well as the heavy materials and falls and burns.

It is stated through the Bureau of Labor and Statistics that one in five roofers are injured in one method or another, whether it is off a roof or a strain or some type of a back injury. We feel in the Twin Cities that we have changed that to about one out of fifty people with injuries. We

know that because we watch our health and welfare programs, and we know who is injured.

We attribute most of this work to education, working with labor and management, and with manufacturers. I have some slides here that I want to go through. It depicts how roofing started out and where it is going to end up. Hopefully we need more vast improvements again, but we are getting there. It is greatly improved.

We are going to start back in the 1920's just to show how things actually started. It actually started with the horse and buggy. Everything was handed -- material was worked by hand. There was no mechanical equipment involved.

This depicts another way of how they hauled the materials to the job sites.

Here is a job set up, and you can see that there is really no safety involved here. It was just a matter of putting a big piece of wood up on the roof, and either a bunch of guys would pull the material to the roof, or they would have a mule or a horse pull the heavy materials to the roof.

It took a lot of men. Since you had to have a lot of material handling, you needed a lot of people up on that roof. And there was a lot of mass confusion, and injuries occur when you have that type of confusion.

This picks up on roof system again. You can see that there is no fall protection around, and application procedures were very crude.

Things did progress. When they came out with the motor vehicle, it created a situation where even the vehicle itself would haul the materials to the roof.

Here is a roofing crew. It is greatly improved. You can see that they don't need as many men with more modern equipment coming around.

Some methods never change. This is for patchwork. When we do little repair work, this is our method for getting hot asphalt to the roof. Just a little pulley system and the guy down below will pull up those little bits of tar. We do not haul heavy equipment up on such a ladder wheel.

We moved into the industries in the 1960's, whereas we started using hoist systems. These are two different types of hoists. The first one on the right was the first crude one that came out, and there was a lot of air involved in that. You had to be on your toes when you ran this particular machine. The one on the left, the state-of-the-art machine, is a hydraulic machine. And there is really no room for error on that when you are operating it.

This is the hydraulic machine set up on a different jobsite.

This little handle here, on the previous hoisting system, the man, when the materials got to the



roof, he had to grab the bar and pull in the materials. Well, he was reaching out over the roof and he had to give it one pretty good jerk. So with the hydraulic, the little lever, you just pull the lever back and the whole materials come in. A good safety feature that prevented the guy from going over the edge of the roof.

This is a monorail system, a different systems that's used.

We now use forklifts on quite a few of the projects. They work real well to get the materials to the roofs.

Now the more elaborate companies are buying cranes, so the materials get to the roof safely and inside the roof system itself.

Another type of crane. Generally, a lot of these cranes are going over 100 feet into the air. So that prevents that guy having to sit on a hoist and pull up materials.

This is another variation of cranes.

In the old days, you can see that's how everything came up on the roof. And it was a bad deal back then.

Sometimes we forget, though. This particular project, we were driving by and you can see the three guys standing up on the roof, and there are three guys below that little house there, and they are pulling for their lives. They are pulling about 350 pounds up. That should not be done.

This is some of the equipment that we use on the roof. Back in the thirties, forties, fifties and sixties, most of the roofs were axed off. Down below that is what's known as a cutting machine. When we had to scrap the gravel, we had to do that by hand. By now we have a brooming machine up in the upper left-hand corner.

This is the operating of the brooming machine. The gravel has to be removed before the cutting operation starts.

These are two cutting machines. And to alleviate back problems, these guys are cutting the pieces approximately 18 inches by 18. Before when they axed the pieces, they would be any size, 10 by 10 or whatever, and these guys would drag it away. This prevents back injuries.

After the material is cut, they did not have to bend over and pick it up. This machine would get underneath the roofing, and it would slide right up so you could pick it up at waist level. Here is another variation of the same machine. Saved a lot of back injuries with this type of machine.

Here is the machine in operation. You can see he just has to reach over and put it on a cart.

Some operations never go away. This always occurs on every roofing job. It is just going to be there forever and ever, and they have to take precautions. Repetitious movements here. You can see how he has to pry down on that. Axing is still around.

We went from the one-wheeled wheelbarrows to motorized carts, which greatly improved our roofing removal.

Sometimes we need education on how to shovel. We have seen that improve by using longer handled shovels instead of the short ones.

Our heating systems have also changed. These are small ones. And we have to remember that when these small ones are used, the worker has to pick up these pieces and put them in the kettles themselves.

They come in all different sizes. And these, again, the worker has to work right along side these things.

Some get bigger, so that means more asphalt can be put inside. I mean, you can see that the level of the top of that kettle where he will put that material is just about chest high.

Another variation of a heating unit. They come in small sizes, large sizes. Notice that the LP tanks are real close to the kettle, which should not be. We will show a picture of something on that later.

Asphalts come in 100-pound kegs, and a lot of the guys are just throwing the whole keg in. It should not be that way. We see a lot of back injuries that used to occur because of that.

During a day, there's a possibility that 50 to 100 of these kegs would be put into the tar kettles themselves. Alleviate that problem by making 50-pound kegs, which helped considerably in the industry.

This is an operation with a guy wearing a face shield and throwing the kegs inside the kettle itself.

Manufactured design lowered the height of the kettle, which improved the ability to reload them.

This is what happens when the LP tank gets too close to the burners. Education is a must.

And this can happen, also. So education was a real important part, and we have nipped this pretty good.

Set-up area is very important. It has to be nice and clean.

We reverted to tankers now. These are semi-automatic and/or automatic, whereas the worker does not have to be near them. Put the LP tanks in the front away from the burners.

These are automatic kettles. The only situation you really have with these things is to haul them down to the asphalt and load them up at the factory.

They come with operating instructions, too, which we never used to see before. This is how it was. No warning protection, very sloppy work area, and see there is no personal protection, no long sleeved shirts.

Now we have warning lights. Safety areas around the asphalt delivery area. The dumping area has guardrails.

Falling materials, conventional equipment. Lane materials. Instead of carrying materials, it uses a cart to haul it around.

Application procedures.

The guardrail systems bases are 140 pounds. One of the roofers had devised a method to haul them away with little energy.

Old-time graveling. This was all done by hand work back then with wheelbarrow. Now we used mechanized equipment to haul everything. This is a graveling procedure with motorized vehicles. Some handwork still being done, though. Motorized cart. We get the material to the roof by crane now.

We still have some handwork that we have to do with the graveling. Fanning the gravel in so we're talking about 30 pounds on a shovel at a time.

Hot asphalt down before the gravel goes on. Motorized equipment, a different method with a conveyor.

Using bobcats on the ground instead of using shovels.

Heavy rolls being moved by hand. There's equipment for that now. No need to carry it. The old-fashioned way. Uneducated people pulling up equipment. Dangerous situations still arise out there.

That's 1,300 pounds of rubber membrane sitting there. The thing we are trying to prevent is the next photo.

Thank you.

MR. SCHNEIDER: Thanks, Bill.

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Paddy Dennehy, Carpenters' Safety and Health Fund

MR. SCHNEIDER: Our next speaker is going to talk about the carpentry trades, and his name is Paddy Dennehy. He has been a journeyman carpenter for 23 years, was business representative of a carpenters' local in Butte, Montana, for 11 years, and secretary/treasurer of the Montana Building Construction Trades Council for 5 years.

For the past three years he has worked at the UBC Health and Safety Fund teaching ergonomics, fall protection, hazardous waste training, -- abatement, confined spaces and asbestos abatement, and the OSHA ten-hour course, and is working on the curriculum for fall protection and ergonomics for the fund.

Paddy.

MR. DENNEHY: Thank you, Scott.

The Carpenters' Health and Safety Fund initiated ergonomics awareness programs back in 1992 from a grant through NIOSH. We have trained over 5,000 workers since then, mainly apprentices and journeymen.

Even though the awareness has increased among the workers, we have found the overall ergonomics problems have also increased, and changes on the jobsite are small or nonexistent.

Factors that have contributed to this are, one, changes in the trade and the carpentry trade. At one time a carpenter performed all facets of the trade, going from form work right to the finished work on the jobsite using different positions and different muscles.

Today the craft is more specialized, where a person might do nothing but hang sheetrock or frame for months and years at a time, keeping their bodies in the same position, using the same tools, and abusing the same muscles, tendons and nerves day after day.

Two, changes in the tools. The screw gun, an air-powered nailer, has virtually replaced the hammer as the tool of the trade. Although the power tools have made the job easier, it has also made it faster, pushing productivity, requiring more of a constant use for longer periods of time in the same position.

Third is the competition. The percentage of the work going from the union to the non-union has

gone up, increasing the number of workers who have not gone through qualified training programs where ergonomics awareness is being taught. The competition in construction has also placed job safety as a low priority, and concern for musculoskeletal cumulative trauma disorders is only after the fact.

We have just completed a four-year ergonomics training grant from NIOSH. And recently we went back to one of our major areas, Seattle, Washington, and asked all the trainers we trained in the last four years different questions on how the ergonomics has changed or affected the jobsite.

We asked them 21 questions, but I thought these 4 were the most significant. Are you aware of ergonomic changes in the construction? Yes, said 21 percent, but 64 percent said no, there wasn't change at all. And 15 percent said somewhat.

How do we change the awareness of the contractors? By far, training was the number one answer at 76 percent. Fifteen percent said show by example, but 22 percent of the workers said you couldn't, there was no way to change it.

Have you ever been injured on a jobsite? Ninety-two percent of those workers that we trained said yes. No were eight percent.

What caused the injury? Lifting too much was 42 percent; carrying too much was 22; poor housekeeping, 51; and repetitive motion. On the poor housekeeping aspect, we asked what was the common safety hazard on the jobsite. Ninety-eight percent said it was housekeeping, walking over tools and the place not being clean. It shows an enormous amount of injuries could be prevented by simply cleaning up the job.

To reduce the musculoskeletal problems in the construction industry, we have to incorporate and educate the following people and organizations: First, the contractors. They need to be made aware that the employee is the producer, and the cost-saving measures of keeping them healthy is also a guarantee of continuous qualified work and also a drop in their insurance and workmens' comp rates.

We have found that when we also train the supervisors and the contractors, the safety on their particular jobsites improved greatly for the employees.

The worker. The worker needs to be educated to know what does affect them and what they need to do different to save their bodies.

The manufacturers need to be brought into this. And I feel that the American manufacturers have lagged behind the European nations as far as creating tools that are ergonomically correct. They are missing a great opportunity.

We took a study of all the so-called ergonomically correct tools and brought them out to a

jobsite. Fifty percent of our workers refused to even deal with those tools if it didn't say "made in the United States."

I would like to show you a few of them that have been promoted as being ergonomically correct. But in reality, because they have not gone through the workers for testing, are not -- this two-wheeled wheelbarrow was designed to stop the tipping. And you could use your muscle and push it across. Now it works great on flat, level surfaces, but what they found is, number one, on construction sites there is no such thing as a flat, level surface. It was harder to turn, and it no longer went up on one board. You would have to build a ramp for it.

So after a study of this, everybody that worked with this wheelbarrow said that this was infeasible on a regular construction jobsite.

This right here is a sheetrock carrier. On the bottom part of it you lay the sheetrock, and you hold it up with one hand and you lift the sheetrock. And you carry it across to wherever you are going.

The intent is good, but the practicality of it is, you have to actually lift the sheetrock on top of the board, on top of the bottom base of it, it doesn't slip underneath. So actually what they are doing is, it's creating more of a job to move the sheetrock than it would be if they didn't use it at all.

Below this is a small, simple design thing for carrying sheetrock. As opposed to the other thing, this thing is only about this big right here. It's a three-pronged thing. The top and the bottom things work as handles, and you just slide it at the end of the sheetrock. Two people lift it and carry it to the jobsite. This thing is one of the things that we found that contractors are willing to buy and use, and productivity greatly increases.

Another organization that needs to be brought into this is the United States Government, especially OSHA. OSHA needs to develop a standard on ergonomics to include all industries. It was needed a long time ago. And every day that we do not have it is one more day that we add up the statistics of workers who have been hurt on the jobsite.

Without the full participation of contractors, manufacturers, government and, most importantly, workers themselves, the construction industry will continue to be plagued by debilitating musculoskeletal injuries.

Thank you.

MR. SCHNEIDER: Thanks very much, Paddy.

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Tom Cook, University of Iowa, Preventive Medicine

MR SCHNEIDER: Our last speaker is Dr. Tom Cook. He is an Associate Professor for Preventative Medicine and Physical Therapy at the University of Iowa, where he serves as Director of the Biomechanics and Ergonomics Facility within the Injury Prevention Research Center. He is a physical therapist and has a doctorate in industrial engineering, specializing in ergonomics.

He has authored or co-authored over 50 scientific papers, chapters and books and served as an ergonomics consultant to numerous companies, labor unions and government agencies in the U.S. and Canada.

He has also been working with us for several years on our ergonomics project and specifically he has been working with an operating engineers contractor in Iowa City. He is going to talk about some of the problems and some of the solutions for operating engineers for ergonomic problems.

Dr. COOK: Thank you, Scott.

One of the advantages or disadvantages of being the last speaker is that I have been sitting as long as you have been sitting. So I would say I will give you ten seconds of my time for everybody to stand up and stretch a little bit, including our speakers, of course.

My topic is operating engineers, and I, at the outset, would like to recognize my colleague, Chris Zimmermann, in the audience, who really did most of the work here. I just have to talk about it.

In the ten minutes I have been allocated, I would like to break it up into two pieces. First is a little bit about a survey that has been alluded to before, a symptom and job factor survey, that we have done with about 3,000 or so construction workers, including several hundred operating engineers.

We have used that as a basis for trying to identify where the problems are. One of the first things we heard this morning is you have to know where the problems are before you try to fix them. So I have used that as a tool to help identify, by trade, some of the aches and pains and what we call trade-specific injury or complaint profiles.

Then I would like to show you 10 or 11 fairly simple modifications that we have come across. We have been directed to them by the operating engineers we have worked with as equipment modifications that they value. The particular contractor that Scott mentioned, when we asked these operating engineers, was who was a model person they would like to work for, invariably they all identified the same contractor. So we went to find out what it is he is doing that everybody liked so much.

First a little bit about the survey. As I mentioned, we are interested in getting some direction as

to where to look for ergonomic best practices. It is a self-reported survey that we copied primarily from the Scandinavians. A body diagram that says, "Where do you hurt?" "Where in the last 12 months have you had a work-related ache or pain?" "Have any of those aches or pains caused you to lose work?" "Have any of those aches or pains caused you to visit a physician?" So some measure of severity of the aches and pains.

We also have a listing of 15 job factors, things like working overhead, handling small objects, hot, humid conditions, standard questions or job factors that we have been asking not only construction workers but several thousand other manufacturing workers to try to get the workers' perceptions of what are the problems within their particular jobs.

Just briefly about the method: self-administered. We got the union folks to endorse sending the questionnaires back to us. We sent them a reminder postcard a week later. If they sent their survey back, they were entered in a raffle for \$100 cash prize. That seemed to be a big one.

We couldn't follow up on the people who didn't respond because we couldn't get to the mailing address list of the union. They kept that confidential. And we actually did the survey the last week in December.

About 38 percent of the operating unit engineers sent their responses back to us. That amounted to 410. In our other 12 construction periods we surveyed, we got about the similar, 36 percent of the ones that we sent out.

The union folks tell us that's terrific. They are lucky if they get 20 percent back on any survey they send out to their own membership. It must have been the \$100 prize that did it.

Our respondents were on average about 46 years old. They had worked as an operating engineer for about 20-some years. About a fifth of them had apprenticeship training. About three-fourths of them were working at the time of the survey, and they reported that they worked on average about 42 hours a week. So these were people who work for a living, as opposed to some of the rest of us academics, I guess.

About 10 percent of our respondents didn't use any kind of equipment, these were the mechanics or the foremen. So about 90 percent of the people who responded actually operate equipment. On average they reported operating about three and a half different kinds of equipment. One of the things that we learned, certainly, is that operating engineers --the work involved in being an operating engineer is not the same. It very much depends on the type of equipment that you use.

This is an example of our complaint profiles here. What it says on the left-hand column is anatomic region, and then it is percentages of those who said they had a job-related ache or pain in that region in the last 12 months, percent who missed work or reported missing work, and a percentage that said they had seen a physician.

The areas that I have highlighted in yellow are the areas that were above the average for the other construction trades. All the other blocks there were below average compared -- now again, we are comparing people to carpenters, electricians, plumbers and other



people who do some heavy-duty work. But compared to those people, only neck and ankle/foot was above the average for that other group.

You will see low back was still quite high, as it was in all the trades. That was the prize winner for all the trades we studied. But this told us that if we are going to make some ergonomic interventions, we probably ought to be looking at things that affect neck and foot/ankle as the top priority, the foot/ankle surprised us at first. The last thing I thought was that someone sitting operating a bulldozer or a crane, would have troubles with were their feet or their ankles, or really high up there as well are knees.

If we looked at the problematic job factors and asked them what they perceived to be problems with their work, they said working in the same position for long periods was a problem. The mean score on a scale of zero to 10 was 4.65. Their peers in the other construction trades was 5.87. You see again that compared to the other construction workers, this group of operating engineers rated these job factors slightly lower. It doesn't mean they don't have problems, but relative to the other groups they seem to be lower. These were the five most commonly reported problematic job factors.

Many of the construction workers, the hot, humid, wet conditions is a little higher than what it was ranked by the operating -- again, it was a little surprise.

Three factors, though, I will talk about very briefly that we think we found out from the survey. Operating engineers, we split them into groups: those who worked as an operating engineer more than five years; and those who have worked less than five years, just as a general cutoff for experience.

We found that there were increased complaints and missed work and physician visits in the people who had worked more than five years. That is not true in some of the trades, because there is a survivor effect. If you make it five years in some trades, you may be all right for the next 15 or 20 years. The other people have dropped out. The people who have hurt themselves in the first few years are gone.

We saw the reverse effect here with operating engineers. There were more complaints among the old-timers, if you will, who have been around awhile. Also increased problematic job factors were reported by the more experienced operators.

In terms of type of equipment, we broke it down. We had enough numbers for five different types of equipment, and there isn't time to go into each one. But we found that definitely the complaints, the missed work and the physician visits had different patterns for five different types of equipment we studied. For example, backhoes, bulldozer operators, crane operators, and so on.

Our problematic job factors were also somewhat equipment specific, different complaints depending upon the type of equipment primarily used.

The third factor that I will discuss briefly here is the effects of equipment age. The feedback we

received from many of the operators is the new equipment is much, much better. And indeed, when we broke it down by age, the equipment that is newer than five years or older than five years -- the newer than five year equipment, we had the same pattern of complaints in terms of where they hurt, but decreased reporting in terms of missed work and physician visits. They had the same aches and pains, but they didn't seem to result in as much lost work or as many visits to a physician.

We also saw decreased reporting of problematic job factors. Basically they were happier. They complained a little less.

What we found then, as compared to other construction trades, was that musculoskeletal complaints in operating engineers were less prevalent except for neck and foot/ankle, and that the problematic job factors were also less prevalent, or they had fewer complaints.

But among operating engineers, there were influences of the type of equipment they used, how long they had been on the job and whether or not they operated some of the newer equipment.

As I mentioned, we talked to some of these folks in smaller groups and asked, "You know what's going on with this foot/ankle business and this neck business and this low back business?" They pointed to this one particular contractor. I will show you eight or ten examples of small things that he did to his equipment that the operators found very desirable.

In fact, some of the local equipment suppliers said that other contractors would come in and say, "Fix my equipment like you fixed his." So everyone, not only the workers but the competitors, knew that this person had made some equipment modifications that were beneficial both in terms of aches and pains and financially.

This contractor, again as an example, did some things -- you don't see real well here because it is painted yellow like everything else, but there is an additional step that this contractor has his people weld onto the different pieces of equipment.

When we started asking about the foot/ankle problems, we found that many of the foot/ankle problems are acute injuries that resulted from getting in and out of the equipment. You know, they climb over slippery treads on bulldozers. There is no easy way to get in and out. They sit in this equipment for four, five, six hours and then get up and have to jump down onto uneven surfaces. So getting in and getting out seemed to be a major problem. If we looked at the workers' compensation data and medical claims, getting in and out was reported as related to the foot and ankle problems.

So this contractor puts extra steps on his equipment. Again the arrows point to additional grab bars that he puts on. He takes a brand new piece of equipment that might cost \$130,000 and welds extra handrails on it so his people can get in and out without hurting themselves.

He also isn't satisfied with the anti-slip surfaces that are put on around the cab areas. There is a closeup on the left and a shot on the right as to where it is. He has his own, or buys his own, higher grade anti-slip surfaces; and again, puts those on the new equipment that he buys.

He has about 330 pieces of dirt moving equipment, this particular contractor. He also installs additional mirrors. This is a large backhoe, and one of the problems is the neck problem related to looking around behind them all the time as they use the backhoe. He simply installs extra mirrors to limit the amount of required twisting.

Another thing he does is to take the old cable scrappers here and replace them at a cost of \$20,000 to \$30,000 apiece with hydraulic controls so that the operators don't have to keep their hand in the air and constantly tug on this lever that controls the cables that controls the scrapper that digs the dirt. He is willing to invest that because he is convinced that it limits the problems that he has on the musculoskeletal side.

And wherever feasible or possible he changes manual cable controls and lever controls to joy stick controls. This is a costly investment that he is willing to make. You see three pictures of different joy stick controls here.

He is also very aggressive at seat replacement. One of the complaints we received from many of the workers who work for other contractors is the seats break, the suspension system goes bad, but they still have to sit on this thing and bounce around on rough surfaces all day anyhow. He has three extra seats sitting in his shop all the time. As soon as a worker complains that a seat doesn't function well anymore, it is replaced with no questions asked. That's pretty much up to the operator's discretion to request that.

Also, one of the things he does on his dozers here that he uses to pull these big scrappers, is to put several thousand pounds of additional weight to keep the nose of the tractor down to pull level and get more tread on the ground. It also provides a much smoother ride for the operator. So there is a 3,000 pound nose weight there in that one arrow and several thousand pounds of additional weight that he puts on.

He also has a very aggressive glass replacement program. He has a maintenance truck that goes around to his sites, and whenever there is a report of busted glass, it is replaced. He doesn't want his operators stretching and reaching to look around the cracks in the glass to see what they are doing, and obviously there are safety hazards associated with that.

He also takes on his scrappers and moves all the grease fittings, connects them by tube down to where you see the white arrow here, so that his maintenance people can stand on the ground and grease the fittings on the scrappers rather than have to climb up on top of them. He has found they get greased more frequently if the worker isn't at risk climbing up with his muddy shoes or whatever on top of a scraper to lubricate it.

He retrofits many of these older style bulldozers with a smaller rollover protection structure, he has actually made his own measurements and found that the sound levels are about half of what they are on the original rollover protection structure that came with the piece of equipment.

These are some examples of things I would say are not rocket science. They are straightforward responses to workers input about things that would make their job more injury free, more comfortable. The bottom line is that his operators are willing to work overtime because they are

more comfortable and they are not wiped out, they actually are more productive than a lot of the competition. This particular contractor continues to be very successful and gets a larger and larger part of the market in his area.

Thank you.

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### Question and Answer Session

MR. SCHNEIDER: Well, we had such a crowded program, we don't have a lot of time for questions, but we do have some time and I hope we will have some discussion if we can get people from the audience who may want to contribute some of their experiences in the construction industry of things that they have noticed that could be done to reduce the risk of ergonomics injuries.

Does anybody want to get up? Any questions?

Q: Yes. I am Jordan Barab, American Federation of State, County and Municipal Employees. I thought this was a fascinating session. I mean, I don't know a whole lot about this, and we have a lot of highway construction people who really need this information.

I have a specific question, Mr. Burkhammer, and I don't know if it is a problem with time or what. But a lot of the other speakers talked about different kinds of equipment they use, more or less engineering controls and that type of thing. You didn't mention any of that in yours, and I was wondering whether there were any different equipment engineering controls you use, aside from the stretching and the back belts and that type of thing.

And also, you did mention some decreases in your workers' comp claims or injury claims and whether you have broken that down at all to whether that was due to the stretching, the training, or the back belts; and if you had done any analysis on that.

MR. BURKHAMMER: Basically I concentrated my talk on the program. We do a lot of other types of ergonomic improvements in our equipment. We have vibrating equipment, we use proper rubber handles. We use all kinds of different things to improve our tools and equipment. We use rubber grips and rubber grommets in our vibrating equipment. All the carpenters have rubber-handled hammers and grips that they use to reduce the vibration that comes up through the arms. We use lifting techniques. We have all kinds of different things on our jobs that help employees lift better. We have the bearing technique on the cable tray that Tony talked about, when the guys are pulling cable in through the trays and through the conduit.

So generally all across our types of work that you saw in my cartoon there, we try to have something or some type of new technology or invention that helps protect the employees or make it easier for them to perform their function.

The second part of your question is statistics. We implemented a new statistic program. It took us three years to build the damn thing, and it still doesn't work right. But it is supposed to slice and dice everything every way you can imagine. I haven't seen it yet, but we are supposed to have it. And as soon as they give it to me, I would be happy to share some statistics with you, if you would leave me your business card.

MR. SCHNEIDER: Ira?

Q: Yes. This is also for Stew Burkhammer. Regarding the body mechanics training, I got the impression that there was some sort of evaluation of people's follow-through on the job and some sort of reward system. I would like you to talk about that a little bit more, how was the effectiveness of the training evaluated? Did people actually use good body mechanics? Were they able to use good mechanics? Or did they revert to the usual way that people bend over, which is to save energy and get the job done?

MR. BURKHAMMER: That's an interesting question. We didn't really do a scientific evaluation of how each type of stretching exercise -- and there's about six or seven of different types that they go through during this five-minute period -- whether it made them stronger, limber or more flexible, whatever, to help them perform their tasks.

The thing we did get for the majority of employees when we went up and asked them what benefit they got out of the stretching was, one, it loosened them up in the morning and made them feel better and helped them get started quicker in the morning than when they didn't do the stretching, it cleared their heads and made them a little more alert. But it also reminded them that their body is a big part of what we are getting from these employees.

And when contractors get employees, they get a mind and they get a body. And a lot of employers use the body and not so much the mind. But we try to take both parts of that.

I think the mind plays a great part, also, in injuring the body. There has been some studies in psychological behavior versus mechanical injuries. I don't know a whole lot about that, but there is a big difference, I think, when you do stretching exercises in the morning and you do some type of exercises after lunch, because it just improves you mentally and physically and makes you a better employee.

Q: But I assume that the training that you were talking about was body mechanics training, like how to lift.

MR. BURKHAMMER: No. The initial employee training that they got in orientation is, you're right, body mechanics and how to lift properly, how to pick up, how to stretch, how to move, how to do the different positions that we do. And we dragged that down in task training. So yes, that's exactly what you are saying.

Q: Well, in construction most people don't have options as to how they can move and lift. That seems to limit the effectiveness of training in my mind.

MR. BURKHAMMER: No. I don't think I would say that. I think it is a combination of that plus individual task training. Whenever we perform a task, we have a program called STAARRT. It's S-T-A-A-R-R-T. And what it does, every employee in the morning goes through this program. If he has a particular job that he has to perform that day that is unusual, different, has a different twist to it than he has ever done before, we give him specific task training how to perform that task ergonomically safe. I think in conjunction with the stretching, when you do the task training, that in combination makes it easier for him to work.

We also have a job where the foreman is responsible for getting the proper lifting equipment to do the job, whatever equipment he needs to do his job, the right vibrators, the right hammers, the right tampers, the right saws, the right everything.

So all that in conjunction makes up a good program. If you take any one of those parts away, I think you take something away from the effectiveness of the effort.

MR. SCHNEIDER: Any other questions? Billy?

Q: Thanks, Scott. Billy Gibbons. I worked with Tony Barsotti and Steve Hecker on the Intel site, and I had a question about your stretching program, also. We did an evaluation, a perception evaluation, on the Intel side with their stretching program. Although it was widely accepted and was actually used every morning by 80 percent, like Tony said, of the workers out there, that is on contractor time.

What we also found in our evaluation was that even though so many of them received a lot of benefits from it, two things, they directly found benefits if they received training on the stretches that they were doing. And the kinesiologist that we worked with, something along the lines of having to do it for a certain duration to actually see the benefits of it.

My question to you is, on this five-minute stretching in the morning which was on your time, the five-minute stretching that was on what you are saying is their time after lunch, what do you do to motivate them? Our group of workers said that even though they love the benefits of it, they didn't feel like they would do it if, a, it wasn't mandatory, and b, it wasn't on the contractor time. So what do you do to motivate them and how do you know, in fact, they are doing it after lunch?

MR. BURKHAMMER: The after-lunch program was strictly motivated and driven by the crafts themselves. We didn't do anything to motivate them. We didn't do anything to tell them to do it. It wasn't mandatory to do. But every craft person did participate in it, because they felt that it was something that they believed in and they got some improvement out of.

It got so bad toward the end that the non-manuals even got out after lunch on their time and participated, too, because they felt they were not doing it properly by letting the crafts do it themselves and then sitting in the office for the extra five minutes. We, the management team, did nothing. It was all done by the crafts themselves.

Q: Okay, great. One more question. You referred to periodic retraining. Was that periodic retraining with your stretching program and the back prevention program? And to what extent

was that?

MR. BURKHAMMER: We do periodic lifting technique training. We do periodic how to wear the back belt again training. If we see somebody that isn't wearing it right or it is hanging down or he has not got in on properly, using it properly, we bring him in, we say, you know, "Let's show you how to do this again, just to make sure you understand."

We also do periodic training in how to do the exercises. Sometimes, people look for shortcuts in doing this, and exercises are no different. You try to find different ways to do them that will affect a different part of your body than we want affected. So we will go out four times a year, and we will have an instructor go in with every exercise group. He will reshow them how to do it to make sure they are all doing it right.

Q: Okay. Thank you.

MR. SCHNEIDER: Next question?

Q: Yes. Marshall Balk from Alberici Construction out of the Midwest. For anybody that hasn't tried what Stew and some of the other people talked about, the stretching and the training really does work. However, we have an additional problem that I haven't heard addressed, and I don't know if anybody can help me with it or not. If it seems offensive, I apologize.

Our statistics kind of match what Stew put up there, but I have broken them down a little bit further and found that in addition to those type of statistics, we had a higher frequency rate toward the end of a job. And it further broke down as a higher statistic incident rate toward higher benefit comp states and lower construction employment rates. And I don't know if anybody can help address that part of the equation as well.

MR. BURKHAMMER: I guess I get that one, too. We had the same problem. Depending on where you work, what state you work in, the amount of jobs, how many people are working or not working, you are going to have a problem like that.

A couple things we do, and it is not a cure-all -- I mean, we haven't eliminated the issue certainly, but when a craft comes on the job in the beginning, we do a little pre-task evaluation of the employee. There are certain things you can ask. There are certain things you can't ask under ADA.

We do a little bit of history on the employee. It is all voluntary. If they want to tell us, fine; if they don't, fine. Then at about six months left on the job, we bring in a loss consultant from the insurance carrier. Every employee who is laid off due to reduction in force between the six month and the end of the job -- and that's where most of your layoffs occur, your reduction in force occurs, the job is completed -- they bring every employee in and do an evaluation of that employee.

So there are no surprises after he/she leaves. If there is a surprise, it is pretty well documented what happened and what didn't happen to that employee. And we keep pretty good records on

the employees throughout their tenure with us. We haven't had a lot of the end-of-job syndrome problems. But when we do, we have pretty well documented ourselves to where we are able to take care of the issue.

MR. SCHNEIDER: Well, one thing I should mention is that in this Iowa survey that Tom and his friends did, we found that one of the biggest problems we had that workers complained about was that 40 percent of them said that they had a problem, one of the biggest problems, was working while they were hurt. What we found is that a lot of guys are going to work even though they are having shoulder or back problems or whatever because they need the paycheck.

And then maybe -- it is conceivable that when the job is ending -- they are not going to have a job anyway, they may report it more. But I think a lot of them are going to work hurt and not reporting it because they need the paycheck. So it is a problem.

But the other data we have, the symptom survey data, we have data from Sweden on 93,000 construction workers. It really shows that people do have a lot of problems that are not necessarily tied to what state you are in or what job you are on or whether the job is ending.

Tom?

Q: I would just add that the end-of-job syndrome is not unique to construction. In terms of manufacturing and other seasonal work, it is not uncommon at all that when layoffs are announced, all of a sudden people start reporting at least the back pain that they may or may not have had for a long time.

So I think Scott's point is well taken. Many of these people may be working continually with these problems. But when they realize that their paycheck is going to dry up, they say, "Heck, I'm going to go ahead and report it." So it is not unique to construction by any means.

MR. SCHNEIDER: Susan?

Q: Susan Moir from the Construction Occupational Health Project in Boston. Another thing that we have found that I think reinforces both what you, Scott, and Tom have said is that end of job also means, oftentimes means, increased production because there are a lot of deadlines in construction. When production levels increase, we have consistently found that safety programs decrease.

New workers do not get orientation, tool box meetings do not necessarily happen. At least the safety elements to those tool box meetings do not necessarily happen. The safety programs deteriorate as production -- there is a direct inverse relationship -- as production pressures increase. We have consistently found this.

Another piece of information that we found out is that there is a commonly held belief that layoffs cause people to work, construction workers particularly, to work slower so that they can increase the work to prevent the layoffs. What we have consistently heard from workers and front line management is that layoffs are a safety hazard because people work harder because



they are afraid they are the next one who is going to be laid off and because they are working on short crews.

And oftentimes, at least in Boston, what we are finding is towards the end of the production schedule, money is tight, production pressures are high, safety goes down the tube. And that is another reason why you have more injury, in addition to people reporting injuries that they have had right along, because they are afraid they are going to be the next one on the line.

MR. SCHNEIDER: Any other questions? Sure.

Q: I am Anne Egan with Metro-North Railroad in New York, and we actually have a project going right now with Bechtel. I was curious, you said you issue back belts to your employees. I was wondering what statistics you use to actually issue them and why all of our data that we have developed has shown that back belts have given a false sense of security and not actually been a preventive measure, at least in our industry in the things that we have come across.

MR. BURKHAMMER: Well, back belts by themselves are a false indicator. I think Linda Rosenstock has a saying: You throw a box of back belts out on a dock and everybody comes and picks one up. That's not a back injury prevention program. Giving somebody a back support singularly is not a back injury prevention program.

You have to have training. You have to teach proper lift techniques and how to wear the belt properly and you have to provide a belt that fits and one that is ergonomically feasible for the employee to use. There are different kinds of back belts in the industry, all different shapes, Velcro, non-Velcro, straps, no straps. You can line up 50 or 75 of them on a table. But not every one of those is right for the job that the employee does, you have to find one that is right, and you have to make sure the employee understands what the belt can do and what it can't do. Just putting it on and wearing it around all day isn't the answer. That doesn't do anything.

Q: Yes. We just never found any positive reason for wearing the back belt, that it has very limited use no matter what. We have gotten to the point where without a doctor's note from an employee we won't even think of it. Actually, we have recently stopped completely, we don't issue them at all.

Q : I guess I am intrigued by it myself. I have this kind of cynicism towards the back belts. I am interested in the data, or if the studies have looked at whether there have been programs which have gone to the same level of training and ergonomic interventions in the analysis of the tasks that haven't used the back belt, so we begin to break out those variables.

Like Stew mentioned, you have to have all those pieces in that as an injury prevention program. The stuff that I have looked at before either has all of it in there or it will have, maybe, a back belt specific kind of program, but doesn't really have a program. It has all of those other elements in it without the back belt for a comparison to it. I just suspect that all of those other elements are the ones -- the rest of your program, the way you have managed your work, the way work is done on your project, are really the ones driving that more than the belts myself.

MR. BURKHAMMER: On the Metro North, we would be happy to sit down with you and show you all the statistics that we had before we had the program and how many dollars it cost us, and then we put the program in and the four years since we have put it in and the benefits we have seen to the program. I like to look at back injury prevention as a system, somewhat like fall protection systems.

There are different parts that make up the system, and if you don't have all the parts, you don't have the system, and if you don't have the system, you are going to hurt people. So it is a whole thing put together.

Q: Do you visit all your jobs?

MR. BURKHAMMER: Any employee that is laid off, reduction in force, quits, what have you, with six months left on the job, before he is checked out or given his final papers, sits down with a loss control rep. and there is a form that they go through.

There are about ten questions, I think. Do you have any injury on this job? Have you been hurt? Different things like that to get a feel for the employee of, do you have an ongoing problem that you had happen here, is it going to continue on after you are laid off? Have you had any problems? You don't have any problems? Are you happy? It is kind of a shuck and jive form, but it does work when six, seven months later the employee comes back and he says, "Oh, by the way, I got hurt on Bechtel's job down the road." And you find out he hasn't worked since, and there have been other kinds of problems that he has had, too.

It helps a little bit in getting the records back and figuring out whether the guy really did get hurt on the job or he didn't.

MR. SCHNEIDER: Let's have one last question.

Q: I am Larry Chapman from Wisconsin. Listening to all of your presentations, it seems there is one theme running through which was: there are certain simple, quick, cheap fixes that immediately become very popular and employers don't resist and seem to go some way towards solving the major problems. How do we get more of those? And of the ones that already exist, are they widely appreciated throughout your industry?

MR. BURKHAMMER: Yes. I think that is a key question, and I think the answer is no, they are not widely appreciated. There is a lot of people doing innovative things in different places, but a lot of information is not shared. I think we need to do more of that or figure out better strategies for doing that. I don't know if other people have other suggestions on what we can do.

MR. COOK: : I think all we can do is more of the kind of thing we are doing here, where somehow we communicate and dialogue. For example, this contractor that we have been dealing with, he is very happy to share. He came right in and said, "Bring in your video camera. I don't care who you tell about this, if this will help somebody from getting injured," even though it might be his competitor.

There are a lot of very creative people who come up with really nice, cheap, quick-fix solutions that can make an impact, but they never go beyond that shop or that facility. And I think somehow we need to increase the information exchange and share all that wisdom that is out there. It is in little pockets. And I don't know an easy way to do that, other than these kinds of forums, publications, trade journals, videotapes, any medium you can think of that will help share this information.

MR. SCHNEIDER: Billy?

Q: I just wanted to add to that really quickly. The consortium that we work with, the CPWR, and the University of Massachusetts at Lowell puts out a publication called Bright Ideas. It is a little one-page pamphlet. Scott, go ahead and expand on that.

MR. SCHNEIDER: Yes. We have a newsletter that goes out to probably 2,000 people, and we try to publicize things through our newsletter, through our conferences, through academic publications, through lectures that we give. I mean, we will be giving talks like this all over the country and other countries as well. So that is one way to do it certainly.

Hopefully we can work more with trade associations, some of the roofing contractors and others perhaps, to try to spread some of these innovations.

Tony?

MR. BARSOTTI: One thought on that is construction, as this group would know, is very complex in the trades, in the tasks, within a specific trade, on a particular job. And I think the key element is a commitment to do it with the empowerment of the people who are on that job, on the project, and a culture on that job and within that company that supports it. Most of the people who are doing the tasks can come up with these ideas, just like the ones on the equipment modifications, the other ones. It is not as much a need to develop those ideas as it is to have a process within a particular company, on a particular project, that supports that, where crews really believe it. Then it will come with that.

Not that we shouldn't share and pass on information and make equipment modifications and change standards and bring those things in as well, too. But as far as what was talked about, picking off the low hanging fruit and what things are available on what jobs today, that it is more tied to just being willing and committed to do it.

MR. SCHNEIDER: I agree. I think the knowledge is out there. I think 70 or 80 percent of all the interventions are already out there. Someone is doing them, and it is because people gave them the opportunity to do them, good management that was interested and committed and believed in this process and set up a process that allowed people to innovate. I think that is what we need to encourage.

Thanks very much for coming and have a good lunch.

(Whereupon, the session ended.)



## Apparel/Textile

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Eric Frumin, UNITE

MR. FRUMIN: Good morning. My name is Eric Frumin, and I am with UNITE, the Union of Needletrades, Industrial and Textile Employees. I am with the union's health and safety department at the union's headquarters in New York City. UNITE is a product of a recent merger between the two long-standing unions in the apparel and textile industries, the International Ladies Garment Workers' Union and the Amalgamated Clothing and Textile Workers Union. We represent about 300,000 workers in the U.S. and Canada, and they make clothes and textile products in some of the more famous brand names in the retail market: Levi Straus, Liz Claiborne, Fieldcrest-Cannon. We also represent workers in other industries outside of traditional textile/apparel production, such as K-Mart distribution centers and the Xerox Corporation manufacturing plants.

I want to thank OSHA and NIOSH for allowing the apparel and textile industries to have a workshop of its own here today. The apparel industry particularly, as distinct from the textile industry, is afflicted by very high rates, notoriously high rates, of ergonomically related disorders on a par, often in the same order of magnitude, as those in the auto assembly industry and even in meat packing.

And so it is important that this conference devotes some attention to the conditions of this industry, even though the industry has not gotten the attention that some others have.

The apparel industry is in crisis for a number of reasons. It faces a scourge of low road competition. It faces not only a bad image, but a bad reality of outright worker abuse and exploitation by employers who have no business being employers. And it faces a traditional history in some sectors of the industry of very poor labor-management relations.

On the other hand, the industry has many good things to talk about, and one of them is the work that workers and union members and leaders and employers do in the area of ergonomics. We are here to tell some of the success stories here this morning.

Hank Lick from the Ford Motor Company made a point when he spoke at the welcome about how ergonomics helps out companies and their unions and workers in a variety of areas, such as improved quality and improved worker training. We will hear about some of that today, and it is important to keep that in mind.

The structure of the workshop will be that it will be moderated by my co-chair, Pat Hirschberg. We will have three presentations. We would like you to hold your questions until the end,

because then all the presenters will be available for questions. And if we can stick to our time, maybe even make up a minute or two, we should have a good 20 minutes or so for questions and answers.

In addition to that, when the workshop closes, the union presenters will be here for a little while to do a briefing for some press people and to show a longer version of a videotape that you will see a condensed version of during one of the presentations. There are also some educational materials in back we want to encourage you to take.

So with that, I will turn the session over to Pat Hirschberg, who is with the OshKosh B'Gosh Company. She will moderate the rest of the workshop.

Thanks.

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Gail Sater, Red wing Shoes

MS. HIRSCHBERG: Thanks, Eric. I didn't bring any bibs, so no solicitation.

Our first presenter is Gail Sater. She has been in the insurance, the risk management insurance, field for 23 years. She has worked for an insurance company, a broker and now is in the risk management area. Gail has experience in a variety of companies: computers, farm co-ops, grocery wholesale and airline, and currently is with the Red Wing Shoe Company out of Red Wing, Minnesota.

Gail holds a bachelor degree from the University of Minnesota and an MBA from Metropolitan State University. Gail is also current co-chair of the Remus Educational Committee.

Gail.

MS. SATER: Thanks.

Well, as Eric mentioned, the textile industry is in a bit of trouble. So is the shoe industry. In 1966 there were 1,100 shoe factories in the United States. In 1994 we were down to 340. Shoe imports in 1966 for leather footwear was 13 percent. In 1994, 89 percent were imported. Fifty-five percent of all the leather footwear comes from China. The U.S. supplies only 11 percent of all leather footwear.

In 1996 there were 214,000 U.S. production workers. By 1994 there were 49,500. In 1994 there were 795 million pairs of men's and women's shoes manufactured. Six percent of those were

work boots, or 48 million.

For those of you who don't know about Red Wing Shoe Company, I will tell you a little bit about us. We were founded in 1905 by 15 investors. The current owner's grandfather bought controlling interest of the company in 1920. We manufacture about three-and-a-half million pairs of shoes and boots annually, and they are primarily work and service shoes. We are also the largest steel toe or safety shoe manufacturer in the United States. We employ about 1,350 employees in our 3 factories. We make about 9,000 pairs of shoes a day in some 150 styles ranging from size 4 to size 18. These go from size AAA to EEEE.

We have been seen on the big screen. Our shoes have been in Grumpy Old Men, One Flew Over the Cuckoo's Nest with Jack Nicholson, Overboard with Kurt Russell, and most recently Clint Eastwood wore them in Bridges of Madison County.

We are still using our original plant that was built in 1905 right in Red Wing. And we also have another plant in town that was built in the 1960s, and we have a plant in Danville, Kentucky, and Petosium, Missouri.

We were in some big trouble in about 1988. Remember I said right now we have 1,350 employees. Our pay-in, the red bars, what we were paying in to the insurance company in the first year, we have now been able to reduce them down. We are on what is called a retrospective rated plan, so it is adjusted each year as we bring people back to work or reduce their injuries. We have done this by some light duty programs, our ergonomics, things like this. But we were paying in over \$4 million a year in '91/'92. We have brought those down. And in '95/'96 with our addition of our two plants, we are a little over \$1 million a year in our workers' compensation coverage. But back then, we almost had no insurance coverage, because we weren't bringing anybody back to work.

I don't know how many of you work with this, but this is the history of our experience modification factor. If you are average, you are 1.0. We were 2.3. So for every dollar of premium that we had, it was multiplied by 2.3. That's what we were paying in. We are now down to .85. That's because we have put in some good programs.

Our frequency rate, if you are familiar with that, back in 1995 was 46.5. We had some big problems. The insurance companies were going to cancel us unless we implemented a comprehensive safety program, introduced ergonomics, and started some return-to-work programs.

We hired a consultant. Our first risk manager was hired from our insurance carrier, or insurance broker. And our losses started to decline.

In one of those years where we had the pay-ins and the big returns, once Bill came on board -- he is my predecessor, and I always give him a lot of credit for this -- our return premium was \$2.6

million. That's a lot of money that the insurance company got to use instead of us using it to improve our facilities. And it was all because we agreed to bring people back to work and that we made some modifications to the work stations.

We also started job rotation. We went off the piecework system. We are now working towards modular manufacturing.

One thing, and it will come out through some of the other programs, is we had to work a lot with our unions, too. We are in the Boot and Shoe Workers' Union and the Teamsters. We did a lot of partnership with them. We changed the way we communicate with them. They are involved in every committee that we have in the company and work with them very well.

We had to change a lot of language in our contracts to allow for flexibility, to allow us to bring somebody back into an area where they didn't work before. We did a lot of job rotation. That was a biggie. We have been doing that for about four years now, and we still felt the growing pains of that.

Our new plant started out that way, so they have never known any different. But it was very difficult to take somebody that had been putting the hooks on a boot, just boom, boom, boom, boom, doing that same job for 30 years, and all of a sudden telling that man or woman that now you have to learn how to sew this gusset in a boot. The gusset is the tongue of the boot, by the way.

We also worked with our local doctor. Being in a small town, we have one clinic. We are about 45 miles south of Minneapolis, if you are wanting the geography. And we are right on the Mississippi River. We can see Wisconsin from our plant, so we have a lot of Packer fans there.

We also have a physical therapist in the plant, and we have him under contract. He is not in our plant, but he comes once a month, works with the people in our facility and our maintenance department. Eric will come in and do stretching exercises. He also works with our maintenance people in setting up the work stations. So we have a regular contract with him. It is approximately \$1,200 a year, something like that, not a biggie. But he is there every month working with us, and we have a regular scheduled meeting with him.

We hire out some of our audio-metrics. We use our insurance carrier a lot. If you are with a smaller business, you may not realize but 15 to 20 percent of your insurance premium goes to your broker. And your broker has a lot of services that you can utilize.

We also have, as I mentioned with Eric, some stretching and exercise programs. Our return-to-work rates were great. We now have a full-time work comp coordinator that works exclusively on our return-to-work programs. Many of our alternate duty jobs are in the office, light maintenance, maintaining our bulletin boards, a recycling program, sorting materials, running messages around, whatever.



Our biggest success story this year was a young fellow that, unfortunately, lost a hand in one of our trimming machines. But this will show you our company commitment. This happened on a Tuesday night. He had his hand amputated Thursday morning. Saturday, or Friday, a bunch of people from our company were at Rochester -- he was down at the Mayo Clinic -- going to see him. Saturday the president of our company drove down to Rochester to see how he and his family were doing. And Sunday the owner of our company drove to Rochester to see how he was doing and to check on him.

We have a rule, if anyone is in the hospital, we are obligated to call the owner and the president within 24 hours and let them know. That is how much they are concerned about the safety within our company.

In our ergonomics, like I said, we used to work around the piecework system. And so you just had to set up one work station. The first big thing we did was we bought everybody new chairs. Voil . Big deal. Now they can raise and lower them. You know, the backs went in and out. We spent a few thousand dollars on those; made all the difference in the world. And also, we are not beating our people up a lot.

If any of you have gone and bought a pair of boots in the last ten years or so, you may have seen the shoelaces manually tied onto the boots. Well, somebody had to tie those. A machine doesn't do it. We do everything in 12-pair cases, so they are on racks 4 high. The highest rack on me -- and I am about 5'5" -- was about here, and the lowest one is about a foot off the floor, because the boots themselves are about this high. So you have to tie the laces on the boots up here, and you have to tie the laces on the boots down there. We had a lot of shoulder problems, a lot of knee problems, and a lot of wrist problems.

What we did was we went to the manufacturer. We found, one, a manufacturer that made longer little plastic things, you know, that you have to cut off with your price tags on your clothes. We needed a longer one of those. And also, we bought prepackaged shoelaces. Now they take the boots, put them on a shelf, on a counter right in front of them, pick up all those little hang tags, pick up the shoelace, go thunk with a little gun. They're all done. No more manually tying. A little more expensive on the front end, but reduced the injuries 100 percent.

I have some slides that we can show, and if we need to stretch, we can do the video later. But this is a very simple one. You notice that the machine is at about a 30-degree angle. We built these in our maintenance shop. When you think about it, if any of you have ever worked over something like that and if you are in the textile industry, many you people do, it is hard to do it when it's flat. But its just like your keyboard tray on your computer. If you slant it about 30 degrees, all of a sudden you have tipped yourself back a little bit. You are not bending over quite as much, and your back is straighter. Every machine, every sewing machine, in the factory is tilted like this.

I don't have a slide on this one, but if you think back to your grandmother's old treadle sewing

machine, the big old flat pedal that you had, we built little stands with some angle iron, and they can raise and lower those and slide them all around. And now the foot pedal sits on that. So no matter what height you are, you can move that wherever you want.

This is an example of -- this is a computer stitching machine, but it is also -- and this gets a little grainy from blowing up these slides, and I apologize. But it is just a movatech table, and you can just see right off her knee a crank. So now you can sit down on part of your job or you can stand up. And because we are rotating and we all come in different shapes and sizes, the individual operator can go there and just crank that thing up or down, and it is very simple to do. No big deal. I believe -- and don't quote me on these prices -- one of these tables is only about \$700.

Another change we made in an operation like this, if you see someone standing like that and if you are dealing with a single foot pedal, you have to put all your weight on the other foot while you are running the foot pedal. What we did is we found a body bar, so it would hit this operator -- and I'm sorry I don't have a picture of it. It would hit her mid thigh, and there is another one that would be on the side of her leg. So on the side of her leg, she just leans a little this way, the presser foot comes up; leans this way, it comes down on the leather; leans forward, vroom, the machine goes; she leans back, it stops. So now all of her, she is balanced on both of her feet. Okay?

Throughout the factory, especially on our waterproof lines, which are very heavy boots, we have the arm slings. They can use them or not. Also, you can adjust them, and they just take a lot of the weight off your arms. These boots, if you have picked up a men's size 16 boot, these things get pretty heavy. So it just helps take some weight off their shoulders.

Next one?

This is a sample of one of our new computer stitching machines. There is about 120 steps, manual steps, that go into make a standard boot. This machine now clamps the pieces together and with one motion they don't have to move anything around and twist it anymore. The machine does it. And we have about 20 or so computer stitching machines now in the factor. But just one like this I believe is in about the \$35,000, \$40,000 range. So they are a little pricy to do, but we are slowly getting more of them in.

The next speaker is ready, I think. And if we have time, we can show some of this real time on a video.

MS. HIRSCHBERG: Thank you, Gail. I thought for sure you were going to announce that Red Wing was going to Velcro ties or Velcro closings instead of tied, but you found a solution to your problem. That's real good.

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Laurie Kellogg, UNITE

MS. HIRSHBERG: Our next speaker is Laurie Kellogg, and she has been working in the labor movement for 15 years, concentrating on organizing and on developing educational programs for Spanish-speaking workers on health and safety issues.

During her six years at UNITE, she has coordinated a union-based Occupational Health Clinic and started a support group for members with repetitive strain injuries. Over 1,000 union members have been seen at the clinic.

She has worked extensively on establishing joint labor-management health and safety committees and works closely with small apparel factories to implement joint ergonomic programs.

Laurie.

MS. KELLOGG: Thanks very much.

Eric, while I begin, put on the overhead about RSI rates in apparel.

I want to give a couple of minutes of background before we show a brief video clip about the industry as we see it in New York City, which is different than some of the rest of the country. Some of these points do not apply to the specific factory I am going to talk about, but it gives you an important context.

The Department of Labor estimates that there are about 6,000 to 7,000 small garment contracting shops in New York City. The average size is 40 workers, primarily older women, primarily non-English speaking, many immigrant workers. Some are not literate in any language. And an increasing number speak remote dialects, particularly in the Asian population.

These workers are extremely economically vulnerable. They are working piece rate. When asked to, they are working very long days because of the seasonal nature of our industry, and they are not taking breaks. Then they are unemployed for long periods of time as well.

These are not workers who are taking time off to go to the doctor. They may be afraid of the outcome and prefer to deny the symptoms they are feeling. There are language barriers. There is massive mis-diagnosis by the medical community, although that is improving year by year. And they may be afraid of employer retaliation. They are postponing their medical care, particularly when they think it is arthritis; they think they are getting "old age" disease at age 35.

Many of them have heard that the workers' compensation system is a cesspool in New York. I'm sorry to say that is the reputation. Again, we are seeing some improvements there, recently.

So a number of the surgeons who are working on carpal tunnel and RSIs in New York have told us that when they see apparel workers, they are seeing the worst, most advanced cases of repetitive strain injuries.

Now, on the employer side, the contracting shops, of those 6,000 or 7,000 shops, an increasing number are illegal and sweatshops. Of those, 1,500 are going out of business every year. And new ones are opening up. A lot of these employers, these small contractors, are being squeezed by the larger manufacturers that are giving them work. Some of these contractors themselves don't speak English and are not that familiar with their obligations (under the law).

And the contracting shops are extremely vulnerable economically as well, so they are putting pressure on the workers. All of this context is basically to say that ergonomics is not yet a household word in many of these shops and that every aspect of the project that I am going to talk about posed enormous challenges, and that employers like Sequins and managers like Peter Meyer, who is going to speak, are very unusual.

So if our video guy is here, I would like to show a five-minute clip of our video.

A videotape which discusses joint labor-management ergonomics project at Sequins Int'l was shown. (The project was funded by matching grant to employer. Ergonomic chairs were purchased and harmful machines were rebuilt to be fully adjustable. The video is available for \$10.00 from UNITE.)

MS. KELLOGG: Thank you.

That gives you a little taste of what this project was about. And I would like to just touch on a couple of highlights of it. Just by way of background again, our experience indicates that many workers are not reporting these injuries and illnesses and that the problem is much more extensive. That's part of why we established the CAF fund, to help employers deal with these problem.

I want to mention again that without the union having established an occupation health clinic, we would not have such good information about what is going on with our workers. We are greatly indebted to Mount Sinai Hospital for partnering with us to set up this clinic. The clinic has seen about 1,000 workers. And having our own occupational health clinic at the union allows for accurate diagnosis, much better referrals for treatment, referrals to the member assistance program to help workers with psycho-social issues and benefits issues. And it has allowed us to get a handle on what is going on with these injuries in our industry in New York, as well as how our members are faring with the workers' comp system. And most importantly, it allows us to prioritize what shops we need to go into to start making health and safety improvements.

The CAF fund, as is mentioned, is a partnership with the industry set up during national negotiations, and matching grants are provided to employers. Any employer can apply. And in

the case of the Sequins project, they received approximately \$8,500 in matching monies.

There were approximately 80 spoolers and 20 sewing machine operators involved in this project. And as you can see with this overhead the demographic characteristics, we had to deal with the language issues, et cetera.

The key element of this program from our point of view was the educational process for starters. I started with a confidential symptoms questionnaire for workers, but what I want to emphasize is that the entire process involved talking to workers and then supervisors as well about how they saw the problems on the job, recording their ideas, and asking them to come up with solutions.

So the ownership of the project in the sense of input, the sense of participation and cooperation, was based on this key fact, that they are the ones who identified many of the problems and came up with the new machine design.

We started with getting the BIOFIT adjustable chairs and doing a training program. And from there went to a prototype spooler, which the workers on the committee gave many, many criticisms to. And from there, we built more and more prototypes until we got it right.

And Peter is going to talk about the resistance from upper management to this project, but I will just say from the union's point of view that it was vociferous and articulate and enthusiastic resistance on the part of upper management. And it was quite to his credit that he was able to get this project through.

The supervisors were a key part of this. They also felt a lot of ownership over the project. On their part, the greatest resistance that they had was that they saw there was a problem, they understood that there was pain, and their attitude was, "pain is part of life". Pain is not a disease. It is not something we have to really worry about. "Come on, girls, you know, grow up. Deal with it." And we really had to work on this issue of disease, disability, and helping people understand the diseases are real.

Then from the feedback and improving the prototypes, the final change was that Sequins decided for other reasons as well, to go to modular production. The modular added a number of additional improvements, particularly the option to sit and stand while doing the work and the fact that workers now were not spooling eight hours a day. They were doing other jobs. There was job rotation. There was walking. Different muscle groups were used. A great decrease in repetition and in awkward postures and an increase in the amount of control that workers had over the pace of work and greatly improved relations with management as a result of the change over to modular.

And Peter will touch on that as well. So the task enlargement was a key part of this.

After Peter gives his presentation, I would like to talk a little bit more about the Mount Sinai

outcome for one minute.

Eric, can you just put on the overhead?

The Mount Sinai study was a key part of this, and that involved questionnaires regarding symptoms, severity of pain, histories, non-occupational ergonomic exposures, and many, many other issues. It is about a 12-page questionnaire. And one of the people involved in that study is here with us, Jonathan Dropkin.

Jonathan has brought copies of three different studies that Mount Sinai has done, one regarding this project and two others with workers from our industry in New York City. And I encourage you to pick up that information from him or in the back.

So I am going to turn it over to Peter, and then I will conclude with the last two overheads.

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Peter Meyer, Sequins International, Inc.

MS. HIRSCHBERG: Peter Meyer began his career with Sequins International in 1968. Peter rapidly established a working knowledge of a mechanic in the sequin section of the company overseeing 40 employees working on a first shift. Ten years of on-the-job training produced the desired results. Peter had evolved into a knowledgeable plant manager now responsible for 100 employees.

In the early ten years of his career, Peter became more and more involved with human resources. He has co-partnershiped several ventures with the in-house union, UNITE. He became the driving force behind the establishment of the in-house ergonomic program.

In 1993 he attended the University of Michigan Executive HR program and was named Sequin's HR director in 1994.

Peter.

MR. MEYER: Good morning. In 1992 you never would have found Laurie Kellogg and I sitting on the same side of the table.

I would like to talk a little bit about some of my personal experiences and some of the experiences that occurred as we did this unique experience of ergonomics. As you saw in the video and as Laurie mentioned, it was brought to our attention that there was a problem that existed in our factory. I had been there for a long time and knew a lot of the people that were

involved.

It is true that workers do not report injury, especially when they are concerned about their job. And our business being as such, workers do not work a full year. They are laid off. They continually are concerned about the hours they are going to work. So it makes sense that they wouldn't report something that might jeopardize their job.

Let me first explain that the difficulties that we ran into running this program was, first of all, we are a small business. We have about 350 workers now. Capital is always a problem. So it's not easy to think about spending money on something that you don't visibly see a return on immediately. That was my problem when it came to upper management. That plus the fact that I think on some level trust was an issue. I had never worked, in all the years that I was, never worked in a partnership with the union on anything. And normally we were on opposite sides of the table.

When someone comes in and kind of tells you that you are perpetrating a problem, it is not an easy thing to accept. It's almost an evasion, and Laurie is an excellent evader.

We saw some videos. We were educated first. The supervisors and myself and some upper managers were educated on ergonomics, what it was. I knew nothing about it. I always considered myself a fair manager, someone who is concerned about the workers, because I consider myself a worker.

I was impressed with the video, and especially when I saw a young woman who was passing packages over a machine in a supermarket. And it struck me how amazing it is that every day you see things that you don't realize are dangerous.

And we proceeded to learn more about it. Then, of course, the shop floor people were trained. They were taught about ergonomics and what their problems were. Once that occurred, there was no way to stop it.

We initially purchased chairs, as Laurie mentioned. We purchased ergonomic chairs, and taught them how to adjust them. Someone came down from the company and taught all the workers how to adjust the chairs. We have two shifts, so the people that are sitting on the chairs in the daytime are not all the same size as the people who were sitting on the chairs in the evening. So we taught everybody how to adjust the chairs.

And Laurie didn't have enough. She wanted more. So we decided to work on a work station, which was, as you can see, a painful operation. We put this committee together, and they were all sizes of workers, to come up with some machine that would solve the problems.

I think what we learned in this process was that if you would like to find out what's wrong in the factory, then you need to ask the factory workers. They had all the information. They knew what

was bothering them health-wise. They knew what was preventing their job from being successful. And it was quite an education for all of us listening to the things that they had to say.

My other problems was resistance. This is a family owned business. There are two brothers that own the business. At the time we started to get involved in this ergonomic program, we were also getting involved with difficulties in business. We had gone from a \$31 million a year business to a \$16 million a year business. Imports were giving us a difficult time, and it didn't seem to them that this was a top priority. So I had a lot of trouble trying to get this done. As a matter of fact, Laurie and I talked about it last night.

We were training workers on company time, and there were times the bosses knew nothing about it. It was a difficult thing. I was having problems with Laurie, and I was having problems with the bosses. So it put me in a great position.

But traditional manufacturing is not something that allows workers to be educated on company time, to make complaints, to have their say. Certainly our people understood that and did not complain, did not say what was wrong. Once we opened up Pandora's box, they all had an awful lot to say about what was wrong. We at that point were listening.

I have to say, if not for the CAF fund, I think it would have been even more difficult. It was easier for me to address the owners of the company and explain that the union was going to partner with us on this project and that some of the monies were coming back from the union and the CAF fund. It made it easier for me to sell it.

The redesigning of the machine, to complete all the machines -- there are about 35 of them -- took about a year and a half to do. We had downsized. We didn't have the correct amount of machinists that were needed to do this project. We were trying to fill in all the spaces and doing it again. The amount of time that was devoted to this project was something that Laurie and I were the only two that knew about it. Laurie doesn't take no for an answer. So it is not something that you can just put aside.

It was important to incorporate all the workers into this project, because their input was the key to the success. There's no two ways about it. They helped actually redesign the machine.

Now I have done this process. Years ago I used to sit and spool when I started, and I know what it's like. So I know what it's like to sit on a hard stool and turn a crank all day. I never did it for eight hours. So it certainly made sense to me that there was a problem with doing this job.

We then came up with a machine that we are quite proud of. It fits our industry. Specifically for what we are doing, it solves all of the problems that they came up with. Certainly, ergonomically, it's a healthy machine to operate. I have had people come back to work who have been out of the company for six and seven years who are looking for cranks to turn. And they sit down and have to be trained on operating this machine because it is a completely different



operation.

The outcome of this, obviously is that there is less pain, less injury. Our comp insurance, our comp cases, have gone down. From February/94 to February/95 we had about 18 claims for a total of about \$97,000. Going forward we had about 5 claims for about \$4,500, and none of them are carpal tunnel syndrome cases.

We have instituted other things since then. And I think the ergonomic program opened up a trust with the company, a trust with the union. We have an ESL program that is going on in the factory during working hours. We are involved in quality management. We have working teams who now report what is not right with their process both ergonomically and productivity-wise.

I think if we did not begin with this ergonomic program, all of the other programs that we have since then instituted would not have been a possibility. It's a difficult thing for small businesses to approach something like this. It is much more difficult money-wise. It is much more difficult time-wise. But it is possible. And I think that is why they have asked me to come by.

Thank you.

MS. KELLOGG: Please put on the Mount Sinai outcome overhead.

This indicates the kinds of changes that Mount Sinai was able to record in their evaluation, in their study. You can see dramatic decreases in reports of pain from before, just the adjustable chair part. So this only addresses adjustable chairs. Sixty-six to thirty-four, you know, you can see it is at quite a magnitude.

And then the second overhead: Then with the final part of the intervention where the entire job was changed and everything was automated and the modular was introduced, there are continued improvements, most importantly, a decrease in the right shoulder pain. Then, the improvements in the other body parts are less dramatic, but still notable. There are handouts for this as well.

Thank you.

MS. HIRSCHBERG: Thank you, Peter.

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Roosevelt Broadnax, Fieldcrest-Cannon

MS. HIRSHBERG: Our last speaker, Roosevelt Broadnax is a staff representative for UNITE in the union's southern region and a member of Local 1855B in Columbus, Georgia. He has

worked at Fieldcrest-Cannon Company yarn manufacturing and weaving mill in Columbus from 1966 to 1991. He served as shop steward president and was a member of the safety committee for his local union.

His duties as a staff representative with UNITE include negotiation and enforcement of union contracts, education and development of local union officers and members, political action, and participating in UNITE's many union organization efforts in the Southeast.

His work on ergonomics include assisting the local union members and management at the Fieldcrest-Cannon Company in Columbus, Georgia, to establish an effective ergonomic program for workers in the textile, yarn and cloth weaving operations.

Roosevelt.

MR. BROADNAX: Good morning. I went to work at Fieldcrest-Cannon in '66. I was fortunate to have a friend that knew someone in management, and he called me in and gave me a job. There's a lot of history that's related to the textile mill, and I won't try to get into all of it. But one thing that comes to mind is last year I saw the movie, "The Uprising of 1934". In that film the ladies were talking about the lint and the dust. Surprisingly, when I went there in 1966, that lint and that dust was still a problem. Not only was the lint and dust still a problem, but there was another problem that was associated with that, too. And that problem was brown lung and byssinosis.

Sadly to say, during the years that it began to be a problem, our companies, not only Fieldcrest-Cannon but other textile industries, did not want to address that problem. I could personally tell each and every one of you today that I have lost 25 percent of my breathing as a result of them ignoring that problem.

Now I am not here bragging nor complaining, but I am here to state the fact that if we don't look at workers as human beings and address these problems and try to do something about it, more people are going to suffer as I have had to suffer. And others have had to suffer more greatly than I.

Management needs to put health and safety at the top of their corporate agenda. It is very important. It is very imperative that workers not be overlooked as simply a dollar sign or piece of machinery.

The contribution that workers can make is very vital because, as previous speakers have said, they are the ones who are on that shop floor day in and day out. They have the solutions. They are waiting anxiously for the opportunity to address you and say that this is what it takes to resolve this problem.

Fieldcrest-Cannon has a corporate headquarters in North Carolina. There are about 13,000

workers in 15 plants. The 3 plants that I am referring to are in Columbus, Georgia: a yarn mill, a weaving mill and a sewing plant. Thinking in those terms that Fieldcrest had that many employees, you would think that they would implement a program that involved the workers. But somehow they were unwilling to do that.

Fortunately in 1971 the union came to the yarn mill and the sewing factory, and they organized. And in 1979 my plant received the recognition. Workers need a voice. Workers make the difference. We are not trying to tear down the company. We are not trying to take over the board rooms. All we want is our fair share.

The company was very reluctant. They didn't want to give us that opportunity. So they left us with no choice but to step up the pressure. One of the things that we did was we had demonstrations right in front of the mill. We had grievances. We had leaflets. We called OSHA in. And we even went to Washington, D.C. Many times we boarded buses. We left one day and came back that same day. We took workers who had been affected. We went to The National Labor Relations Board. We went to Congress. We went to other places to let them know that we were human beings, and we need to be treated as such, and that those demonstrations were not to make the company look bad, but to bring our point to focus that we had a concern and a vested interest in our health and safety as well.

Our company finally began to formulate health and safety committees. Our union had direct involvement in that. Part or half of the committee was selected by the union. We began immediately on the very issue that I talked about that affected me, and that issue was brown lung.

We started telling the company that they are going to have to do something. They are going to clean up this mill, because the Act said that we no longer had to tolerate all the cotton dust. We no longer had to walk out of that plant with the lint, the dust, and also with it affecting our breathing.

So as a result of long meetings, difficult negotiations, the company finally realized that it was in their best interest to purchase new machinery. That resolved one problem, and lo and behold another began. For every action there is a reaction. The reaction was that after they started and addressed the byssinosis, the brown lung problem, up came ergonomic problems. Because of the new machinery, you had to speed up, you had the new risks. And the cycle began over again.

It was seeming like the company would have realized that we are here for the long haul. We are not going anywhere. We were working in these plants to support our families, to make a living, and we can't do it if we get hurt and if we can't breathe and we can't work. We wanted to work in those factories. We were proud. We were happy to come out of there.

One time at my church, they said, "Every time I see you, you're full of lint and you're full of dust." I said, "Well, that's true but the time to worry is when that lint and that dust disappears, because that means that I no longer have a job. And I can no longer support my family."

So I was proud. I was not ashamed of the fact that I worked in the textile mill, and I'm still not ashamed, because that is the bridge to help me to get where I am now. And the union has been a very important factor in that, because had we not had a union, there still might be a lot of problems. I am certainly proud because my union helped to play a major role in addressing the brown lung, the byssinosis and certainly the ergonomics problems.

We again had to start dealing with grievances, filing OSHA complaints. One of the major OSHA complaints that came out of this whole thing came up at the sewing factory. The ladies and the workers there were complaining about all the repetitive motion, all the different problems that were associated with ergonomics. They wouldn't listen. They said, "Oh, you all are just making a whole lot of unnecessary noise."

As a result, the company was inspected, cited, and fined by OSHA. And out of that fine, they also were made to give us a yearly audit on ergonomics, year after year even after the completion. We are proud of that citation because out of that citation the company then began to formulate joint committees. We now felt like the company was on the right track, that they were doing the things that were going to help to achieve the health and safety aspects that need to be achieved.

There was direct involvement from the workers. We began to recognize and realize and discuss with them and tell them that certain things need to be done, not only to the machinery, but to the equipment; such things as: getting better chairs that were ergonomically safe; adjusting the height of the boxes; and putting springs in the boxes, so when they got yarn, the yarn would come up to you and you wouldn't have to bend way down and hurt your back or hurt your shoulders.

They deal with getting gloves, back braces. They also got a new bagging system. And one thing that some of the workers did at the sewing factory was help to design a box. And they did it -- management took them into the office, and they did it on computers. They knew what they wanted. And once they designed that on the computer, management implemented that program. All these programs helped, because the workers were out there day in and day out, and they knew what it took.

We also had labor-management meetings that we used to enlighten the ones that were not at the meeting and helped to resolve those problems that we were not able to resolve at the health and safety meetings.

I will further tell you about the education program on safety and health, and on ergonomics. Management has a typical program, sadly to say. During my 25 years at the plant, they showed the same film over and over and over again once a year. We signed a piece of paper that said "I've seen this here film."

But health and safety is a 365-day event. The real involvement came when the workers had a hands-on approach. They began to recognize that they had a stake and that they could do something to help management realize that it was much better for them to involve us than to try

to ignore us.

And by that, we began to go out on the shop floor and educate the workers and tell them and ask for suggestions: "What can we do?"

During this whole process, during our regular union meetings, we talked to the workers. We told them about what achievements we had made, what needed to be done. We had classes. Through UNITE's Health and Safety Department, we trained the Trainers, which the company will say quickly, helped their organization tremendously with the knowledge that we provided into health and safety meetings. We also go to locals in other companies and help them to understand the importance of health and safety.

This was a win-win situation for all of us. Management looked at it, I guess, and thought that it was going to be a very costly, very ineffective way of doing things. But as a result, when we had direct involvement, there were fewer injuries. They began to upgrade the job training. There was higher morale in there. People felt good about coming in there. We were in there to make money, but we also knew that we had invested a lot of our lives in that plant.

Productivity came up in the plant. There were fewer injuries. I am going to share a few figures with you in just a few more minutes. And we talk about being competitive. There is no better way of being competitive than to have safe, healthy workers there in the plant, because a safe and healthy worker is going to be there day in and day out when the doors open. They don't have any problems with coming in there to work and feeling good about when they leave. They're going to be able to come back the next day and the next years.

To share some of these figures with you -- I won't give them to you all, but if you would just look at them. In 1993 there were 121 cases of worker injury. After we became involved, that number moved all the way down to 21. Workers do make a difference.

When it came to all back injuries, 1993 was 19; but in 1996, there was only one. We can make a difference if given the opportunity. Lastly, on all other "strains/sprain injuries", in 1993 there were 26. In 1996, there are only 6.

So our involvement has made a difference. Being in the union has made a difference in my life. I'm proud. I'm happy. And I certainly can say to each and every one of you, whether you have a union there or not, recognize your workers. They can be a very valuable asset to you.

Thank you.

MS. HIRSCHBERG: Thank you, Roosevelt.

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## Question and Answer Session

MS. HIRSCHBERG: This is an opportunity for any questions, comments, concerns you may have of the speakers. From the audience? Yes, in the back?

Q : I have a question for Ms. Sater. Can you hear me all right?

MS. SATER: You are fine.

Q : You mentioned -- you showed a sewing machine with some arm supports.

MS. SATER: Yes. The arm supports.

Q : I didn't really understand that. Could you explain that a little bit more?

MS. SATER: Okay. The arm supports are on a pulley overhead or a weight. That can be adjusted based on your height and what you are holding. The arm support, you just slide them in there, and your elbow is bare in there. It just helps hold the weight up, because when you are working with a size 12 men's boot that is insulated, you are holding probably 4 or 5 pounds of boot there. It is real heavy and awkward, and you are having to muscle it around. So you are just sliding your arms in there, and it just helps hold it up for you.

They originally, I believe, were a Danish or Swedish company that we bought them from. And then one of our factory workers started making the slings herself because she got bored with them all being navy blue. So -- if you are interested, I can find out who they come from.

Q : Thank you.

MS. HIRSCHBERG: Yes?

Q : How do you accomplish the job rotation with piece rate workers?

MS. SATER: You go off piece work.

Q : You did that in collective bargaining?

MS. HIRSCHBERG: Collective bargaining. We went off the piece work. I am not sure if Peter did, but yes. What we did was our workers, they worked for I think it was like three, four months. We kept closer track on their piece rate, and they got what is called a red circle rate. That is just what we called it.

So your piece work rate was locked in. So when you went off piece work and on job rotation, you continued to receive that piece work rate that you had been working at prior to it. Then as new workers come in, they are more on a standard hourly rate.

Q : Peter, I have a question for you. I would like to know what tricks or motivation you had when you were able to convince management that they really needed to deal with their program.

Obviously, if you take a look at our comp claims, there was a red signal going up that something needed to be done. They were resistant to getting involved in relation to time and money, but certainly we knew that there was a problem. They are not totally insensitive.

Once the project got started and you could see the difference with the attitude of the workers, I don't think there was too much needed to motivate management from continuing. They didn't get as much involved as they did allow me to continue my involvement.

Q : Thank you.

MS. KELLOGG: I want to add to that, I mean, quite frankly, we were actively hoping that OSHA would be taking a serious look at an ergonomic standard. This is a couple of years ago. When I documented the level of injury in that one department with the 80 spoolers, it was pretty overwhelming documentation. There were very few people who were not injured or hurting. (I told the company that this could be a problem if OSHA were looking at ergonomics in the factory.)

You know, we said, "Look. We've got money to help you. So why not get ahead of the game? You wouldn't want to have to deal with this later down the road when the problem is more serious and the injuries are worse." I think that was persuasive.

MR. MEYER: I think it's true, the fact that the union was willing to take on some of the responsibility for getting this program off the ground helped. I think it is important that a company has the involvement of either something like the CAF fund or the union.

Q : I work for a large chemical company. My challenge is that, until recently, we were not having the incident rate that warranted showing the dollar figures. Now after about five years, if we looked at the increase in the number of particularly office ergonomic-related carpal tunnel/tendinitis cases, now I can probably put together a couple dollar figures just with two or three employees this year that will do the same thing that you are saying.

I guess I was curious if there is anything for folks more on a proactive side of things that you could say that might be able to help out, instead of having to be so reactionary. Again, that was our standpoint, too, where I am at, is we are hoping that OSHA was going to do something. That was going to be our push, but that didn't help us.

MS. SATER: : A proactive -- I don't know how many facilities you have, but I wrote my master's thesis on what effect does charging back your workers' compensation have on the actions of the company. I have designed three or four different systems at different companies, because you have to tailor it to where you work. I used the airline because that's where I started from scratch and had all the data.

Believe me, once you start hitting an individual plant supervisor's bonus with those costs, they get religion really quick.

Q : That's what it took in my inventory management group. He personally got carpal tunnel syndrome. And that convinced him. And now he is my swing point for the rest of them. But I guess I was just curious. You know, besides just the raw data of the money and figures, is there anything, any other magic you could put in there, or is that -- that was it. That was their language that they wanted to hear.

MR. MEYER: I mean, consider the first lady you saw in the video is working in our company 26 years. These are a lot of people that have been living in this company for a lot of years, including the owners. So again, I think it may be important to take the owners, or the people that are giving you the resistance, down on the shop floor and show them where it is happening.

MS.SATER: I will just mention one other thing. I asked the supervisors to sit down in the class. And the first thing they did was sit in the class and mind the job. I asked them to sit there and do this while we were teaching, so that they could start to experience it, those who hadn't before. That was helpful in terms of their recognizing the problem.

Thank you.

Q : I don't know if I need the microphone, but Pat Hirschberg is being very quiet. Would you like to tell us your story about the chairs as far as the motivator?

MS. HIRSCHBERG: Yes. Kathy, who has just asked the question, has been in partnership with Oshkosh in getting our ergonomic program started, and getting the message to our upper management. We knew that chairs was going to be one of the first things we wanted to address and we would get the attention of every employee in the facilities.

So the first ergonomic corporate meeting we had in bringing all of our leaders of our companies together was in a boardroom on the sewing machine steel metal chairs. And they sat on those chairs for eight hours. They were all given a cushion or a pillow to adjust during the day. By the end of the day, we had a signed request for approximately 3,500 ergonomic chairs.

So I think it is putting some fun into getting the attention of the equipment and putting managers in the same positions that your workers are out on the floor, if that will give you any ideas.



MR. MEYER: I would just like to mention, I talked earlier about traditional management as far as a manufacturing facility is concerned. There was a time when workers were trying to bring out pillows from their locker room to put on these hard metal chairs, and we didn't allow them. We wouldn't allow them to store pillows in their locker.

So, you know, if you take a look at the way things follow, I mean, there is a lot that will tell people what is actually going on.

Q : I have one more question, and I am not sure who would be the best to answer it. But how do you retrofit these really old sewing machines that -- you know, the old black metal kind? If getting a new one is completely out of the question, is there a way to go back in and -- have you had any experience modifying those things?

MS. SATER: We have machines that are dating back from the 1920s in our factory, and we are still using them. But the sewing machines themselves, I think the biggest change we made on them was tilting them, like you saw in the one slide.

But the machines themselves, we have put some of them up on posts so they are sewing up on a post versus down low. And some of it is just a matter of putting it on a height adjustable table so that they are not sitting, but they are standing doing it.

I think that body bar thing, I mentioned the table was like \$700. I think that body bar was like \$350, something like that. So it is not so much the sewing machine that we changed. We just made it so it is up or down, back and forth for the operator, because you can't change the machine a whole lot.

MR. MEYER: I think we had a similar problem. We have a mending department that also has quite old machine heads. And the problem was not the sewing machine. We redid the tables. We put in a foot rest for the left foot, and we did something about the lighting.

But those three components -- and again, we then purchased ergonomic adjustable chairs that are made just for sewing. It is completely different from the chairs you saw there. We purchased 18 of those chairs for 18 workers that were sitting at a sewing machine all day.

But again, the table size, the foot rest and the lighting was extremely helpful.

MS. SATER: There has been a lot of other things that we have done, and we don't have enough time for the video, but we had one operation where they were using scissors a lot to cut off the little strings. Well, instead of the scissors, we put a little heat gun there. So now they just grab the string and go zzt, and the heat breaks it off. And no, they don't burn their fingers, surprisingly. But they are no longer having to cut these heavy threads off. We are zapping them off with a little heat unit.

We had operations where we used to think you could only glue the edge of a piece of something. So somebody was standing there all day long running this through to glue the edge. We said, "Big deal. Let's roll the whole thing through there, and you don't have to twist it around." So now we just glue the whole surface. It is no big deal. It is inside the boot. So now they just run it through rollers, so there is none of this twisting things around anymore.

We had one big machine, and everyone kept hitting their head on it. Well, we stood there and looked at it. We raised it up a foot off the ground. Now 90 percent -- and it was angle iron out of our maintenance shop. That's where we do most of our stuff. It is like -- I mean, the microphone stands here go up and down. Why can't you make things on a post go up or down just with pegs?

We use a lot of hydraulic lifts for our stuff, put those things in there, bring the product up to the person so they don't have to bend down and do it.

In our tannery we have guys throwing 2,000 hides of leather a day. A wet hide weighs 60 pounds. That's heavy work, a lot of bad shoulders. It used to be you had to grab them from up here at the start of the pile and grab them from off the floor at the bottom. You put a simple little scissor lift in there, they are always doing it from their waist. And those guys rotate the jobs all the time now.

Simple things that don't cost a lot of money make a big, big difference.

MR. BROADNAX: I would just like to echo, too, what the panel is saying. Two of the plants that I service are sewing factories now, and they have gotten the chairs and gotten the machines that adjust up and down. It has helped tremendously. You know, there wasn't anything major that you had to do like going out buying new machinery, but simply making it adjustable to the height of the worker. We haven't had too many problems with tendinitis or repetitive motion.

Q : I just wanted to -- there were some others. Go ahead.

Q : I was just going to say that, Roosevelt, in your presentation you talked about how you went from another health and safety pattern into ergonomics. I was going to ask the other panelists if, using the worker involvement model in ergonomics has helped other health and safety problems in your plants using that model.

MS. SATER: Just the worker involvement standpoint of it, I think, because in safety committees, because they are the ones that have to work on the machines. Our maintenance folks are the guys and gals that do most of it, but with the input from the workers. Then when it gets on to other issues, I think they come to us quicker with things that are wrong, sometimes too often. But, you know, they will let us know when -- I think in Peter's plant they could probably -- they have been working with this stuff so long, they can tell by feel if something is wrong. They don't even have to see it.

The same thing with the leather. They can feel if something is wrong with it or it smells different. I don't know if you use adhesives and stuff in your facility, but, you know, if a vendor changes something, our people know about it immediately. That has helped because they are coming to people, because they know we are going to try and do something about it right away.

MR. MEYER: I think in our case once we got involved in the ergonomics program and involved 100 workers who were involved in having things to say and opinions, in a small factory, news travels real fast. When people realized that people were listening, those two facts developed an incredible amount of trust. We now have six working teams from different parts of the factory that meet once a week on their own, not with any supervisors. We have many, many less supervisors than we have ever had in a factory. They meet. They take minutes. They list grievances. They analyze their process. They analyze their process both productivity-wise and health-wise.

This is all fed back to us. If it is not addressed, we hear about it. We have opened up all kinds of avenues for communication now that would be impossible to shut down.

MS. SATER: You have to have fun with the programs, too. I mean, I made major points because I bought in cookies one day for 1,000 people in the factory. It was a thank you. It was a project they worked on, and I can't even remember what it was right now. But they still come up to me and go, "Gail, that was fun to have all those cookies that day."

I have one -- if you are working around sewing machines, you know this happens. We just put in a whole eyewear policy, that if you walk through this door, you have to wear safety glasses. Well, that was a real chore. I mean, nobody liked it. They complained and everything.

Well, this week -- and I know if you are not working with sewing machines, this is going to sound gross, but a needle broke and went in a lady's nose. They bleed a lot. So they took her to the hospital, make sure it still wasn't there. We got teasing her about it. I said, "Okay. Now because of you I suppose we are going to need nose guard policies."

So we went to the local -- and you know the Groucho Marx glasses with the nose and the -- we bought her one. And she wears it around, and they are just a stitch. It was a serious problem, but we made it a little fun, that no, we are not going to have nose guards.

MR. MEYER: A year after we started this ergonomic program, we worked with the union and we have had now a health awareness day at the factory where the union brought in ten medical people, and they all got reports on their blood pressure. There was a nutritionist there. Their cholesterol was given to them.

Again, we made it fun. There were balloons all over. We made it a whole day event. I don't believe, if we wouldn't have started the ergonomic program originally, people wouldn't have been trusting of this. They were excited about it.

So again, once this little snowball gets started, it is very tough to stop.

MR. FRUMIN: Okay. I would like to thank the panelists for their presentations. Just to sum up very briefly, we have heard certainly about some of the severe problems in the industry with very high workers' comp costs, high rates of injury and disability and lack of information or resources to do anything about it. Then we have seen some incredible success stories which extend far beyond the sort of bread and butter of ergonomics in terms of job design and job analysis and job modification-to things like improved organization of work in general, greater productivity, improved quality, greater trust, better communication, improved supervision, reduced supervision, and flatter management structures.

We have heard about the essential role of worker involvement in all phases of the program, whether it was getting the program off the ground and overcoming stiff management reluctance or it was establishing a line of communication or doing job analysis or coming up with prototypes and new prototypes and more prototypes or doing training at every stage of the game. In this industry certainly, worker involvement is a critical component to the success of any ergonomics program.

Finally, in terms of some of the key job modifications, we have talked about modifying equipment. But that equipment alone is not enough, whether it is seats or machines, modifying entire work stations and then modifying whole systems of work organization. I think the arguments for piece work have about died. Many people have piece work. In some places it still makes sense, but clearly the awareness is growing that piece work is as much a part of the problem in many sectors of the industry as it could be a viable manufacturing technique. We now see job rotation and modular manufacturing as part of an overall change in work organization.

So I am going to try to summarize this at the plenary session this afternoon. I hope I don't get too far afield from what the speakers have said. I want to thank all of you for coming.

We do have some information, again, in the back for those of you who might have come in late. We are going to take some time over the next half-hour, 45 minutes, to show some of the videotapes that people have brought. We have a longer version of the UNITE videotape on the union clinic and the Sequins project. We also have the video from Red Wing.

We won't be doing that immediately, though. You might want to come back later after lunch, because we are trying to set up a brief press briefing at the noon hour.

Any other final comments?

MS. KELLOGG: Yes, just that we have materials available in Chinese and Spanish, which you can take some of or order from our office, along with our other health and safety materials.

MR. FRUMIN: We have a photocopied version of the union manual back there. At the back of that is an order form. So feel free to pick one up.

Thank you very much for coming and enjoy the rest of the conference.

(Whereupon, the Apparel/Textile Session was concluded.)



## Health Aspects of Successful Programs

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Brad Evanoff, Washington School of Medicine

DR. EVANOFF: I am head of the section of Occupational Environmental Medicine at Washington University in St. Louis. I will be chairing the panel today, along with Dr. Becky Moreland and Dr. Kurt Hegmann.

We plan on having three presentations of approximately 20 minutes each, with time for a few questions after each presentation. We are trying to protect a full 20 to 30 minutes for the end of the session for the purposes of a panel discussion and addressing questions and issues that you have. So if you find me cutting off your questions at the end of someone's talk, you will get another chance at the end of the session to address questions to any of the panelists.

The topic today is Health Aspects of Ergonomic Programs, otherwise known as medical management issues. And I will be providing a general overview of medical management issues, focusing on the things that employers can do to work best with the health care professionals. And then Drs. Moreland and Hegmann will be addressing specific experiences in industry relating to different aspects of medical management programs.

So I bring, I think, three different perspectives to the issue of medical management. The first is as a physician in an occupational medicine group practice, which treats employees from approximately 1,500 small- to medium-size companies in the St. Louis Metro area. The other is as Medical Director for a large hospital, and then the third is as a researcher in the prevention and treatment of work-related musculoskeletal disorders.

And in the talk today, I will be relying more on the perspective as a treating physician seeing patients right off the shop floor, and to a lesser extent on that of a medical manager responsible for reducing total lost time within a company.

So, what is medical management and when does it kick in. I think it is important to stress that the main effort of employers should be on the primary prevention of musculoskeletal diseases through the reduction or elimination of workplace risk factors. And this has been a primary focus of many ergonomics programs and, I think, of many of the discussions that you will hear over the ensuing two days.

Medical management is what you need after your prevention efforts fail, and so in a certain sense, every employee who comes to see me represents a failure of a primary prevention effort. No matter how good a primary prevention effort is, there still are injured employees. And the medical management attempts to reduce the functional impairment and disability in people who become symptomatic. It can also be thought of as medical treatment.

The goals of a medical management program should be to reduce or eliminate symptoms in employees who have suffered an injury, to prevent the progression of musculoskeletal disorders from early stage easily treated disorders to expensive late stage almost impossible to treat disorders, to reduce the duration and severity of any functional impairments that an employee might suffer; and to prevent a reduced severity of disability, including time loss, in employees who have suffered a musculoskeletal disorder.

This is a satirical slide from Dean Lewis. This is the sort of medical management program you would like to avoid, which unfortunately is extremely common. The symptomatic employee sees the plant nurse, gets referred to the plant physician, gets treated with wrist splints, returns to the same job with no modification, symptoms return, is referred to the specialist.

They get an operation, they return to work at the same job with full clearance to return. Symptoms return. They are out of work for a long time. They get involved in the workers' compensation system. They get a lawyer at least in Missouri. Now they are involved with the rehab nurse. There's now a case manager from the insurance company. They get sent to another referral, M.D., ad nauseam, ad nauseam.

This has also been referred to as the vortex of disability or other metaphors involving spirals. I think we see this all too commonly in patients who are referred to us who have been caught up in the system. What I would like to address today are some ways to break this cycle early and avoid having your co-workers or employees caught in this spiral.

What are the essential elements of a comprehensive medical management program? One is surveillance. This is defining problem areas using either data that you already have or collecting data specifically for that purpose. Dr. Moreland is going to address this area in much more detail. Early recognition and treatment is vital.

As a treating physician, I would much rather see a patient very early in the course of their problem when I can probably return them back to work with no lost time, with minimal modifications and very inexpensive treatment. The problems come when we have people who have had symptoms for two, three, four months without seeing a health care provider, and then you have a much harder job ahead of you.

In a few minutes, we will talk about access to appropriate health care providers, and about what makes a good health care provider. Job evaluation and job modification has to be an integral part of any medical management program. It is unrealistic to think that I as a physician sitting in a clinic five miles distant from your worksite can magically fix your employees and send them back to doing a job that caused the problem in the first place, unless there are some changes, at least in the majority of cases, some changes in the way that work is done.

It is also important for me to diagnose whether a medical condition is related to the worksite or not. Unless I get information about what the work involves, I can't make that diagnosis, and I



can't make appropriate treatment.

Conditioning and rehabilitation programs are necessary for employees who have more severe or protracted musculoskeletal disorders. Follow-up is something that I think almost everyone doesn't do well enough. Even programs which provide good case management and follow-up, almost all will stop the follow-up the day the employee returns back to their regular job. If you look, however, at what happens to people who have had time off and return to a job, a large number of them, six months later, a year later, have had recurrence of symptoms and are out of work again. I think once you have had an employee with a significant musculoskeletal injury, even after they are back at work, you need some way of following up to see if symptoms recur and you intervene at a very early stage and avoid having a more protracted problem.

And then finally coordination with primary prevention efforts. And hopefully you are putting this medical management program in place in a plant that has some efforts at changing the underlying risk factors. And if you are trying to affect the work for your healthy employees, it is all that much more important to try to make changes directed at those employees who have had a problem. And if you see some of the follow-up and coordination, this comes back up to surveillance and early recognition.

And the last page of your handout shows a diagram that we will get to at the end of the talk, really showing how these different elements ought to be thought of as a connected group of concepts and not broken up into separate noncommunicating programs.

So how do you choose a health care provider to see your injured co-workers or employees. You would like to find someone who has some specialized training or experience in ergonomics and/or the treatment of work-related musculoskeletal disorders. And this really involves a working knowledge of the industry and the specific work that employees do. And by working knowledge, I mean willing to obtain information and work with it, to talk with the employer, talk with the employee, and try to use the information about the worksite in the diagnosis and early treatment. And it is very difficult, again, to treat an injury if you have no idea what the person does.

Your health care provider should be willing to communicate with the employee and the employer, not in cryptic dictums from on high, like a scribbled prescription that says "light duty," which is extremely common. You need to find someone who is willing to make specific recommendations regarding the nature and duration of any changes in work status. In my opinion a work prescription that says only "light duty" is almost worse than useless.

Finally, you would like to get someone who is willing to consider conservative therapy and not hustle the employee quickly off to see a surgeon.

If you have found this paragon of a health care provider who is willing to communicate with you and willing to get information about the job and use it in treatment, how can you make this

provider familiar with the job. Well, walk-throughs are best. The best way is for the health care provider to actually be physically present at the worksite and see what a specific injured employee is doing, or at least employees in that class.

For large employers, for companies that have in-house medical, this should be really the standard of care. For small- or medium-size companies this is more difficult to attain. Again our group serves 1,500 different companies. Unless I would go to 7 or 8 companies on a walk-through every workday, I couldn't see them all in a year. So if you aren't able to get a health care provider out at the worksite to see the specific job, there are a number of other ways to communicate: check sheets, detailed descriptions of a job, or videotapes are a very good way to communicate about jobs. And many physicians who see work-related diseases have a videotape player in their office, and we use ours fairly often. So the more information you can give your health care provider, the better job they can do with diagnosis, the better job they can do with treatment.

And, finally, if you have found this provider who is willing to communicate with you, you need to facilitate communication with them by providing someone at the worksite who is familiar with the jobs and who can facilitate or actually make decisions about alternate duty and can provide the necessary conduit of information back to the physician.

And I think often when you see cases that have gone on for three or four months, we see that the communication has consisted of memos which arrive a week or more after the episode of care, so everyone is communicating back and forth by memos that have a week- to two-week lag time on what is actually happening. And it is much easier if I can pick up the phone and I know who to call at your company. And things can often be resolved extremely quickly that way.

So, as I mentioned, a mainstay of treatment of work-related musculoskeletal disorders is reduction in the exposures, relevant exposures, posture, repetition, and vibration. What if you were to go to see a physician for tennis elbow that was caused from being a slug all winter, then hitting too many balls over a couple of weekends, and all the provider did was say, "Here's a splint, here's some pills, play as much tennis as you like." If the physician didn't talk about the amount of your tennis playing or your tennis technique, you would probably find another physician pretty quickly.

By the same token, if you had a work-related disorder that was contributed to by the work, it is often unrealistic to think that a physician has wonderful treatments that can fix that and yet the person can keep doing exactly the same job that contributed to the problem in the first place.

In treatment, particularly of chronic musculoskeletal disorders, some sort of permanent job modification, temporary job modification, or, if all else fails, removal from work may be necessary. Here is where you can guide the physician in telling them what options are available for different types of work or different modifications so that the physician doesn't just jump right to giving people time off.

By far the best option is modifying their current job, making some permanent change to the job that eliminates the relevant risk factor or markedly reduces the relevant risk factor and allows the employee to go back to work. This is the least disruption to the company and the employee. And, as you will hear in the primary prevention talks or the other talks during the few days, there are often very cheap and easy ergonomic solutions -- raising a table, lowering a table, raising a chair, changing the height of a keyboard -- that can be done for low cost or under \$50.

And it also amazes me that employers are willing to pay for visit after visit to me, visit after visit to a physical therapist, but aren't willing to spend half as much money as one visit to me costs to buy their employee a tool or make an adjustment that might make the problem go away completely.

Temporary modifications, such as reducing speed, reducing overtime, restriction of certain tasks that may not be essential to the job, are also effective. I think less desirable but often necessary is a temporary job transfer, moving someone to a different job. It is important, of course, to screen the new job to make sure it doesn't have the same risk factors that the old job did.

And for workers who have been out of their usual job for some period of time, particularly if that job involves a lot of force and repetition, you should consider a gradual re-entry into their normal job.

Least desirable, of course, is time loss. In the case of acute or severe injuries, short-term time loss is useful and necessary, but you should work hard to avoid long-term time-loss for a variety of reasons, remembering that "the longer someone stays off work, the longer they stay off work." It is almost inconceivable that there is not something useful that can be done at your worksite by someone with almost any conceivable physical limitations.

I think the Americans with Disabilities Act has provided something of a prompt for employers to find these accommodations for people who don't have work-related injuries. I think that same process can work for people with work-related injuries. There is a fair bit of evidence that bringing people back to work early in some capacity is helpful in getting them back to their permanent job, avoiding long-term disability, avoiding the attendant expenses in litigation that long-term disability settlements bring.

Let me switch now to an example of some results from a medical management program. These are injury data from a large urban hospital in St. Louis, 6,000 employees. Like health care institutions across the country, there is really a high injury rate within several of the departments. In particular, transporters or orderlies, LPNs or certified nursing assistants, and housekeeping workers have injury rates that are compatible with those in construction sites, steel foundries, and other places that we think of traditionally as heavy industry.

The situation at this hospital in 1990 was that they had a lost day rate of 94 lost days per 100 full-time workers per year. They did not have any medical management program and were

sending their employees to a variety of different providers, none of whom had any background or experience in work-related diseases.

The major change that they made in 1991 was to switch providers and start sending all initial injuries to a multi-physician group that specialized in occupational health care. Over the next three years, there was a pretty dramatic reduction in lost days. You should note that this was occurring in a setting actually of an increasing injury rate, not a decreasing injury rate. Part of this increase was probably an artifact, because at the same time they started keeping their injury records a little better, and I am sure there was significant undercounting in the early years.

Note also that they had almost no restricted days related to some administrative issues that you may face as well. In 1994, restricted duty was introduced in a limited way by a few departments. In 1995, they did more. I can tell you that 1996 looks pretty much like this, more of a decrease in lost days, an increase in the proportion of restricted days.

Again, these results were obtained just by doing one aspect of medical management. This hospital is just now starting to do primary prevention efforts, and we foresee a further reduction in these numbers as time goes on.

Since I am from the "Show-Me State", I have to tell you there are some things of which you should be skeptical. There is no technological quick fix that is going to solve all of your workers' comp problems yet in any trade meeting or publication, you can many vendors making such claims. I think it is ludicrous to think that in a system that is so complicated, bringing in one piece of equipment or one programmatic element is really going to change things completely.

In my opinion, the most successful programs have an integration between prevention programs which seek to minimize the risk of injury, treatment programs which seek to manage injury, and rehabilitation programs which seek to minimize disability in cases of an injury. When these three elements are working in a coordinated manner, you see the best change. Again, this diagram is in great detail on the last page of your handout.

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Rebecca F. Moreland, Chesapeake Occupational Health Services, Inc.

Dr. EVANOFF: I will now introduce Dr. Becky Moreland, our second speaker. Dr. Moreland is President of Chesapeake Occupational Health Services and has been newly appointed as a member of NACOSH, so has been active on the national scene for a number of years. And now I think her activities will be more visible as a part of NACOSH.

Dr. Moreland.

DR. MORELAND: Good morning. It's good to see everybody this morning. I also wish to

thank NIOSH and OSHA for gathering us all together this morning and allows us this opportunity.

I will share with you that I come before you this morning with many, many hats, and I will try to describe those as I talk in the next 10 or 15 minutes. Particularly, I am a newly appointed member of NACOSH, the National Advisory Committee on Occupational Safety and Health. I join Peg and Hank in welcoming you and seeing your interest in ergonomics, and I certainly welcome any information that you can share with me that we need to use to be able to continue to guide ergonomics forward in a very successful, constructive type of a fashion.

We will see this type of a slide over and over again throughout the conference that involves the different types of components, worksite analysis, hazard prevention and control. At this particular time, we are talking about health aspects, and of course we present the middle component, medical management and health surveillance. Again, we can't provide any one of these particular components without a comprehensive program. And over and over again you will begin to hear us use those particular terms, training and education, evaluation and audit, all a part of OSHA's variety of types of components of ergonomic processes.

Certainly when we talk about medical management, Brad has done a nice job in outlining what that is. I don't want this particular session to get lost in the shuffle in reference to what health surveillance is.

At Chesapeake Occupational Health Services we are a practice of strictly health prevention and health surveillance. We do no injury care, we do not treatment of any particular problems. We strictly help set up health surveillance programs for industry, both large size, small size and medium size. And part of my experience I will share with you today, so that health surveillance is the piece that we are going to look at.

In looking at health surveillance, it makes sense for us to review what it is we are talking about, what is our definition and what are the particular factors that we may look at. The World Health Organization suggests that health surveillance includes the completion of routine measures on health and environmental indices. It involves recording and transmission of such data, and it also involves the collection and interpretation of data with a view and with a focus for its detecting changes in the health status of, in our particular situation, working populations and our respective environments.

As an active member of the American Association of Occupational Health Nurses, I, too, am very interested in their definition of health surveillance as well, screening activities which are designed to detect changes in the health status of individuals or employee groups which might be related to the occupation performed or to a particular process that we can identify in the work environment.

As individual health care providers on the scene, at a job, at a particular plant, it is critical for us

to start our work early on, as Brad says, before we have disabilities, before we have significant types of changes in health status that we can diagnose and that we can measure. It is important to begin to look at those subtle types of changes, even subclinically, that may guide us towards factors or towards interventions at the outset.

In pursuing this and in working at Chesapeake Occupational Health Services, we routinely look to this model for guidance. All of you come from different types of industries, and as such, we certainly know from the industrial hygiene perspective and the safety perspective that as industrial hygienists, the workplace has been -- we have recognized certain hazards, we evaluated them, we have controlled them. And as such, we have managed to just stay atop of what may be going on in our particular workplaces.

As health care providers, recognize we have another component, namely the worker, the employee population that we represent, in which it is important to us to come up with consistent, objective written programs that guide us in reference to how are we going to recognize very subtle changes within our workers.

Once we recognize those subtle changes, what do we do to evaluate them. Is it one of these epidemics that we heard about this morning that's not really true, or indeed is it misrepresentative of how large an epidemic as far as musculoskeletal disorders that we may actually see. If we can evaluate them in a consistent type of a fashion, what can we do to control those, controlling the particular worker in the sense of making sure that we are referring them appropriately and they are getting the appropriate care that they need, as well as making sure that we are controlling the workplace and dovetailing appropriately in that sense.

Lastly, I have added in coordination implementation and evaluation, because as you heard, once we establish a program and put it into effect our work is not done, merely our work just begins.

What that teaches us is that in looking at surveillance, the ergonomic elements that we have talked about this morning, commitment by top management, a written program, employee involvement, regular program review and evaluation, are no different when we deal with health surveillance. It is important to make sure that each one of these particular actions is taken care of as you begin your endeavor into health surveillance and medical management.

And, in addition, as we begin to look at the objectives of our surveillance, as you begin to review your program or to establish your program, realize that it is important to have goals and objectives at the very outset. What is it that we are hoping to accomplish? Are we going to identify at a very early stage health changes? Are we going to then allow prompt evaluation before disability sets in? Are we going to look at conservative treatment of these signs and symptoms?

In some situations, we find that on our OSHA 200 if we are looking at illnesses and injuries, this may cause an indirect increase in these particular cases, but we also know that we are

conservatively treating them so that our restricted days and our lost days should ultimately go down as well.

We are looking at implementing interventions to prevent a reoccurrence of a particular situation, and we are also using health surveillance to assist in program evaluation for effectiveness. As we have heard this morning, it is critically important to make sure that we have a direction in which we are going when we talk about surveillance and that as we do so, we have some way to begin to evaluate how well our efforts have done.

We also know that as we take a look at different types of surveillance -- my colleagues at the University of Michigan have talked about passive surveillance. Passive surveillance meaning assessing different types of data sources that are already in existence.

What do we know about reviewing or compiling the OSHA 200? Have we just taken a look at the OSHA 200 and looked at mere counts, or have we gone the next step to take a look at incidence rates to know how many particular individuals are complaining of repetitive stress injuries compared to the denominator, or the total number in that particular department.

Have we reviewed restricted and lost work days? Do we have some idea of what the workers' compensation data is telling us? Recognize that this is a very easy and potentially simple step to take, but it is laden with a number of pitfalls. There may be misclassification in the sense of what type of injury we are looking at. Is it carpal tunnel syndrome, really a tendinitis? What is it that we are seeing? There may be a lack of reporting, or there may be an over-reporting. And there may also be a reluctance on behalf of the working population to come forward and to share with you that they may have these particular problems.

Lastly, health insurance summaries are important to look at, too. I sit as one of a four-member scientific advisory committee with Chrysler and the UAW. I have been in that capacity for about the past ten years. And, obviously, with the UAW and Chrysler, ergonomics takes an extreme lead.

In looking at that, we have also found that in just looking at your strict health insurance carrier, in some situations employees are still going to those particular carriers, Blue Cross/Blue Shield, those types of carriers, talking about their carpal tunnel syndrome and their tendinitis, not understanding what the mix or what the fit may be between work, between hobby, and between other types of factors.

So again, these passive surveillance activities are important to at least begin to incorporate within any particular surveillance program you may have.

One of the particular issues that has gotten an extreme amount of attention certainly is the issue of active surveillance. What is it that we are doing as far as establishing programs within our companies to tell us more about what indeed may be going on. Have we looked at, again, Hales

and Birchey certainly in 1992 outlined a number of different steps that could be taken -- looking at a symptom survey, providing a survey throughout the entire working population or certain types of department -- to give you identifying information or information at the outset to give you a feel for what the baseline might be. Not necessarily of an individual worker, but of what is going on in that particular workplace. Looking at periodic types of updates to give us a better feel for are we on track, are things improving, or, heaven forbid, are they getting worse. Because, certainly, as we make changes, we want to make sure that the changes are on tap.

Annual special project types of surveys, symptom surveys, again very, very helpful. In your packet, the OSHA Red Meat Packing Guidelines were given to you. Any of these particular types of survey forms have proven very useful. There are many different ones that are on the market today, but again that particular one represents what you can begin to look for in a survey. And, again, you will find that as you begin to implement it in your particular workplace, you will change it and you will alter it to make sure that it answers your particular needs.

Surveillance examinations, again a hot topic, as well. Should we actually be doing physical exams, and if we should, what should they consist of. Should they be done as pre-assignment and baseline. My experience in a brief survey I did with the AAOHN membership suggests that again they are not done to exclude workers from the workplace but indeed to give you a feel for what baseline measurements the individual may be coming to the workplace with you.

Most individuals have found a demonstration project to be most helpful. Evaluate those, alter the program, modify the program to make sure that it gives you the best information possible. An exam or an assessment just to take a look at workers after they have been on the job for six months to find out after they have been conditioned, after they have worked, after they have hardened at the job, are indeed they doing things correctly or is there something else we can modify.

Taking a look at period health surveillance, either on a yearly basis, an every-three-year basis, affords us an opportunity for collaboration and communication with the working staff to find out if they come to you and say, "Well, you know, I'm fine, except it hurts when I go like this," or, "It hurts when I do this." And if you ask them what "this" is, they will demonstrate very nicely for you exactly what they are doing when they perform their jobs. And it affords a wonderful opportunity for health counseling in which we can alter that particular activity to a more appropriate ergonomic posture from that sense.

Referral evaluation and treatment Brad has talked about very nicely. Again, I mention it here under active surveillance not because that is included as a part but because it is important for you to begin to keep information data that suggests to us what is going on in that particular realm. Summary information that doesn't betray anyone's confidentiality but that gives us a better feel for what is going on in that particular situation.

Those workers returning to work to know what is going on with them, as well as potentially



looking at intervention surveys after we have made major engineering changes, after we have looked at different types of work production issues, to make sure that our efforts are on the right track.

I think the other thing that we find is that in looking at active surveillance, although it has been hotly contested and extremely controversial, what we are beginning to find is that it does serve several purposes for us. Again we can detect unrecognized ergonomic hazards, we can identify jobs requiring intervention to eliminate the particular ergonomic hazards. We can definitely dovetail with that issue of what are we looking at in the workplace versus what are we looking at in reference to the workers.

It also allows us a wonderful opportunity to monitor changes and the effectiveness of ergonomic interventions, as well as a triage function for employees that may need health care evaluation at this early point, as we have all talked about over and over and over again, but for some reason there is a reluctance for that particular employee to come forward.

In reference to the surveillance examinations, again, a questionnaire which may include a survey type of a symptom survey or a survey response. There are a number of these that are out on the market that are available. OSHA and NIOSH both have listed a number of these for you. My sense is to choose one that is going to be close to your particular industry. And you probably will make changes that are going to happen as well. View the particular questionnaire as an opportunity for collaboration, for communication, for better understanding of what's going on with the employee population.

Again, physical examination and assessment has included many different types of things, as we can imagine, inspection, palpation, the general types of things that we may use. And we find different types of subtleties that when looked at in a group type of process may be very meaningful and very helpful to us.

Range of motion, strength testing as far as a subjective type of response have been fairly helpful. But in our experience the physical examination and the assessment has basically provided a means in which we can counsel and communicate and make sure that people understand their body mechanics and what they need to be doing.

Screening tests, I can't agree with Brad more. If there is an ammeter out there that does it or tells you that it is going to solve your problems, certainly beware. I am going to comment on that in just a few minutes. But certainly recognize there are a number of them, vibratory perception threshold, strength testing, range of motion testing, goniometers, all of these are certainly tests that are available. Use caution with them.

In my work initially with Johns Hopkins, I took a look at the medical evaluation of carpal tunnel syndrome. And in looking at that -- again, I use carpal tunnel syndrome because at least it had the easiest point of a case definition. We used nerve conduction studies, changes in motor and

sensory function as far as the nerve conduction goes to identify who had carpal tunnel syndrome and who did not.

We then compared both groups and took a look at vibratory perception, that perception of vibration in the median innervated index finger compared to the ulnar innervated little finger, to find out if we could come up with a surveillance tool that was quick, accessible, acceptable, easy, that would identify for us or predict for us who would get carpal tunnel syndrome at the outset. As far as a cross-sectional approach, it wasn't that helpful, but I think there is great merit to consider in prospective approaches here, too.

Diagnostic evaluations, nerve conductions and other types of things. Again, the point here is in surveillance examinations, that they be consistent, they be objective, and there be a plan and a protocol.

Again, so that as you put your protocol together, it is a point at which other colleagues can review it, can take a look at certain deficiencies, can comment on it. And certainly what you are looking for is to make sure that your screening tools are going to work appropriately. Is there a particular standardized format? Is there a way in which the procedure should be done? Is there a standardized way in which it should be recorded? And is there a way in which we should be able to collect the information? Is there an estimated sensitivity and specificity?

Can we count on the fact that if we are screening individuals, those that are positive are truly positive or those that are negative are truly negative and what is the interplay between the two? Not only is there an estimated sensitivity and specificity, but is there a reproducible factor that we can get from the manufacturer or from the scientific community as well.

Are there predicted values? A lot of the screening tests that we use in a hospital situation with individuals that are there because they are being treated for carpal tunnel syndrome or they are being treated for tendinitis is a much different population than our working populations. We need to begin to better understand what these predicted values may be.

Are there calibration issues that we have to deal with on our goniometers or on our different types of pieces of equipment so that the information is giving us information that we are counting on, and do we have an acceptable test format as well as interpretive criteria that is going to guide us and tell us who may be positive, who may be negative, who may be normal, who may be abnormal, or is there a gray area that we can also cut into that says early intervention is important here, let's re-instruct, re-look at the job, and re-correct and different pieces of the puzzle.

So that as we take a look at this issue of health surveillance, certainly know that this is the big preventive type of an activity that is going on within a company. It is that particular person that is there for doctors or for physicians or for other folks that are actually treating people with different types of repetitive stress disorders. But it also means that there is usually a case management type of an activity that is going on, as well.

Brad nicely showed you the paradigm once before, and I think here it behooves me to at least mention to you that those individuals who are on site at a company can give you a feel for what is going on with the cases of carpal tunnel syndrome or tendinitis. We certainly know that if somebody gets prepared or gets recommended for surgery, especially in cases of CTS and trigger finger, the case management function here is critical to take a look and make sure that conservative therapy has been adequately assessed and that indeed it has consciously failed.

So that conservative therapy among everyone that we talk about certainly is the approach we appreciate taking. And almost without question those that I telephone surveyed, a second opinion is almost always obtained that corroborates the initial recommendations for surgery.

If we expand the definition of case management just a little bit further, certainly recognize on site the health care provider that is the point of contact almost always will know for you a review of symptom surveys, a review of cases, what's going on with those and what do they entail, descriptions of the particular surgical cases and what activity that might involve, a review of restricted limited duty types of cases to give us a better feel for what's going on with those individuals.

What is our conservative therapy experience? Are we using cold, are we using heat? Heaven forbid, are we using wrist splints in the workplace and is that creating more of a difficulty than it is attempting to solve? All of these are important from a case management perspective to know are we moving in the right direction, not have we substituted one wrong or one particular ergonomic risk factor for another.

Return to work, rehabilitation, and, lastly, program review and evaluation. This issue of case management, the process that we go through can be very instructive and very helpful in our health surveillance activities.

So again, symptom surveys and reports. Recognize that the activity here is identifying conservative effective treatments that are working in your place of employment. It is helping us to monitor employee responses. It also allows us the opportunity to re-review the progress and to ensure that improved interventions are truly working.

Lastly, it also gives us the opportunity when we take a look at, again, those that have restricted duty or limited duty. In my experience in consulting with a couple of companies, we very nicely have gone through and identified the areas where we can have limited duty. We have identified those individuals that may profit from conservative treatment. But when we have really taken a look at it, all we have managed to do is complement or supplement one particular ergonomic high-risk thing for another.

So here, looking at case management type of an approach, we can ensure the appropriate assignment, we can review any aggravating characteristics of job assignment, we can identify co-workers who may be reluctant to report concerns, and allow us that early point of intervention,

that early recognition that we are looking for.

Return to work issues, assess with counseling needs, those particular activities of daily living, the trauma that the individual has been through, and allow them to accommodate to work a little bit easier. We can review the correction of ergonomic risk factors that we may have overlooked or continue to complement them and make them better. And also it allows us to, again, re-review this issue of job accommodation. What are those essential job functions that are required on the job from that perspective.

In summary, certainly what it allows us is not necessarily medical management, medical intervention, it allows us counseling, it allows us an opportunity for education and training, it allows us to review ergonomic risk factors, like we all know, abnormal awkward postures, force, repetitive motion, issues of the job station, and it also allows a review of job activities and assignments, as well as to collaborate ergonomic changes and make sure that as an ergonomic team we have done the appropriate process.

So again, the goal of the surveillance programs. I took a little more of a positive stance, but my words of wisdom are, again, that it is a comprehensive approach. No one single person can pull it off. Everyone's efforts are needed. It is a problem that is so large, it is going to continue to involve our comprehensive approach. There is no single solution. And if someone tells you there is, I beg to differ.

Again, we are looking at effective, constructive communication, and lastly, proactive strategies that are going to begin to take the place of these reactive strategies. So the words that we are talking about here in Chicago, comprehensive, constructive, communication, all these particular "c" words here in Chicago that hopefully are going to bring us forward in ergonomics.

The last one, please.

I just wish to share with you, those of my colleagues who are in the audience, I am not sure who moved me to Grand Junction, Colorado, but I still am very active and well in Baltimore, Maryland. I look forward to hearing from you.

I challenge you, is the last of the "c" words. OSHA and NIOSH very graciously offered us the opportunity to participate in this conference. It is now our job to communicate back to them, to let them know what is working in our communities, both as a letter or both as a summary, so that we have some way of doing it. I certainly welcome such input and will certainly help to guide the process through, at least on behalf of the National Advisory Committee for Occupational Safety and Health.

Thank you for your attention.

DR. EVANOFF: I think we have time for one quick question for Dr. Moreland, if someone has a

question at this point.

Yes, in the back. Can you go to the microphone, please. The questions and answers are all being taped and will be part of the transcript that you receive after the meeting.

MR. : I was wondering how easy it is to convince management to convince management to somehow address this issue with the employees of having their own personal physicians cooperate with management in that type of medical management protocol that we would prefer to have established. In particular, it seems like the conservative interventions that you talk about being the preferred route, that gets just run over all the time. They go immediately to the surgery and the expensive options. How do we intervene in that situation without --

DR. MORELAND: Let me choose to comment on that, as well. And I think from the perspective at looking at health surveillance, my advice is that if we have summary data, if we have group data, not the data from employee A, employee B, and employee C, it is extremely helpful. If we as a company have begun to identify a source that is going to provide us our referral, our diagnostic evaluation, our treatment that is one particular facility, or facility that we know, then we have done our job in describing in a written procedure what we are going to do, at least from a symptom survey, what is going to happen if somebody has positive symptoms, are we going to do conservative treatment, what is going to happen, that issue of communication and collaboration on the plant side, on the employee side, and on the diagnostic side, or on the medical management side, all begin to come together pretty closely.

So it allows us a better way to monitor that, to provide summary data that is going to be more helpful than just looking at specific instances in which it gets lost in the shuffle given different individual personalities or whatever it is. It is important to continue to go forward in as consistent a process as possible that is appropriate for your workplace, as well as an objective type of a process, looking at how are we going to summarize this activity and this experience in the end.

DR. EVANOFF: Two quick additions to that. The question is how in a state where employees have free choice of provider can you try to control some of the inappropriate or overly aggressive medical care that's done.

I think two successful approaches. One has been to work with your insurer, whether it is a state as in Washington State, which is an insurance -- individual insurance. Many of them are starting to now put in practice guidelines and starting to look at the provision of medical care. Another is to make sure that your employees are well educated.

And I find that most patients, given the choice between surgery tomorrow or conservative treatment for four weeks and then reconsider surgery if you are not better, not many people who choose surgery tomorrow. And I think it is making sure your employees have access to reasonable conservative second opinions or make sure that they get appropriate medical advice.

MR. : Okay. Thank you.

DR. EVANOFF: We are going to have to hold the rest of the questions to the end.

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Kurt Hegmann, Medical College of Wisconsin

DR. EVANOFF: Now I want to introduce Dr. Kurt Hegmann. Becky did a very nice job of covering two ends of medical management: the front in the surveillance, picking things up early; and then the back end, case management. Filling out the middle will be Dr. Hegmann who, in addition to being a fan of the Green Bay Packers, which you may be able to tell by his tie, is a Professor at the Medical College of Wisconsin and the Medical Director of Master Lock.

Dr. Hegmann.

DR. HEGMANN: Initially, this paper will review background information so it is understood why I believe that medical aspects of ergonomics are very important, just as the design aspects are important. When clear hazards are present, they need to be addressed as best as can be done. However, once that is done, there are going to be residual cases. No matter how much modification of the job is done, there still will be residual cases reported due to the development of chronic disease processes. Thus, the medical aspects are very important.

## Background

The first graph is from the sensor data from Wisconsin covering carpal tunnel syndrome. What is apparent is that the incidence of the disorder climbs with age, with the exception of the perimenopausal dip in women indicating the probable hormonal aspects of some of the epidemic curve there is not a decrease in cases in the age category of 65 and up, rather, the incidence continues to rise.

Back pain rises with age. The problem with reported data on back pain cumulative incidence is that there appears to be a lower recollection of back pain in the over 65 year category, yet it is not possible to have a decline in your cumulative lifetime incidence. That's not possible. That is probably unreliable data. Also, if all causes of back pain are combined, including lumbar sprains, strains, degenerative intervertebral disc problems, sciatica, and spinal stenosis, it is likely that the combined problems would rise relentlessly with age.

Shoulder problems including supraspinatus tendinitis, rotator cuff tendinitis, subacromial bursitis and impingement syndrome also rise with age in a relentless manner. If anything, the slope of that epidemic curve rises faster beyond retirement. Further shoulder problems are the second greatest workers' compensation problem after back disorders.

This information does not refute that there are work-related aspects, but it implies that there are non-work-related degenerative aspects of these problems, and it is very hard to sort those things out.

If the postulate is accepted that these problems are all work-related, perhaps they would rise after some latency period and then they would decline after retirement. Although, perhaps there is a fixed defect that occurs. In such an event, the epidemic curves should rise and then plateau. However, that is not what is observed as rise relentlessly with age. Thus regardless of ergonomic design issues, a number of these cases will occur in a plant's population.

With this knowledge in mind, several things have been done at the Master Lock Company. This paper will focus only on the medical aspects, rather than design changes.

#### The Plant Site

The Master Lock Company is in Milwaukee. There are about 1,400 workers at one plant. There is another small plant in Alabama; that plant manufactures door hardware. This paper only deals with the Milwaukee location. It is a stable work force, largely unionized (UAW).

The basic job functions vary. Materials are brought in, and handled by Material Handlers. Most of these parts are small in size. It is light in weight, except when it is bulk. Then there are some heavy material handling tasks by truckers. There is some die casting of parts that is done. There is a small electroplating area. Most of the workers, however, are employed in assembly tasks. Mostly these tasks are light assembly, but can be highly repetitive. Shops support the manufacturing plant. There are office workers as well.

While some areas, tasks or jobs have been automated, it is not practical to automate everything. Some products do not have enough volume to warrant it.

#### The Medical Facilities

Medical facilities consist of an on-site clinic. There are three full-time nurses. The nurses cover the first and the second shift with some overlap with the third shift, 7:00 A.M. to midnight. There are two part-time physicians working about three half-days a week. Contracted-out services include part-time physical therapy and occupational therapy. The therapists and nurses have not held any turnover for a number of years. Thus, they know a lot of the workers, and the supervisors, as well as being very familiar with the worksite, all of which is quite helpful.

The clinic has two examination rooms, as well as treatment areas and a waiting room.

Estimates of the patient mix are comparable with what most people see in diverse manufacturing settings. Most problems are neuromusculoskeletal, mostly upper extremity problems, then back related problems, then shoulder pain, followed by neck issues, and then a mixture of minor things. Treatments provided include acute injury care, chronic care, and follow-up care. Patients will be treated for six months. As long as better results cannot be obtained out of the clinic, then

they are treated on site; it provides significant savings, as well as early diagnosis and treatment.

Nonoccupational issues and return-to-work examinations are also addressed. In the event that a patient has been off work for a month or two, an appointment will be scheduled with me. Currently, these nonoccupational issues are not managed as much as the occupational injuries, and supporting data are presented.

Ergonomic evaluations are done by both the therapist and me. The evaluations that the therapists do are important, particularly as the therapists are the ones who evaluate the jobs to accommodate the light duty restrictions. They are critical medical aspects of this ergonomics program. The other critical aspect is having a knowledgeable nurse who knows the patients, and performs the case management functions on day one, rather than on day seven, or day thirty.

#### Personal Protective Equipment

Patients desiring an elastic wrist support may obtain them without a prescription. It is dubious that there will be a significant alteration in force or posture. These are mainly a comfort measure, as it is dubious that there is any preventive aspect.

However, regarding other "personal protective equipment", a diagnosis is required. They are evaluated, examined and diagnosed. A record is made of the issues at that time. The problems with not following this are that they may wear a brace inappropriately, or may not recognize that problems can arise from wearing braces at work. Also, they may not accurately recall the inciting circumstances at a later date.

Mainly, the volar reinforced wrist splints are used on a nocturnal basis, because they are principally used for those with carpal tunnel symptoms. They are not used as a preventive measure.

Thumb spica splints are used mainly to treat deQuervain's tenosynovitis. They are used in the daytime. They also are not used as a preventive measure. Lumbar supports are not prescribed and they are not available.

#### Medical Evaluation and Treatment Goals

The first goal is early reporting; this is believed to be very important. With early reporting and early identification of symptoms, people are generally easier to treat. They also will tend to come to the clinic much earlier than they will go to their own doctor because of the convenience issue. Treatment and restrictions are applied early. Also, should a physician not be available on-site, the nurse will place the patient on light duty until the next appointment. They are gradually returned to regular work as available. When a clinic is on site, and therapy is also on site, one of the hazards is to over-utilize it. This may occur because of the shift in patients towards the mild spectrum. Time off of work is another incentive. Thus, judicious use of therapy must be utilized.



## Nonoccupational Vs. Occupational Issues

What patients need and desire are accurate diagnoses and appropriate treatment. It is also important to facilitate return to work for nonoccupational, as well as the occupational problems. This de-emphasis on the difference between occupational and nonoccupational disorders then also reduces incentives to misrepresent facts such as when or where the problem began. Unfortunately, differentiation is forced, when a problem does not resolve due to medicolegal or fiscal reasons.

Encouraging accommodation for all injuries is recommended, regardless of apparent etiology.

If there are early attempts to differentiate nonoccupational from occupational problems, the incentives are likely to increase the probability that patients will not accurately report or record the inciting information. It increases the probability that they will report back pain with doing a lifting task with previously reported excess induction of back pain problems, rather than from a motor vehicle accident, for example.

Information is also provided to the primary care physician that she/he does not know. For example, what are the job tasks, and forces are involved. These pieces of information, in conjunction with proposed light duty restrictions that are able to be accommodated often resolve conflicts.

## Restrictions to be Accommodated

These are the key restrictions to accommodate. If a plant/employer can accommodate these restrictions, there are very few problems that will be resolved. The prioritization may differ based upon in terms of which one is most important to a given work force. If there are much heavy materials handling tasks, then the accommodation of restrictions should take precedence over the others, for example.

First, completely one-handed work should be accommodated. Second, no lifting more than ten pounds, no bending, and alternating sitting and standing as needed for those with back problems is a common restriction. Third, forward flexion or abduction more than 45 degrees and no lifting more than ten pounds for the shoulder are frequent restrictions. Lastly, no highly repetitive work is sometimes needed. Less frequently, but usually more easily accommodated are completely seated tasks for lower extremity problems, knee sprains and ankle sprains. If these restrictions can be accommodated, an employer can accommodate almost anybody.

## Implementation of a Medical Ergonomics Program - The Results

With about the same number of injuries (occupational versus nonoccupational), the number of days the workers are off of work is about 16 percent as many days for the occupational in comparison with the nonoccupational problems. These results are the opposite of the results previously and widely reported. There is no management of the nonoccupational problems.

Nevertheless, it is clear that managing the occupational injuries with application of and accommodation of restrictions has resulted in a marked improvement.

After implementation, the number of employees on lost time is typically one or two at any time. Previously there were approximately a dozen. Only at the end of a three year period of time did these results become somewhat less impressive. The primary reasons for that dealt with running out of work because of orders slowing down and the slow down in production.

Light duty is light duty, largely as a spinoff of the main manufacturing processes. Workers work on the main manufacturing processes until they run out of that type of work. At such time, they too begin to do some of the light duty jobs and these are no longer available for the accommodation of injured workers.

Likewise, workers' compensation costs, medical plus indemnity, from 1993 to 1996, fell from three-quarters of a million dollars annually, down to about a quarter million. Why did it go up in late 1996? It went up again because of lack of accommodation of light duty due to the aforementioned problem.

## Conclusions

The impacts of a medical ergonomics program include a marked reduction in lost time and a marked reduction in workers' compensation costs. The patients are basically very happy, in part because they do recognize that we know a lot about these disorders and how to treat them. The usual relationship of occupational lost time for back problems being greater than nonoccupational lost time has been completely inverted.

Lastly, it is suspected that there was little, if any, impact on total numbers of neuromusculoskeletal disorders. Encouraging early reporting is likely to augment numbers. Alternating accurately recording the inciting event information may lower the numbers. Regardless, the concentration cannot be on numbers of people recorded on the OSHA 200 log. The attention should be directed toward severity of cases, impairment, and disability; cost issues are a reasonable index of such a problem.

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## Question and Answer Session

DR. EVANOFF: At this point you may feel like you have been trying to take a sip out of a firehose. And we would like to open up the floor to questions to any of the panelists at this point.

Q : I guess I would be curious to know, of particularly the two doctors, how many diagnoses of reflex sympathetic dystrophy and thoracic outlet syndrome you have made in addition to the

carpal tunnel, which is apparently more obvious. I am also interested in knowing if you have read in the American Journal of Industrial Medicine the report by Dr. Bingham, Rosenkrantz and Cook, related to the prevalence of abnormal median nerve conduction in applicants for industry. And if you could comment on that if you are familiar with it.

DR. EVANOFF: I diagnose reflex sympathetic dystrophy or thoracic outlet syndrome extremely infrequently. As you may know, these are controversial diagnoses. They are often used as diagnoses of last resort, but sometimes are applied liberally.

Particularly with thoracic outlet syndrome, I would urge reviewing Gary Franklin's data from Washington State. He found that they often have many diagnoses applied before they arrive at that diagnosis. That is the single most expensive diagnosis for the Washington State Workers' Compensation system.

DR. HEGMAN: I have made diagnoses of reflex sympathetic dystrophy. I have had also evaluated cases that were actually rather severe. But those are extremely rare. Mostly at an academic institution, a patient has seen many prior practitioners who usually accurately diagnose. Regarding thoracic outlet syndrome, I have never made that diagnosis.

DR. MORELAND: I was also going to say, from the surveillance perspective, certainly we look at different types of symptoms that may be related to body parts, to shoulder, to other types of things, so that we don't get into the issue of diagnosis. But certainly that there are early ways to begin to get a feel for it, if there is damage or if there is something going on, that someone is lifting their elbow, lifting their shoulder up too high, so that there are certain interventions that we can do before people actually have disability or trauma.

From the issue of some of the median nerve types of issues, we certainly had the debate and had the discussion about whether nerve conduction is considered a surveillance or a screening tool. I think you have to look at the issue of whether or not it is acceptable. There are a lot of issues that come into play with nerve conduction, such as temperature, placement of electrodes, all these other types of things.

So from the surveillance or the screening perspective, we certainly haven't found it to be an effective type of tool. We know what happens when different individuals actually have the problem, but again it is not one that should be used in the workplace.

Q : Is either doctor familiar with the study that was done looking at pre-employment nerve conduction studies?

DR. EVANOFF: This is the one in the poultry industry?

Q : Yes. Well, actually it was more than the poultry industry, but --

DR. EVANOFF: Right. I think the more we learn, and particularly looking at, say, Al Franzblau's data from the University of Michigan, it shows actually a large number of people in the general population have abnormalities in median nerve conduction, partly because of the issues that Becky just addressed. There is a great deal of variability in how they are performed.

Carpal tunnel syndrome is a syndrome, and I am one of those who believe that the diagnosis is not made solely on the basis of median nerve conduction. It has to be made in the context of appropriate symptoms, as well, and perhaps physical diagnostic findings.

Q : I find, Doctor, that most of our practitioners, particularly in rural areas, have a tendency to label disorders. It makes the patient feel better if they go home and say, "My muscles ache," and they say, "Fine, what's for dinner?" If they come back and say, "I have reflex sympathetic dystrophy," it is, "Oh, my God, are you going to survive," and, "Gee, don't you think you ought to go lay on the couch for a while."

But I am concerned over this issue. I believe Dr. Sandler is a person who feels that there are many people who are asymptomatic and yet who once they enter a workplace and the symptoms are exaggerated or exacerbated by the repetitive type work, that the industry then picks up the cost of rehabilitation and/or surgery and/or any other medical treatment. I feel that post-offer pre-employment nerve conduction studies are a valid test to identify those people who are asymptomatic but who do have latency within their median nerve.

DR. EVANOFF: But actually there is another interesting thing about Al Franzblau's data which was just presented some data in Ann Arbor about a month and a half ago. It showed that of about 15 percent of the people who they found who were asymptomatic people with nerve connection abnormalities, actually after 2 or 3 follow-ups, there was no increased incidence of carpal tunnel syndrome in the people who had abnormalities. So the abnormalities were not predictive of progression to symptoms of carpal tunnel syndrome.

My hope is that in the future we get away from reliance strictly on this one number. I think it is back to the technological quick-fix point. You can't take one number and use that to define a problem or address the issues.

Q : And yet that is the number that is used in the worker compensation system for compensation.

DR. EVANOFF: In some settings, at least. And let's hope that we will get away from that.

Q : I have two questions. One is for Kurt regarding not differentiating between occupational and nonoccupational low back pain. I am not sure how much this is a state phenomenon, but in my experience I find that a lot of personal physicians are more willing to let somebody in occupational medicine manage occupational low back pain because of the familiarity with workplace issues plus the workers' compensation statutes. Whereas, they seem more unwilling to

do that with nonoccupational low back pain. They view that more as infringing upon the patient-physician relationship. I would like to hear something about your experience with that.

The second thing is, and I am not sure who, if any of you, can answer this question or if you have had a similar experience. My partner and I provide medical services for a large manufacturing facility in a rural area. In 1990, we started services there, there were ten to fifteen putative cases of carpal tunnel syndrome diagnosed a month. They were supposedly confirmed by EMG NCV, by a physician who was not actually board certified in physiatry or neurology. Sixty percent of the cases went to her husband for the surgical release. Neither obtained any kind of job history besides, "they used their hands at work".

We started going there to provide medical services, and the management there was really open to a new approach. If they were not, we would not have been there. We examined these people, analyzed their jobs, performed a complete examination, as well as obtained electrodiagnostic studies from a different individual who was actually trained to perform them correctly. We found only about six cases in the entire year and about two appeared to be related to the job.

I guess I am looking for an impression as to how much of that do you think might be going on in industry as a whole? How much of that do you think you might be increasing to these BLS statistics that we see jumping up all the time.

DR. HEGMAN: There are significant differences in workers' compensation from state to state. You are to operate in and/or are constrained by your state. But regardless, there still are tools for you to use that are usually available.

Wisconsin is a state in which the patient can see a physician of their choice for the first visit. Even in that kind of setting, a plant nurse who can call the patients and request that they come in to see the plant physician. Barring that, the union contract may be invoked. There are always tools to use in your state, you just have to know what they are and use them as needed.

Regarding the nonoccupational low back pain question, my experience with most physicians is that they do not like to manage back pain regardless of cause and that they actually are delighted that I like to manage back pain. Thus, I have not found that to be too much of an issue. If Master Lock ever did try to manage each nonoccupational case and provide restrictions and accommodation, that may become more of an issue.

I heard of a similar kind of case of a husband/wife duo except it was not Aurora. Perhaps we have the same couple. I heard that many people in the plant were getting diagnosed and treated with carpal tunnel releases. Some people supposedly did not even have symptoms consistent with CTS at all.

I practice in a fairly large area, a 1.8 million person metropolitan area, and consequently I do not see that type of problem. An insurance company will refer for a second opinion/independent

medical examination. This type of problem is more likely to occur in a small town.

DR. MORELAND: We will just quickly comment that we know we were in trouble when we all of a sudden hear different individuals talk about carpal tunnel syndrome as the back of the '90s. We had a feeling for there was going to be this increase interest.

In the same situation in Baltimore, again, there were certainly similar types of situations here, we found that a number of industries banded together and took a look at the experience that we were seeing and the same type of consistency with experience as far as the conflict of interest and those types of issues. It was managed from a group perspective in a very comprehensive and concise way, as well.

Clearly, although the Bureau of Labor statistics or OSHA 200 forms, the counts may go up of people reporting symptoms, people reporting perhaps small changes in physical exam. I think as we begin to look at those incident rates compared to severity indexes, and in particular severity looking at workers' compensation cases and looking at lost time restricted days, the fact that we are seeing certain workers complain about or give us symptoms, we are seeing our conservative therapies working. Again, it is how do you look at the numbers and what information do you have in a surveillance system at your place of employment that can better guide you.

Q : Since Dr. Hegmann brought up the back belts, I know we can't make it through the conference without addressing the new study on the 32,000 Home Depot employees done by U.C.L.A. Could you please address that? Because that changes everything. Now it is in The Wall Street Journal. Those of us in the profession are being bombarded by employees and managers as far as what to do about this new back belt study.

DR. EVANOFF: That is really a primary prevention question. This is a session on medical management, so we don't have to talk about it.

I am actually not sure that study changes everything. I think it is one study in a whole group of studies that have been done. There are methodologically a number of problems with that study. For instance, the employees, I believe, also received training in prevention at the same time they got their back belts.

And in particular, I can't believe that they got those changes without making changes in their case management and medical management at the same time. It will be very interesting to see, for instance, what happened to their neck injury, shoulder injury, foot injury data. If those all stay constant, then I think that decline of back injuries is more believable. But at least in our hospital setting when we have done any primary intervention, we have seen a decline in multiple injuries. So if there is decline in other injuries, it would be less believable.

The other problem with that is they did a lot of new hires. They greatly expanded the company. What we have seen in other settings is that new hires that come in often have a different injury

rate than the older work force that was there before. So it is evidence on the positive for back belts, but it is by no means a definitive study that should prompt us all to run out and buy them.

If you look at the whole body of literature, it has to be balanced against other studies. I think it certainly opens a door that I think was pretty much closed before it came out. I don't think it is enough to really completely reverse our thinking. That is my opinion.

DR. HEGMAN: I agree. Well said.

DR. MORELAND: I think it also moves the point again that if we choose just one particular item, one particular piece of the puzzle to view to find out exactly what contribution it has, as we are looking at the conference in Chicago these next two days, hopefully we are looking at a comprehensive type of approach that includes all the different types of components that we have talked about.

The training and education, how to use it, work postures, counseling, all of these types of pieces go together with that to give us an outcome. It is still that comprehensive process, it just gives us another point of dialogue to begin to discuss together.

DR. EVANOFF: Actually, I would be happy if they are very effective, because then I could quit worrying about backs and start worrying about necks, upper extremities and everything else. Even if there is one item that really works well, I don't think it takes away from the need for a comprehensive program and the need to appropriately manage those cases and still become injured.

Q : I am a registered nurse. I am also a certified ergonomic compliance director. I actually have a comment and a question that goes along with this comment.

Let's strip away all the rhetoric about ergonomics. It is about work-related musculoskeletal disorders, it is about cumulative trauma disorders, it is about carpal tunnel syndrome, thoracic outlet syndrome, it is about tendinitis, tenosynovitis. When and how is the medical community going to step up and take charge and take leadership in this area? We are talking about medical injuries, we are not talking about just establishing a workstation that is ergonomically correct from an engineering perspective. We are talking about how a human being interfaces with equipment, how they interface with processes for performing work, and what that effect is on their body over a long period of time, as well as in a short period of time.

I think your comment earlier about this is medical management not prevention. I think prevention is a medical issue at this point. Statistics show us that over the last two decades cumulative trauma disorders have skyrocketed, following primarily an engineering design program. And from my experience in dealing with these issues and dealing with other physicians, surgeons, orthopedic specialists, we tend to use a more restrictive model in terms of limitations that we allow the body to be exposed to.

It has been also my experience on a very small basis that those restrictions actually are improving the results and get the kind of results that we see when you put up your charts on how we reduce cumulative trauma disorders.

When is the medical community going to step up and establish standards by which consultants such as myself can go out and use and point to these communities? NIOSH has their standard of cumulative trauma or proper upper body posture. I took 25 workstations of people who had actual injuries, compared and took measurements of every one of those individuals, and found that 95 percent of them complied with NIOSH's recommendation. But all of them had injuries.

So my question is, what is going to happen on a government level, what is going to happen on a political level, and when is the medical community going to step up in leadership on this whole issue?

DR. EVANOFF: I think one point is that it is a mistake to think that there is such a thing as the medical community. The medical physicians and nurses and other health care providers belong to different groups with different political agendas. For instance, if you contrast the American Medical Association's stand on OSHA reform with that of the American College of Occupational and Environmental Medicine, they are diametrically opposed. Many people in ACOEM are also members of the AMA. We can be members of two organizations that have diametrically opposite views on something that is very important.

Q : Then how do we move to consensus?

DR. EVANOFF: There are a number of moves towards consensus, particularly in the American College of Occupational and Environmental Medicine, which for an organization which is basically pretty conservative has been progressive in terms of recognizing the problems of work with musculoskeletal disorders.

The political agenda is going to be driven by the things that drive political agendas. The last piece is going to be more education of physicians, both trainees and practicing physicians, because most medical schools do a woefully inadequate job of training physicians to recognize workplace hazards. Continuing education for medical professionals is a critical part of this whole piece.

DR. MORELAND: I continue to support that. As you have suggested, we may expand your definition of medical community to be the health community. And I don't think any of us can say that we are not a definite part of what this means.

The usual case definition of any musculoskeletal disorder is numerous. Again, there are various stages that we probably are going to end up looking at. But that is the purpose of this particular forum, is to move the discussion further so that we can finally begin to look at case definition, to look at different types of standards of practice for all health care professionals, whether they be



PAs, nurses, physicians, those that have occupational health-related types of things, too.

We still have a good ways to move, but the sooner we do that, then the more we are going to understand our numbers and understand our rates and understand the epidemiology of what is going on, as well.

DR. EVANOFF: So we will take two hopefully quick questions from the person in --

Q: Neal Taslitz, Executive Director of the National Repetitive Strain Injury Foundation.

One of the important unspoken issues that we have discovered over the past several years is that there are an increasing number of individuals that are suffering from early symptoms that are quite fearful of reporting this to the occupational physicians or to the employer because they are worried about either being labeled as having a problem and that having a future effect on their employment or on their own perception amongst their managers and their other colleagues. Also, many people fear through the screening process that they eventually will be screened out of the system. And we have seen that.

What experience have you had or have you implemented or suggested, some of the anonymous surveys, for instance, the type of surveys that I think NIOSH recommended that were taken at the Los Angeles Times at an early stage, and how has management been receptive to doing anonymous surveys of all workers for symptoms?

DR. MORELAND: What my experience has been is that if indeed there is an objective, if there is a goal, are we attempting to find out if there is a problem here, do we already know there is a problem because of the workers' compensation costs, that they have skyrocketed, those particular managers or those employers have been very anxious to get a better feel for and a better understanding of what these rates mean and what is driving them.

So from the perspective of a commitment to looking at how can we begin to establish a program, what baseline data do we have to know as we endeavor into this ergonomics program, can we make people better or can we make them worse or what happens. Almost without question, as has been stated throughout the room, once this anonymous survey is done, it usually is the key point in which a program is established and forge that communication, that we can develop a protocol and a program, a paradigm that is going to say with individuals that have symptoms what is going to happen to them.

The program is then again an active part of employee, union, management, those types of individuals, so that some of the fear is at least talked about, is communicated, and there is an appropriate step that we can make.

From there then, I think certainly to look at interviews, to look at each individual directly, because again if you know that there all these people that are supposedly claiming they have

these particular symptoms, you afford them the opportunity to come to the plant nurse or to come to the plant physician. Again, that is where we can begin to tease out part of this, too. But you go into it knowing that there is probably going to be an initial increase, but given that initial increase it immediately begins to dissipate pretty quickly as everyone finds their particular role to play in this big phenomenon of ergonomics and repetitive stress injuries.

DR. EVANOFF: We have had experience in several different work groups in doing anonymous surveys. You need to establish credibility with the workers, that it really is anonymous and that management will receive only summary data, and no data in a way that can allow the identification of individual workers. If you don't achieve that trust, you get a very low participation rate. If you do achieve that trust, we have seen 95-percent participation rates in some of our areas.

Actually, in my experience, management has not been as impressed by numbers about symptoms as they are numbers about dollars. I think having symptom information is useful. You may say 50 percent of workers in this job have symptoms. That may be useful, but to many managers a dollar sign seems to say more.

Q : The questions I have aren't extremely technical. I have gone from being a nurse on a regular hospital floor to an industrial setting within the last year. A year ago I had no idea what ergonomics meant when I was hiring in for the job.

I have some questions dealing with carpal tunnel syndrome. What percentage would you say you have seen or heard from in studies that are actually influenced strongly by post-menopausal women with their hormone changes?

DR. EVANOFF: Let me make two comments on that. The first one is your point of going from one environment to the other. Actually, you oftentimes will have gone from the more hazardous environment to the safer one, because the manual materials handling tasks of somebody who takes care of a patient and the mismatch, because it is mostly female, versus their job requirements are way out of whack compared with most manufacturing, which is relatively light.

Q : Not in my case. We build trailer vans that semis pull. It is extremely labor-intensive.

DR. HEGMAN: The other question is essentially addressing what percent of carpal tunnel is work related. Nobody can say zero percent and nobody can say 100 percent. It is probably someplace in between although it should be recognized that some feel it is never occupational. This is true of carpal tunnel syndrome, shoulder tendinitis, and this is also true of the back, unfortunately.

DR. MORELAND: Let me make just one quick comment. In my work I completed in 1985 in which we looked at carpal tunnel syndrome only, we had a definite definition of carpal tunnel syndrome which was abnormal nerve conduction studies. I purposely chose a working

population that included 50 percent men and 50 percent women. It was a floor tile manufacturing facility in which everyone was doing the same thing.

It is very difficult to find an employee population in which there are equal numbers of each sex, especially as they complete the different aspects of their task. The employee populations were either strictly men, such as in red meat packing, or they were strictly women such as in upholstery, electronics and those types of things.

In this community we found that if you calculated carpal tunnel syndrome by nerve conduction studies, men and women working side by side doing exactly the same task had exactly the same rates of carpal tunnel syndrome. The outcome of that was that as far as -- to answer the question that was asked earlier -- those that were still subclinical and that were asymptomatic, there was clearly a very gender bias in reference to who was willing to report different types of changes in strength, changes in sensitivity, women versus men. Those issues certainly came up.

If indeed you look at the ergonomic stressors, what is causing different people to change, and you have a definite way that you can define that, we don't find the different types of health aspects or the hormonal status to really prove out.

Q : One more quick question for Kurt. You were talking about accommodating work restrictions for nonoccupational illnesses and injuries. Ours is relatively higher than the six percent. I have calculated it at sixteen percent. What is one easy way that I can get my top management, which is my plant manager, to see that we need to accommodate restrictions for nonoccupational problems? Everything is in conflict with the union and who we are going to upset about it and who we are not.

DR. HEGMAN: If you can get dollars and label it with dollars, that is the way you get anybody's attention. If you cannot do that, you are really not talking about just a second or third best option. Then, you need to get numbers and try to compare them just as I did here to show that you do have a problem. I think that until you get management behind you, you cannot even bother going on to the next step of how do we address the union issue.

DR. EVANOFF: If you find one easy way to get management behind you, please let us all know. I think it is a long iterative process. You need to show them gains in one area before you can start talking to them about spending money in one way or another to achieve gains in another.

Well, thank you very much for your participation and your attention.

(Whereupon, the session ended.)



## Worksite Analysis

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Welcome by Suzanne Rodgers, Ergonomics Consultant

DR. RODGERS: The purpose of these sessions are to share success stories, and you will see that here for sure. I think it is to share things that we learn by trying things that didn't work, too. So we are going to share some failures as well as some successes. But I think you will find a fairly common thread throughout them.

In this work analysis section, we have tried to include some methodologies for you. I am sorry if we don't have a handout for you now, but there will be a proceedings available that will include those bits of material for you.

Just one comment from me. I'm Sue Rodgers. My work is as an independent ergonomics consultant. I have had the good luck of being in this field since 1968. And one of the things that happens when you are in a field, is the older you get, the simpler you get. So I am going to focus on those things that are simple that we can do, because our focus is on the small- and medium-size businesses, especially those that may not be able to afford people like me, but who can do things for themselves in a very effective way in the ergonomics field.

The main point I want to make about worksite analysis is that I believe it should begin the solution generation when you do the analysis itself. It shouldn't be something you do separate from the solving of the problem. And the same group needs to be involved. The people who do the jobs really need to be involved in the solutions. They can't be asked to identify the problem and then be sent out and asked to come back when the engineers have done the problem solving. What is fun when you do involve them throughout the process is the incredibly positive feeling you get when everybody is looking at a problem together and all the information is there to use in the solutions.

I think you will find, in listening to some of these papers, that job analysis is done in a lot of different ways, but I think in all cases we depend entirely on the person who does the job for the information about the job; and, then, we all use that for the creative solutions.

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Donald E. Day, Ergonomics Consultant

DR. RODGERS: Don Day is our first speaker. Don has a masters degree in kinesiology from the University of Colorado at Boulder. He is an exercise physiologist by background, and an athletic trainer.

I met him in 1974 at the American College of Sports Medicine meetings when we did a session that Don Chaffin chaired on ergonomics for exercise physiologists. He worked at the Kodak Colorado Division Plant and became the chief ergonomist there before he left, with some prodding from me, to come out and help to do consulting around the world. He consults with a lot of small, medium, and large companies. Basically, he builds programs and processes for ergonomics in the workplace.

MR. DAY: Thank you all for coming. There are more and more people filing in. There are some seats up here if you all want to come up.

Basically what I would like to do today is to give you a brief rundown on an example case study of an assembly plant. We will be actually showing you the analysis process that they use, and then show you some of the actual data that they have collected in terms of cost savings and some of the other things that are associated with that.

For those of you that have been in this for a while, you know that there are citations that do go on. This one is associated with the work at Samsonite, where they build luggage. And, also, just to let you know, we do have a couple of the people from Samsonite that are here from the Ergonomics Group. There were actually four engineers at one time. Right now there is one. One is on special assignment. They are Loyce Malleck and Tim Fegle. We also have a representative from the medical management effort here. The physician, Mark Frank MD, associated with that is here as well. So both of those fellows, Loyce and Mark, are here to answer some questions if you all are interested.

I wanted to recognize the Local 724 United Steel Workers. Al Bray is the President of that group, and he is very integral in terms of the overall process as well.

The citation occurred in '91. There were 100 medical record keeping violations and 250 ergonomic citations were videotaped. The method of analysis in risk factor recognition, that they utilized was primarily with respect to recognition, and the abatements were based upon those that they saw. All operations that could possibly cause CTD were analyzed, which when you think about an assembly plant, that essentially is all operations.

So with that in mind, Samsonite did have a bit of a concern because there were something on the order of 2,500 total operations that they were going to have to analyze. Although, when they actually came down to grouping them, there were about 450. They prioritized their operations based upon lost time and the citation associated with the fine. Ergonomic engineers were selected from personnel within the plant.

In terms of the overall program there was a culture change. It has taken several years. Samsonite is actually in the fourth year of their program now. It is a combination of human resources, operations, union employees, and environmental health and safety, which medical management is part of. We will talk about these groups more specifically.

When you talk to these individuals at Samsonite, they will say that ergonomics is an integral part of all of their efforts. All groups need to be considered during development and maintenance of the ergonomics effort.

The medical management effort is an integral part of the history at Samsonite. Stemming from an OSHA citation back in 1982, Samsonite employed emergency room doctors to actually run their occupational clinic. Emergency room doctors tend to treat things differently than occupational doctors. So we "blew up" the medical department and replaced that with an occupational doctor, Mark Frank, MD.

A couple of things that he does that is very nice in terms of the overall program, Medical Management does an ergonomics review of every CTD case that occurs. There is also a physical job demand (PSD) analysis, which is a very short, method of looking at the jobs in such terms that it also fits their Samsonite ADA requirements. The physical job demands are actually matched against the return-to-work program for injured or ill employees.

The transitional work program (TWP) actually uses one of the ergonomics engineers to supervise the employees that are coming back to work. The ergonomic engineer actually helps place them into a job that fits their restrictions and makes sure that things work smoothly. There is a great deal of cross-referencing back and forth from the medical group and the ergonomics group.

There are several things that I tend to take a look at within a company. First, we do have to have the management commitment and support. Well, this was sort of a foregone conclusion for Samsonite. You had to have that based on the OSHA citations. The other is a structure that is reliable and works well within the company. You have to be very flexible in terms of the company that you work with.

Samsonite has an Ergonomics Council, which is comprised of ergonomics engineers, management, medical, HR as well as the union. The coordinator was an ergonomic engineer. The Ergonomics Group didn't have teams that they were working with, but they partnered with the people actually doing the work. The consultant, me, made up the third corner. This is structure. So the "structure" becomes a very important issue when you consider the ways the company runs their ergonomics program.

By the way, over on the TV monitor you can see some of the actual work that they do. This is a case assembly. There are several operations involved within case assembly. This is representative of the types of jobs that the employees do.

These are the results of the program. This is the CTD incident rate. All CTD's. In February of '92, the CTD rate, was running around 40-plus. This is a six-month rolling average, every month the previous six months are averaged. At this point in time the program began, in terms of signing the OSHA agreement. This is then followed by a decrease in the rate. In August of '93, Samsonite blew up the medical department and got Mark Frank an occupational physician in.

There is a continued drop in the rate from 40 down to 6 or 7.

The ergonomic workplace analysis process becomes important to think about, because there's several things that it does. It focuses what the individuals doing the analysis look at, as Sue talked about. It also helps the leadership become more aware of how you are looking at ergonomic issues. They need to be able to believe in it, it needs to be simple, flexible for other needs as well.

I like to see a problem-solving base and analysis process. If you do bring in experts, they do need to work with the employees so that they are actually on the floor. It needs to include the "science", and the employees must be involved as well.

Now, the ergonomics analysis flow process looks something like this: A problem: quality, error, complaint injury or CTD has to occur. In this case it was the CTD problems associated with what OSHA was citing Samsonite for. That problem is given to the "team" or the analysis group. The team collects data and there is a measurement process. The "team" then completes the Job Fatigue Analysis. The next step is problem solving with a reality check, where they go back to employee to verify what they found. You will see more about this. There is a cost benefit step as well with this. The control is then implemented. Re-evaluation occurs. There's an overall case study as well. This is given to the ergonomics coordinator. And finally there's a follow-up process.

This process had to be sent back to the national OSHA group to take a look at before it was accepted as the methodology that Samsonite was going to use to be looking at their work stations.

It is flexible in that once you get into the actual problems, there are several ways you can look at it in terms of safety, quality, lifting and lowering-material handling types of situations, as well as the repetitive processes.

Now what I would like to do is introduce you to an alternative way of looking at the workplace. This is the analysis process that I use that Dr. Rodgers developed in '87.

You will have the references with the material to be compiled. These forms follow the flow process that you saw. The job that you are going to be viewing on the monitor is taken from another site. It is an assembly process. The employees are assembling a gas range. So what you will see is an individual who is doing a particular operation. The operation is to attach the outside gas line to the inside gas line. The employee bends into the range, putting on a fixture in the back of the range, fixing that in place, running the nut runner down to make the connection. And then they come out, do a suboperation, and go to the next one.

There are a couple of different forms that go before this one. One of the things that we always ask is, what is the process of looking at these jobs? Typically, the typical risk factors: force,



duration and repetition are identified. Recovery is sometimes looked at, but these are the big three.

From an exercise physiologist's standpoint, I tend to think 1) the intensity of "how hard" the person might be exercising, 2) the duration that the person is exercising for and 3) the actual frequency of bouts or exercise sessions. From an ergonomics standpoint, that makes sense if you think about the percent of effort that that person is working at compared to their maximal capabilities. We also look at the continuous time that the muscle is actually contracted. And then you look at the efforts per minute. Does everybody follow that.

So duration is not duration over the long haul in terms of the day, but the actual time the muscle contracts. Now, you do have to overlay the actual time that the person is doing this operation over the day as well.

This is the Job Fatigue Analysis form that we use for analyzing repetitive work. And, again, this is in some of the references that Dr. Rodgers has written. On this side of the form the body parts are located: the neck, shoulders, back, arms and elbows, wrists, hands and fingers, legs, knees, ankle, feet and toes. So it pretty much covers the entire body.

When we view a job we take a look at the effort level, continuous effort time, efforts per minute. This assumes that we are looking at an operation that has a one three-second effort within a five-minute time frame, by the way.

So now we need to consider how to determine the effort category. Well, the way that you do that is you tend to break that out into categories. Dr. Rodgers uses the psychophysical rating. Now, this makes sense to me because exercise physiologists have used psychophysical ratings for years. This method can be used for analyzing work.

What you need to be able to recognize is that the response is not linear. Secondly, it needs to be anchored. And the way you anchor this is to determine what the maximum level would be. So in terms of getting this information from the employee that is actually doing the job, you would ask them when they are doing the job to imagine a maximum effort to complete that particular test operation. Or to actually do the operation with a maximum effort.

Well, maximum is the point where you are going to "throw up". Everybody understands "throw up". You have to use those graphic terminologies. So once they understand, if they are putting a driver in place, or performing some task they need to envision a "maximum effort". Then we back off of maximum and describe what it actually feels like based upon the descriptions on the side of the form. This has been done by Borg (1982) over in Sweden.

What Dr. Rodgers has done here is broken it down into light effort, moderate effort, and heavy effort; approximately based upon a 30 percent level or less for light, 70 percent and 40-60 percent or in between for moderate. Now, again, that makes sense from an exercise physiologist

standpoint as well.

So if we, again looking at this task, go down and start thinking about the effort level associated with this -- and I am going to kind of roll these off so we can get done with this in a hurry -- the effort level for the neck, where do you see this? When she is actually bending inside the range. So what would be the effort level? Well, it's not light. It's not maximum, but it is probably a 2. Make sense? Okay.

Then we have the shoulders. Again, looking at the effort level associated with this task, outstretched, probably a 2 holding the driver in place. For the right, 2 as well. For the back -- anybody got any guesses? What does it look like? At least a 2 for sure. And there's a possibility that some people, especially if they have some problems, may think that the effort level could be more of a 3 with this task.

Arms and elbows, in terms of the effort level associated with doing this job, probably a 2, but it might be on the lighter side of the 2. Again, as you start taking a look at the 10-point scale, dropping down into the lower 2 categories.

Wrist, hands and fingers, actually holding the driver in place and running the nut down. Again, because we can't really see what is going on, there's probably deviation involved and those types of tasks. Probably again 2s, at least for this task. And if you think about some of the deviations, depending upon positions they get in, it may be higher than a 2.

Legs and knees associated with this task, it is not just standing, it is leaning forward, so there is some effort associated with this task. Again, it is probably 2 or maybe on the lower end of a 2.

The ankle, feet and toes, probably a 1 associated with this task. The continuous effort time is broken down in less than 6 seconds, given a 1; 6-20 seconds, a 2; and 20 seconds and greater a 3. Continuous effort time associated with this task is about 18 seconds inside. Every 35 seconds you have a cycle, so there are 2 ranges that go by per minute.

So with that in mind, 18 seconds would be a 2. Therefore the neck and shoulders are a 2; the back would be a 2. The back would be a 2. Arms and elbows, again they are probably a little bit less than 18 seconds, but probably still a 2 associated with this task. Wrist, hands and fingers, probably a lot shorter incremental movements associated with this task, so we are talking probably about a 1 in those cases. And in terms of the legs, again in that 18-second time frame, a 2. Ankle, feet and toes are actually standing for the entire time frame, is 3.

Now we determine the efforts per minute. Less than 1 effort per minute is given a 1; 1 to 5 efforts per minute is given a 2; and greater than 5 efforts per minute up to 15, is given a 3.

So therefore efforts per minute categories are as follows: 2 for the neck, 2 for the shoulders, and 2 for the back as well as legs. Considering the arms and elbows and the wrist, hands and fingers

there are more efforts per minute for this task. For the ankles, feet and toes the efforts per minute are less than one or a 1 category.

The next step is to consider the combination of these categories, for example a 222, 232, or 322 and determine the priority for change. The categories for the priority for change are high priority, and very high. These categories represent the magnitude of potential fatigue associated with this task.

The resulting priority for change categories are 222 for the neck. Moderate priority for both shoulders. A 322 would be high priority for the back. Moderate priority for the arms and elbows. 213 is a moderate priority for the wrists, hands, and fingers. 222 is a moderate priority for the legs and knees. And for the ankle, feet and toes the priority for change is a 131.

Now, we take this to the next form. I will show that to you very quickly. This form represents the problem-solving analysis step associated with this task. The body parts that were prioritized as moderate, high or very high are taken from the Job Fatigue Analysis form. Initially, list those body parts on the form. Then list the risk factors associated with that body part. Then list the contributing factors or root causes associated with that risk factor. Finally generate or list the suggested strategies of alternatives for rechecking the risk factor.

Observing the job on the monitor the risk factors include: bending the back, reaching out for the shoulders, extending the neck. There is also leaning forward for the legs, and probably deviations for the wrist, hands and fingers.

The contributing factors or root causes to this, for these risk factors will be identified next. Upon further observation, discussing the risk factors and continuing to ask the question 'why', the root cause is identified as the fact that the employee is actually assembling this part in an enclosed environment. Concentrate on that as being the root cause, then one of the possible solutions, and the best solution, the team actually arrived at was to actually make this a sub-assembly step off line prior to assembly. Here you can see the actual solution. We took the process off line then, put it on line here. The ergonomics team actually did this with the assembly group. You can see that they take the back of the range, place it on this fixture. By the way, it costs \$45. They then put the outside gas line in place and run the nut down while it is in this position.

This job prior to this fix resulted in four open back cases. There was about \$200,000 of workers' comp, dollars associated with this task. It was also hard to keep people in this job, because they didn't like to be in this job. In terms of quality problems, there were gas leaks that occurred at this fixture. Customers don't like to find gas leaks, for obvious reasons. So that was actually part of that that they rolled into the overall cost of this analysis and fix.

Hopefully you can see that by utilizing this process we are able to, in a short time period, focus on the job, the body parts and the risk factors associated with it. More than that, actually coming up with what the contributing factors are and being clear as to the root cause, and then actually

coming up with a feasible cost effective solution.

By using a sound problem solving analysis process a company can have an effective ergonomics process. These are some of the costs associated with the ergonomics process at Samsonite. Again, light assembly, 640 employees, and kind of a small plant. The ergonomics process costs \$2,500,000, cumulative total (91-96). There were some things in there that probably weren't necessarily ergonomic fixes. There also was some redirection of my time. Productivity and quality issues weren't because they didn't have a real good process to do that. So the actual cost for the ergonomics process for Samsonite was just short of \$2 million for about 5<sup>1</sup> years.

DR. RODGERS: Don, thank you very much. We appreciate you sharing that with us. It is awfully hard to tell everybody everything you want to tell them in 15 or 20 minutes.

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Tom W. Jacob, Corporate Industrial Safety Manager, Frito-Lay

DR. RODGERS: Our next speaker will be Tom Jacob who is a corporate industrial safety manager at Frito-Lay. I think there are free samples in the back.

Mr. Jacob is responsible for leading the safety and industrial hygiene improvements throughout the operations group at Frito-Lay. Prior to joining them, he worked for Texas Instruments for 14 years in a variety of safety, industrial hygiene and environmental positions at the plant, at the division, and at the corporate level.

Mr. Jacob is a graduate of Oklahoma State University, a certified safety professional, Past President of the Dallas Chapter of the American Society of Safety Engineers. He has received chapter and regional ASSE Safety Professional of the Year Awards in 1996. He also serves as a member of the Occupational Safety and Health Advisory Committee for Texas State College in Marshall, Texas.

MR. JACOB: Thank you, Suzanne. I am pleased to be here with you and share some of the learnings that we have had at Frito-Lay over the last several years. I have been there just a little over three years, and I think we have had some great successes.

What I am going to cover are the things that you see here on the chart. I am going to go through this fairly quickly, but certainly will be available to talk about anything later on.

First of all, about the Frito-Lay environment, just to give you some idea who we are. You probably know, but we are a member of the PepsiCo family, although Frito-Lay on its own acts as a whole subsidiary. We don't have a lot of corporate direction from PepsiCo. And even Frito-Lay itself is a very decentralized sort of structure. So all the locations do have a lot of

autonomy, do their own things.

Annual sales of about \$6 billion with 40 manufacturing sites across the U.S. I know you are going to see a variety of the product lines and some of those that we make. There are over 100 product lines that we do make in these manufacturing facilities in a variety of bag sizes from the small ones that you are going to get at Subway for your sandwich, to the larger bags that you are going to get at the discount stores for larger home applications.

And obviously to be able to serve our customers and serve the public, we have to produce a lot of product. And that is producing 30,000 bags a minute across the United States. And during the course of my presentation here of 15 to 20 minutes, our plants will be churning out somewhere in the neighborhood of 600,000 bags.

When you are talking about that sort of volume, and understanding that most of this product is fragile, nobody likes to open up a bag and find their potato chips all crushed up. Unfortunately, many current practices require those bags to be placed into boxes and cartons by hand. So 600,000 bags a minute, we are going to pack here in the next 20 minutes, and many of those are going to be placed into boxes -- the majority of those, although we have new technology -- by hand. The potato chips aren't heavy, weight is not the issue. Repetition is the issue. So we certainly had to go look at things like that.

I'd like to give you some further idea of our environment. We are going to break it down into four sections. First of all, the processing area. Processing is where the cooking is done. From an ergonomic standpoint, there's not a lot of issues there. There's only a few people that work in the processing area.

The second area is packaging. The finished product moves to the packaging room where it goes through the bagmakers and then is placed into the individual boxes. There are a lot of hand manipulations. An area of intense ergonomic efforts on our part.

Next, warehouse and shipping. Palletizing of product is done here. Some of it is done automatically, but we do a lot of picking operations to put together the specific distribution center orders, to go to our distribution centers or to our small bin locations.

And finally we have route sales, all the folks you see up and down the street in the Frito-Lay step-vans that are going into environments that we typically don't directly control. Placing product on shelves that may be seven feet high to three inches off the floor. And obviously there is a lot of potential ergonomic risk for these people as they go and make their sales routes day in and day out.

What I am going to be focusing on primarily is the packaging and warehousing and shipping area in our manufacturing environment.

We have taken ergonomics and we have made it a local initiative. It is not one that is driven from a headquarters standpoint. We work with the individual locations in a consulting role to get them to set up their own ergonomics teams at their individual locations.

Our leadership team, the management for the individual location, establishes an ergonomic steering committee that is made up of management as well as our resources as well as our technicians, our line people, to try to get a cross-section of employees to go work on these sort of initiatives and decide for the year what are our priorities going to be, what things do we need to work on, looking at historical data from the OSHA logs and workers' compensation.

There is typically an ergonomics coordinator for the location, most likely is our safety individual at that site. And we provide resources from headquarters as well as division from a consulting role. Not only in the process but also some from a specific task evaluation. We do use some outside ergonomics consultants particularly for new equipment designs. When we're looking at new packaging operations, when we're looking at new warehousing designs we bring in some experts with a fresh set of eyes that can help us try to design these things to minimize our ergonomic issues.

The steering committee then can set up, and we encourage them to do this, to set up smaller teams, like one for processing. There are processing issues, since they understand that role. One for packaging, maybe one for warehouse. So when you come into one of our locations you are going to find that we may have several ergonomic teams working on the issues. And they are going out and doing their own cursory sort of task analysis. We provide these teams with training to be able to do that.

Our ergonomic strategy is really our foundation for the improvement in all of our manufacturing locations. And at the left there you see the things we are doing around training and administration. We also encourage people to report issues early. And that is something we probably didn't do well earlier. Not that we encourage people to work through it, but we didn't get them to come to us earlier. Now when they come to us early, we can get something done about it.

New employee ramp-ins. You are going to be on the packaging line working eight hours a day. You don't just throw yourself out there and expect them to get up to speed with the packaging lines. So we have a couple of weeks for them to, if you will, climatize to the environment and make sure that they are getting adjusted to the speeds, to the repetitions and things like that.

Packer training and P.I.E. I am not talking about cakes here. I am talking about a program that we have that is called People Improving Ergonomics. That is a technician-based team that goes out and evaluates other technicians doing the job. They go videotape them. And if they find that they are varying from what the standards are for this sort of job, they pull them in, show them the videotape and say, "Look, if you do it this way, the way we prescribe, you are going to have less

risk. You are adding additional movement and things like that." So that one-on-one sort of peer technician feedback has really been important and really given us some good successes.

Job rotations, trying to get people to work on different operations, relieving some muscle strains and strains on different parts. And then overtime management. We found that overtime certainly has a big impact on whether or not we have had ergonomic-related issues. We have gotten a little smarter about managing that overtime.

The medical management piece, from an earlier intervention, getting people to come to us earlier. We have occupational and/or physical therapists in most of our locations now who can provide that immediate sort of place for them to go. OTs and the PTs also help us in doing task analysis. We expect them to spend a lot of time out on the floor. They are not office-based. They are supposed to be out on the floor, working with people, looking at jobs, working with their teams, doing the analysis.

We are very interested in return to work, getting people back to work as quickly as possible in some modified duty, if that is possible. And then once they do come back, if they need some work -- just like climatizing them to begin with is trying to get them back to up speed maybe post-injury.

But obviously the real important thing we want to be doing is working on engineering controls. And we have a lot of things going on in our packaging technology to try to assist the packers in doing their jobs and giving them some aids, giving some additional automation to that sort of process, the warehouse designs and how we are picking operations and the anthropometrics around picking different conveyor heights. And as well as trailer loading. We load a lot of trailers by hand, and now we have gone to some assisted devices which help load those.

So, have we been able to do this and have we been able to make an impact? Our process there that I have gone through very quickly, I think we have. Let's take a look at a couple of our locations. The Georgia facility, their rate of CTDs over a three-year period is down in manufacturing operations, the packaging and the processing part. It is down 73 percent. It puts a focus on it, puts some effort to it. Yes, we have invested headquarters money to try to get new equipment and technologies. In the warehouse, down 83 percent, and their overall plant workers' compensation cost per claim is down 24 percent over a 3-year period. Made some great strides in there.

In California, we have had another facility that over a 2-year period of time now has reduced their CTDs in the processing packaging area by 55 percent. And, additionally, in line with that, they also reduced their work comp costs.

Those are just a couple of facilities. But if you go look at nationally what we have been able to do, our 40 locations all involved on the CTDs and the ergonomic-related issues is our claims have remained relatively flat. They went down just a tick last year in '95, but they came back up

in '96. But the overall cost, the overall cost incurred for these sort of injuries has gone down 35 percent and the cost per claim has gone down as well. So we feel real good. This is helping us to be able to invest in some things, to be able to show a return to our management that the things we are doing are helping them get better at what we are doing and making some more money.

I want to share with you now just some things that I have learned in working Frito-Lay, as well as my previous employer. If you all are out working on some ergonomics programs, maybe some keys we have seen to success. The first one probably everybody thinks about is the management support and involvement. Obviously, they are the ones that fund our ergonomic future, if you will. We have to be able to show a payback for these sorts of things, I think, to be realistic, in order for them to sign up for these things rather willingly. And, also, we want them to be very visible cheerleaders and if we hit a win, making sure that they are out there supporting us and are communicating that to everybody else.

The participative program. We want a very team-involved sort of ergonomic process that supports us. We are a team-oriented location, so we have to have all levels of the organization participating in that. And they run their own business, the teams do, and we expect them to work on the ergonomic issues as well, and we think that has been a big win for us.

We have to have a sustained and focused strategy. Each one of our locations are required to put together a safety action plan every year, what they are going to work on. Part of that has to be spelled out as to what kind of ergonomics and issues that they are going to work on for the coming year, what about training, what about interventions. So you have to make sure that you are heading in the right direction and you stay focused on where you are trying to go.

And like was talked this morning, we have to promote the success stories. You get those wins. Boy, if I ever get a ergonomic solution where I can show some productivity gains as well, they will never get me to shut up. Because I keep throwing that back at them, that those sorts of things have had that productivity benefit as well. So if you get those, make sure that you are a success in promoting those around.

Well, everything is not a success story. There are some pitfalls to avoid, and make sure if you are getting into this -- I think these are some that we have learned from. First of all, obviously, is don't rely exclusively on consultants. I think you have to develop some in-house expertise. Now, we don't do everything in-house, we still do some work with consultants. But, nevertheless, a lot of the local sort of activities, there's a lot of job analysis you can do at your locations of cursory sort of stuff and that teams and people will be glad to do. They would like to have an opportunity to learn more about what ergonomics is and how to go off and do those sorts of things.

Don't attempt to do too much at once. And you can quickly get overwhelmed by the amount of work. If you go out to everybody and say, "Bring all your ergonomic solutions to us and we are going to fix them," and suddenly you have been inundated. And in short time, your program that



you thought was going to be a positive turns out to be a real negative because now people's concerns are not getting addressed. So you have to watch out that you don't bite off more than you can chew originally with what resources that you have.

Don't unreasonably raise the expectations of your customer. "We will have all this fixed next week." It's not going to happen. This will take care of the problem and we won't have any more injuries. Not going to happen. You have to make sure that management understands that we are probably going to minimize our risks. We are going to get some benefits out of it and there may still be some risks there.

Also, you are rolling out a new ergonomics program to a plant that the trend, as we saw this morning in one of the charts, show that the number of claims or number of injuries actually went up, because you are getting people to report things early, you want them to come to you. But you have to look at your other data to show that things are going down.

Don't think that every problem requires extensive engineering controls, because they don't. The old kiss principle, keep it simple, stupid, works. And there's a lot of low cost, low technology solutions that can be put into place in your locations as well as ours that will minimize or eliminate these potential ergonomic issues.

Don't insist on 100-percent elimination of the problem. I think that is clearly unreasonable. As long as we have people in the work environment, risk is going to be there. We look at trying to minimize those things, we look at trying to cut the hazards down. And our job analysis that we are going to do should show that a rating now has gone from a job rating of 90 to now 60 or something like that. So you are making progress and minimizing the risk. Prioritize what you are going to work on and make some impact on that in the work and move on to the next one.

And, finally, what are we getting out of it. And, again, this was brought up this morning. This does give you a competitive advantage. And we believe it is going to give us a competitive advantage. It is going to be a safer work environment. That's good for everybody. That is good for our employees, that is good for everybody.

Enhanced employee morale. They now understand that we are interested in helping them. We are interested in making their work life easier. You don't have to come here and go home aching in pain.

And, last of all, we do get some productivity boosts about it and, let's face it, that's what the management likes. They like to see productivity increase as well. All those things coupled up obviously give us a heck of a lot better work environment and give us a competitive advantage.

I appreciate the time I have had with you, and I will be around later on if anybody has any questions.

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Paula Bohr, Washington University School of Medicine

DR. RODGERS: Paula Bohr, who is a Ph.D. and is an occupational therapist whose practice in research interests focus on evaluation of workers and analysis of work tasks and assessment of work environments.

She received her B.S. in occupational therapy from the University of Kansas and her doctoral degree in industrial engineering from the University of Oklahoma. Dr. Bohr has served as consultant to businesses and industry. Currently she is overseeing implementation and evaluation of participatory ergonomics teams in health care.

She is a Director of the Occupational Health and Ergonomics Laboratory in Washington University School of Medicine, St. Louis, in the program in occupational therapy, where she serves as a faculty member.

I might just make a comment relative to this. If anybody has not had an opportunity to see what opportunities there are in ergonomics in the health care system, you have a real eye-opener coming to you. It is similar to construction and industries where you don't have much control over your workplace and the situation. So I am looking forward to hearing Paula's talk.

DR. BOHR: Thank you. I am excited to be here to talk about this project today, because we really have been surprised by a lot of our outcomes.

This project, funded through a cooperative agreement with CDC/NIOSH, is now in its second year. It is taking place in a large medical center that is a part of a larger health care corporation. The health care corporation has 16 acute care hospitals and 7 long term care facilities. And overall that system employs over 25,000 employees and 6,000 medical staff. So we are talking about a significant population of workers here.

They are going through the restructuring and the downsizing that is very typical in health care these days, and that is resulting in increased work loads for the workers in many of the departments.

My slides were on a handout. I am not sure that everyone got those, but if you are frantically taking notes, there are handouts around.

We targeted several groups in the hospital to look at implementing a participatory approach to ergonomics. We identified the groups because of the diversity of their hazards and also because of the educational backgrounds of the workers in those areas.

We also had to have willing participants, and we identified those participants in an intensive care unit, which was general medical intensive care, that had employees numbering around 50. We had a dispatch service which consisted of orderlies and transporters, and this was the group of individuals who were responsible for lifting and moving patients throughout the hospital and also for picking up blood samples and things from various patient rooms and going to the laboratories.

Our third group was clinical laboratory workers, and this was for the entire hospital, 450 workers in a variety of jobs.

We targeted the clinical laboratories because of the upper extremity risks that we were able to identify; the dispatch services because of the back and lower extremity problems that they were experiencing; and the intensive care nurses because of a variety of symptoms of unknown origin, back, upper extremity, lower extremity, a very mixed bag of complaints.

We developed teams, employee-management advisory teams, that consisted of four to six workers but had both worker representation and management representation. To those teams, the three of us who were involved with the project acted as technical advisors. We have an M.D. on the project who provided medical expertise; we have a certified ergonomist who is also a technical advisory; and I serve as the third technical advisor to those teams.

We started out with how in the heck do we train all of these people to do the jobs that we want them to do. We started looking at the literature and realized that many of the training sessions were very long and extensive, and that was not going to be possible for our population of workers. They were under time constraints. If we pulled too many workers out of one area for long periods of time, then we would have problems with coverage and getting the services provided in the hospital system.

So we were able to provide eight hours of training for the ICU and the dispatch teams, but our laboratory team could not get the work done and be out of the labs for more than four hours at a time. So we acknowledged that these were less than ideal situations. We focused the training for these teams on team process and team-building kinds of activities because we thought that was more critical to the process.

We did provide some basic technical information to them as a part of the training, but we tended not to focus on detailed evaluation techniques and chose to provide that type of training in the context of the problems that they were identifying. I will talk about those in a few minutes.

We had videotaped many of the jobs, and we had the opportunity for them to do some actual hands-on analysis of the videotapes as a part of the training session.

The problem identification, initially we looked at all of our records, workers' comp, accident on duty logs, medical records, and did a record review. That was performed by the technical

advisors to the teams.

We also had a process of sending out worker questionnaires. And the worker questionnaires had a number of components, including symptom reporting, and the psychosocial factors involved with the jobs. The symptom reporting, I will say we found very valuable in having three levels of reporting. First of all, did they experience discomfort by body part. If they did, how uncomfortable was it. And the third level was if they experience discomfort or pain, how much did it interfere with the performance of their job. And that was very useful information when we started looking at the problems.

We also relied on a lot of observation from the team members and the team members' measurements.

The observation and measurements really relied on training in context with the individual teams. For example, when our nursing group started looking at poor lighting in patient rooms, as technical advisors we took the light meters in, trained them how to use the light meters to do the measurements. And they took it from there and did a beautiful job. But we used that type of in-context training.

We did utilize some personnel with expertise in areas. We involved some of our safety people when we were looking at noise evaluations for all the alarms that were going off in ICU. So we did have access to them.

We provided each of the teams with a basic measurement kit. And that consisted of things like a camera, tape measures, goniometers, the little clicker counter instrument, but very basic kinds of tools for these kits. We provided those to the teams. And because they were available, the teams really have made good use of those kits.

The expensive pieces of equipment, like the Chatillon gauges, the sound meters, the light meters, we have available to those teams, but it is on a request basis. We didn't put them in the actual team's kit that they keep with them.

We have provided them in their training materials a notebook, forms or formats for looking at analysis. We provided those as guidance only. What we have found is that they really haven't used any of the forms that we thought were so wonderful and provided to them, but they have made their own forms and have actually been much more productive using their own forms than they would have using ours.

The problem really determined what type of data collection these teams did. The methods that they selected have varied with the teams and with the teams' expertise. I will mention those when we look at the problems, but they picked the methods that they were most comfortable with and that they thought would give them the best information.

From an engineering background, I questioned why are they doing that, why aren't they doing this, and it was very hard to sit on my hands and let them evolve this process. But what we found is that they didn't approach it the same way as an ergonomist would from an engineering perspective, but they came to the same conclusions. And their methods were much simpler than what we could have anticipated doing. I was ready to go do all the biomechanical analysis, and it wasn't necessary for the identification of the problems.

The worker groups tended to select the things that they knew would be accepted by their co-workers when they went out to make measurements. They knew whether or not they could take photographs or videotapes, and that played an important role.

The priorities were reached by group consensus. In some parts they were based on the number of workers who were impacted by that problem. They were based on the severity of the hazard as the team saw that severity. And they initially were based on the complexity of the problem defined and, as we have heard this morning, reaching for the low hanging fruit. That is basically what we did. We went for the simpler problems to get some success behind us, although we found one of our groups tackled their major problem and did a beautiful job first thing off.

The dispatch team: All of our teams have been productive in their work, but the dispatch team has probably been our outstanding team at this point. They identified problems first related to not having standard procedures for lifting and moving patients. They also identified the fact that there were inconsistent training procedures. Not all new workers were trained in techniques to lift and move patients.

They were using mechanical lift equipment either improperly or it was sitting in the corner because they didn't know how to use it properly. They were doing standing pivot transfers with patients under unsafe conditions, things like not having shoes or some kind of footing under the patient to move them. They were transferring in stocking feet and patients were slipping.

They also identified a problem with the lower extremity discomfort from their worker surveys. They did not identify that problem from injury rates, but the symptom surveys. The single, most reported complaint that the transporters had, was that they were having knee and foot and ankle problems. The team is now investigating that problem in terms of whether or not they need shoe requirements for these people who on average, they are estimating, may walk up to ten miles a day throughout the hospital on concrete floors.

They also had injuries from moving hospital equipment. This actually is quite a humorous issue. It was incidents such as running the gurney wheel over their foot when they were trying to put it on the elevator. The solution was simple in some ways, but the injuries were still happening.

The methods that this team used or relied on:

- 1) They relied heavily on interview of workers. This did tremendous things for developing

the communication within that group. This group now has such a pride in working in the hospital system that we have really seen a morale boost, and especially now that they have done some of their problem solving. Other parts of the hospital and other hospitals are contacting them and wanting to know what their procedures are for lifting and moving patients. But a lot of that information they got from interviewing the workers.

2) They did do a lot of incident investigation. What did you do wrong with this procedure, that you ended up hurting your foot?

3) A lot of observation, and they were on target 99 percent of the time. I would be wanting to measure the angles, and they are going, "No, he is bending his knees too much." So it was much simpler than what I had envisioned the analysis to be.

4) They also reviewed the documentation of procedures, which they didn't have. They looked at equipment usage patterns and then they started evaluating mechanical lifts and other equipment that could be used.

The ICU team identified low lighting levels in patient rooms, noise from the alarms at the front desk, which were borderline up there with being out of compliance, uncomfortable computer chairs with no back supports (all of their record keeping was computer-based systems in the ICU), and potential injuries from lifting and moving patients. But the big area, and we are still struggling to define this with this group, is stress associated with ICU work.

This team employed some additional measures. They used many of the measures the dispatch team did, but they additionally added meter readings, both light and sound meter readings. They did workstation measurements, getting down with the tape measures and looking at computer work heights and that type of thing. They did a lot of photographing of work postures, because they really didn't believe, and their work force didn't believe, that they were using bad postures to lift and move patients or to change I.V. bags and that type of thing. So they did a lot of taking pictures, and that was really helpful for their analysis.

They evaluated a lot of seating options, actually got chairs in to look at, to evaluate. And with the stress issue, they found themselves doing a lot of literature review, which there's extensive literature out there but no real solutions. But we know there is a problem.

The laboratory team identified fatigue from prolonged standing on tiled floors, workstation discomfort in the transcription area, discomfort in sitting for performing laboratory procedures, poor body mechanics, particularly with the phlebotomists who are drawing blood, and poor design of laboratory areas that required awkward postures.

Additionally, they used worker evaluation of products, particularly anti-fatigue mats and seating options. They did cost benefit analysis of their equipment choices, and they did a wonderful job on that. They did do some detailed task analysis for some of the procedures with the help of the

technical advisors. They used a lot of photography and videotaping. And they started looking for standards for laboratory equipment and procedures. And in some cases those do not exist.

So what we have found at this point, being that we are just starting into our second year of this project, we have seen significant decreases in low back symptoms among the ICU nurses and the orderlies. We have seen significant increases in time pressures for the laboratory workers. We have had approximately a 50-percent decrease in back injuries for the orderlies, and we have had an 88-percent decrease in lost days for the orderlies.

So we have had some significant changes, and it is a process that is working in the health care system at this point. The process will be expanding to go to those other facilities within the health care system.

Thank you.

DR. RODGERS: Thank you very much.

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Mark D. Johnson, Eastman Kodak Company

Transcript not available for this presentation

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### Question and Answer Session

DR. RODGERS: We have about seven to eight minutes for questions before we close. Any questions you would like to ask or any comments?

Q: Rich Rebar from Smith Kline Beecham. One comment and one question. My comment was, on Mark's slides he had one of the "patients" that all that stuff was done based on the functional job analysis. And that paper smooths over and it really does explain everything that you guys were talking about.

DR. RODGERS: I didn't plant him. It is available literature, though.

Q: We have translated it into Spanish, also, if anyone wanted that.  
The question was, I noticed, Paula, in your work you used a lot of photographs. Did you use videotaping, too?

DR. BOHR: Some of the teams did use videotaping, but not all of them. The problem with the videotaping is being able to get the three-dimensional aspect. They felt they could capture it

better in still photographs. They particular used the instant photographs where they can write on the bottom of the photographs to be able to track or to make notes. They also carry markers with them so they can mark angles or twists or that type of thing on the photographs. But they do use both.

Q: Is that that other photograph company.

DR. BOHR: Yes, that is that other photograph company.

DR. RODGERS: Yes, the one in Boston, I believe.

Anybody else who wants to ask a question?

Q: Mike Halter with M&M Protection Consultants. My question is directed to Mark. When you sent that E-mail questionnaire, what sort of percent of response did you have? Or if you don't have that number, what was the sheer volume of response? My fear of doing that within my own company is getting 10,000 people wanting workstations assessed.

MR. JOHNSON: I don't know what his total response was, but he just did it for the one little division he was in. So he probably didn't have more than about 200 people that he was collecting from. But the point you have made is a very good one.

The biggest problem that we have had is once we start talking to people -- I will use office ergonomics as an example -- typically we go into a department and we try to talk management into instead of having us look at one person's workplace, let's do an awareness session for like an hour or 45 minutes at one of the staff meetings. We usually end up with somewhere around 10 to 20 percent of those people walking out and making appointments for somebody to come in and take a look at them.

I had a discussion a couple months ago with our senior vice president. In fact, our company CEO said we need to be doing more in office ergonomics. They said, "We want you to go out and give these large group presentations."

I said, "Well, if I get 500 to 600 people in an auditorium and I get a 20-percent hit rate, I have 4 people trying to service the world." You can figure a half-hour to an hour per visit. It doesn't add up.

What we have to break it down into the lowest common denominator. And we have done a lot of training of people in each organization. Much like Paul talked about at the hospital, train the people in that organization to do it and then coach them into doing it. Then they become self-sufficient.

DR. RODGERS: Also, the other thing you teach them, is that most of it they can do, and then



they know when they need to call you in.

Any other questions?

Q: My name is Brian Sherman. I am with Prince Corporation out of Holland.

This is for Mr. Day. On your worksite analysis protocol you identified risk factors like time to endurance, force, repetition, that type of thing. I notice you didn't mention postures or awkward postures, and I know that plays a major role and biomechanically speaking time to endurance. If you can just reiterate and discuss how that affects your psychophysical measurement.

MR. DAY: Posture actually is involved in the force or the percent of effort category. What you do is you take a look at the change in the posture, and the change will increase or decrease the force. So that is involved in that and it has that biomechanical overlay already.

DR. RODGERS: I wanted to pick that up from the other discussions, too. The effort level is where all the typical biomechanical risk factors comes in, in determining that effort level. But as Don says, we express it as a percent of capacity in that posture. I don't think posture is separate from effort. What determines the level of effort is what posture you are in.

So Mark, I think, has put up the form. This is in the publication, too. I'm not trying to sell this to you, just letting you know it is out there if you want to try it and it is easy to use. All we have done is describe postures that would be light, moderate, heavy.

The main thing you have to be sure of is in building in the endurance factor in the rating of effort, because that's what happens, if it's fatiguing. And then I say, "Well, what makes it heavy?" Well, because we do it all day. Then you know you are integrating the other factors. So that's how we say for just three seconds if you did it and you didn't do it again for five minutes, how heavy would it be. Then they get back into the real effort rating. But all of those risk factors we use in the other systems are really basically describing the posture and the situation. And now we can relate it to percent of capacity in that posture.

Q : My concern with that is you are involving employees on the floor that may not be aware of that relationship.

DR. RODGERS: You know what is fascinating, that they don't have any problem with the level of effort. The one that they can measure is the one they don't do as well on, and that is understanding that the time and the frequency is related to the level of effort, to the heavy effort. They want to do it for the whole cycle.

And I say, "Wait a minute. How long is it heavy?" It is only heavy when you do the final force, like putting on the coil back there. It is only heavy on the hand when you are actually driving that thing home. So that is the timing you have to use. It is a matter of getting them to be able to

see this. And I'll tell you, once they have seen it, they do it better than I do. They are so much better because they understand that job.

MR. DAY: That has been my experience, too, Bob.

DR. RODGERS: Thank you.

Yes.

Q: I am Colleen Burnett, and I'm an occupational therapist. I am at a hospital and dabble enough in the industries to be very dangerous. So I am wondering what are some more reference points? In particular, the work set analysis from yourself to have more of the equations I am interested in.

Q : The references are included in the handouts, and that will be in the overall syllabus that everybody is putting together.

Q: Okay.

DR. RODGERS: And the RULA method, for instance, that Mark referred to that has been published again, too, is a nice method, used originally in Sweden, I think.

DR. BOHR: If I can comment on that also. What we have found in health care is that the workers have, by comparison with other groups I have worked with, the workers have a better understanding of what health risks are. So they are able to identify without using -- and I am not downplaying the formulas, because I find them very useful. But they are identifying the problems more innately and being able to target exactly what the basis of that problem is without having to do the calculations.

The calculations to me are my security of being able to document that, but they have been able in health care to zero in on those issues and identify them very quickly. And their outcomes, again, were not different than what I would have arrived at spending all of the time doing the calculations.

MR. JACOB: We use a standard checklist, I guess, in our techniques for job evaluations. We use some canned ones that we have used. We have done some redesign of those, but it is a numerical sort of checklist of the number of repetitions that people are doing. And when we go and modify the job, we will go back and look at those again. Hopefully it is going down and that would be the direction we want to go.

Q: I am John Legenberger with Wal-Mart Stores. Has anyone on the panel done anything with handholds on boxes.

DR. RODGERS: The reference that I would give you first is look at Colin Drury and Joe Deeb's

work, which was done under a NIOSH grant and was published about 1984, '85, somewhere in that range. And I think one is in Applied Ergonomics and then there is some in the Ergonomics Journal, too.

I make one comment about this, because having done a lot of work in warehouses and distribution centers, the thing that struck me is the great idea of telling people where to put their hands just goes to hell in a hand basket as soon as you get out in the real world. So the real question, I think, is do they have to have handholds because they are lifting them or are there other ways you can help them direct the package as you see in Fed Ex and UPS and some of the other places, where you can direct the package without actually having to pick it up.

Because of the heights of shelves, because of the locations you are trying to put these things sometimes, what you will find is that what is the best handhold for the low stuff just doesn't work for the high stuff. I can just say from my own experience, it is a long time of trying to solve that problem, too.

The only place I really saw a handhold make a huge difference was in a large product which happened to be lithoplates at Kodak Colorado where you couldn't handle it unless you had a handhold. The handhold was actually part of the packaging design so we worked with the package engineers to put it in so that we could handle that product. I think trying to find the optimal handhold is a good idea, but I don't think it is going to work in the real world as far as putting them in direct packaging.

Did you have some experience that you are working on?

Q : We have been doing quite a bit of work in the last year or so with our packaging design community. We have actually put all our package design engineers through a four-hour ergonomics awareness. Handles are one of the things we talked about, but we actually put more pressure on them for the product size and weight, to try to get that down.

DR. RODGERS: And actually try to build that into the computer program that was used to decide about the type of packaging that was needed for the heavy products, particularly.

Yes.

Q: My name is Tom Doyle. I am with the State of Ohio, Division of Safety and Hygiene. And I was wondering, I know you guys at Kodak have been at this for a long time, I was wondering if you were going to publish some of these checklists as guides for other people. It looks like you have put together a workbook.

MR. JOHNSON: Well, we have the two-volume text out there, but that doesn't have a lot of these checklists in them as they are set up. A lot of data came from there, but not all of it. We are in the process, and Sue and I have to talk about this, Volume I is in the process of being

rewritten. We are trying to start that up, and that may be a good addition to put in there. I hadn't thought about that. We'll have to make a note of that, Sue.

DR. RODGERS: NIOSH has published some good checklists in this area, too, and the OSHA standard had some checklists in it. I think the main thing you want to do is make sure you are asking those questions about all the risk factors. But don't forget, those are usually one factor at a time. It is the interaction of the factors that I think is terribly important in a lot of our jobs. It is not just the weight, but the weight and the time and the frequency together.

I think there is enough out there to try to do that. Certainly the latest OSHA one did try to bring that in as well. But there's a lot of good stuff out there. A lot of it is getting on the internet now and you may not see it in publication.

Q: I just know that you guys have been at it much longer than OSHA has, so that is why I bring it up.

DR. RODGERS: Yes. And I have to say that the older we get, the simpler we do get about it. We try to ask people if there a problem. If there is a problem, what do we need to do? That comes back to the main question, why is there a problem and what is it that creates the problem? If you know why the problem is there, fixing it is not difficult. As a matter of fact, you get lots of ways to fix it.

Q: I am Russ Hayward. I am with Mobil Oil Corporation. I don't know who to direct this to, maybe all of you. It is along the same lines as this gentleman. I have problems evaluating maintenance activities because they are not production line, they are not continuous, they are different from one minute to the next. Are there any, along the same lines, checklists or research or anything of that nature that I might look at to help me evaluate maintenance activities? Because we are seeing a lot of problems in these areas, and I don't see a lot of people discussing maintenance-type issues. It is more production line and production, same job for eight hours a day.

DR. RODGERS: I hate to say this, but you should have been over in the construction session.

Q: I was going back and forth actually.

DR. RODGERS: Because I think this is exactly the kind of problem. Mark, do you want to mention the way you have approached that?

MR. JOHNSON: Well, we are doing a couple of things with our maintenance group. They are very active in ergonomics right now and they started off with their shop steward. But one of the things they went after were hand tools. We have what we call ergonomics equipment catalog; and before anybody asks, it is not meant for outside the company distribution. When we find a unique tool that we think has some value to it, and it can be a piece of furniture, a tool, whatever,

software, we put it in this catalog and it is distributed to our company worldwide.

But in this group with the maintenance folks, they have started out with the tool process and they are actually going through an evaluation of safety and ergonomics of every handtool that is provided by the company.

The other way is going back to, as Paula put it, get the operators involved. Let them do the assessments. I can give you checklists, and one of those checklists that I have is for a maintenance-type operation. You are going to find the stuff in there is very generic; what you really need to do, and this is where I have had some success in going at new equipment, is get the maintenance people to sit down with you and come up with a list of the types of tasks they are going to have to do, change filters, lubricate the pump, whatever, and then go through those jobs. Do a very cursory task analysis and then see how they are doing it.

Once they have the idea of what the things are that they want to look at from a force or repetition posture standpoint, then they will start being a little more creative. You know, little jackets on casters to slide underneath and then lift it up to the pump that is in the bottom of the tank. They can get down there on a little scoot stool, unbolt it, and then they jack it down and slide it out and they bring it over and jack it up to the bench. Something as simple as that to them is rocket science.

I did that with one of the chemical maintenance groups. They had this 75-pound pump sitting in the bottom of the tank, and they are trying to hold it with one hand and loosen the bolts with the other.

DR. RODGERS: A lot of good ones, I thought.

We will do one more question. If you want to get your buffet before it disappears, we have to finish up.

Why don't you go ahead and ask your question.

Q : Thank you. I have a question in general about the financing of the implementation of the solutions that you come up with. Do you find that they are usually cost-justified as part of the analysis or are budgets typically set aside? I am very curious about that.

DR. RODGERS: Tom, why don't you start with that.

MR. JACOB: It is done both ways, I guess. We have some money that is set aside, but most of them are probably done honestly from a productivity standpoint and is typically done out of headquarters for major initiatives. The other things are funded out of the location where they see a need to improve something, that will be funded out of their local budget. Does that answer your question?

Q : Well, yes. I guess everybody is aware that there are ergonomic issues in the workplace in corporate American, but are people really budgeting money to address those issues or are you pooling the money?

DR. RODGERS: Can I just answer that quickly, because I have a lot of different types of clients. The ones who are really wedded to this from a management standpoint often do set aside a very large budget for these things. I actually suggest a smaller budget, because I want people to be creative in their solutions. not do something that is going to be effective, but not jump to the automation. Go back to that process of why is there a problem, what do we need to change.

I usually give them \$200 to start with, and what that forces you to do is to really understand the problem before you start solving it. That is the biggest problem I find is we jump to the equipment. There is a lot of good equipment out there and that ought to go in in the first place, but if you are going to have to retrofit, it is hard to get that funding.

Don has just one more on the example he gave. This was a good one.

MR. DAY: I gave you this example earlier, and the actual cost of fixing, at least in the Samsonite group, is based in that \$2.5 million. One of the things about that, we have an actual analysis form that they use for analyzing whether it is going to be feasible or whether it is helping them to cost justify those things. They would actually do that on each one. All my clients do the same type of thing as well within the analysis process. So this is part of this. Now, the one thing you can't see is the exact amount associated with that.

Loyce, off the top of your head, \$1.2 million for the fixes, something like that?

This is for all of the things that they had to do. But with that in mind, getting back to the cost justification, we have gone back and actually taken a look at the average for the '92, '93, '94 time frame, this is really since they have been into the whole ergonomics issue, and taken that as the base. If you take a look at the cost savings just for '96 and the cost that they were actually looking at, that is \$740,000 per year.

Then take just a real conservative "what if" look at the hidden costs, the quality problems, production problems, all those type of things, take it three-fold, that is a potential savings of \$1.-something-million a year. Then once management sees that, they start thinking a little bit more about it; and they will start thinking about how to budget for that.

Really what they have been able to do is, if you take that and say over a five-year time period, the time the program is in place, they could have, if you used that '92 through '96 time frame, they could have had a savings of over \$3 million with this. But you have to be able to start tracking this and pulling that stuff out. That is what these guys have been able to do.

DR. RODGERS: After a while it adds up to real money.

Q : Do we have enough statistics on the retrospective savings to use examples with that as opposed to potential savings? Case studies?

DR. RODGERS: Yes, and your point is well taken, because things are being measured in terms of cost savings right now.

Let me just say that the true cost is never really known because that isn't collected. As you know, the budgets are in different pockets, so you can tell them we just saved workers' comp \$500,000, but that is not on my budget line. That is an overhead issue that I don't see because it is distributed out to the different departments.

The biggest problem is getting a company without the \$500,000 to put into it to understand that there are a lot of good solutions that can be done within the normal course of operations and as a result they save you money in the rest of your operations. I haven't seen one yet that cost too much unless it really wasn't carefully problem-solved, in other words, unless it was a large expenditure, and that may be fine. That may be part of a growth part of the industry, too.

Thanks very much for your attention. I hope to see you around the next set of sessions.

MR. JOHNSON: I have a copy of the RULA article if somebody wants to see that for a reference.

(Whereupon, the session ended.)





## Resources And Where To Go For Help

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Welcome by Sheree Gibson, American Industrial Hygiene Association

MS. GIBSON: I want to welcome you to the session on Resources, otherwise known as where to get help. What we are going to do today is have several 15- to 20-minute presentations, and then we would like to have a question and answer period after the last presentation.

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George Gruetzmacher, Wisconsin Consultation Program

MS.GIBSON: Let me introduce my first panelist. George Gruetzmacher has a B.S. in aeronautics and astronautics from M.I.T. -- now I know why he is so smart -- and an M.S. in industrial engineering and human factors from the University of Wisconsin at Madison. He is a CIH, which is a certified industrial hygienist, and a P.E., professional engineer. He has more than ten years experience with OSHA Consultation Program in Wisconsin doing industrial hygiene and ergonomic evaluation.

George Gruetzmacher.

MR. GRUETZMACHER: Good morning. The purpose of what we want to do today is to give you an idea of the kinds of resources that are available to you if you are trying to find help for ergonomic issues. We have ordered what is going on today, to start from my end, which is basically free, you don't have to pay for it, but that also means that there are certain limitations, all the way through hiring a regular consultant. So we are going to give you a flavor of the different options that you have available and what each one can do for you or what they can't do for you.

I work in the OSHA Consultation Program. When the Occupational Safety and Health Act happened in the early '70s, there were three branches created. Everybody is always very familiar with OSHA enforcement activity, which is one branch. The second branch is NIOSH for research. A third branch was consultation. Consultation was created at that time, and we have been around since that time.

We are available in all 50 states. The main purpose of consultation is to focus on providing assistance to small business. We can discuss and argue over what small business is. The primary point is, the smaller the business, the less resources it might have. So using its resources efficiently is an important thing, and we are there to find help to do that.

We are a combination of federal and state funded, primarily federal. We consist of state employees. We are completely separate from federal enforcement. The reason for that is so we don't accidentally trip an inspection. If you call us, we do not give OSHA compliance any information on the companies that we work with as a routine part of our activity. Also, there are no fines or penalties associated with coming to us initially.

Again, we are trying to focus on small businesses. For us at the moment, that means companies of under 500 employees. So you can figure out how much business actually qualifies as small business, which is the vast majority.

Again, there are no fines, no penalties. The one trick that we get in, if you will, the condition for participation with the consultation program is the fact that you need to be sincere about trying to address hazard. So if you are interested in actually looking at a hazard and taking care of it, you can come to us, no fines, no penalties. However, if we find something, especially something that would require a monetary penalty, we have to verify that you have corrected it. We help provide technical assistance, we provide a whole variety of things, but basically if you refuse to correct something, then our only recourse would be to turn the company over to the enforcement folks.

I have been doing this for ten years. We do somewhere in the ballpark of 300 to 600 studies a year. That gives you a ballpark figure of about how many studies we have done. I don't really know how many companies, we have numbers in the 4,000 category. I can only remember 2 or 3 companies in the course of the ten years I have been there that have basically participated and refused to do anything.

So it is not something that happens very often. To tell you the truth, I am backlogged normally 3 to 6 months. So if you are not interested in fixing it, I can go to the people who are and say have a nice day. That is basically how we work from that perspective.

Wisconsin is a little bit different. We are the only state left where the consultation program is broken into two pieces. We exist in two separate departments of the state government. We have a Department of Commerce where the safety inspectors are and we have the Department of Health and Family Services where the industrial hygienists or health inspectors are.

The one advantage that leaves us is the fact that from an industrial hygiene and an ergonomic side, we can call on the resources of the Health Department in order to do a number of other things. For example, within our program, immediately adjacent to the OSHA consultation individuals, we have people who are NIOSH-funded to do research. In fact, we do carpal tunnel research with the people, again, immediately adjacent to the consultation program.

We do a variety of things. But what irritates me is when I go to meetings like this and we start to focus in on one hazard, and the point is that we want to make sure that we address all kinds of hazards. And again, from our perspective, we do this from an industrial hygiene side. So we look at air contaminants, we look at noise, we look at nonionizing radiation. I mean, whether

there is an OSHA standard or not is not the issue. The question is, is there a potential health hazard for employees, and that is what we look at, that is the reason that we get involved in ergonomics.

The purpose here is to try to provide professional resources. I can only tell you how our program is set up in Wisconsin. There are a variety of other things; but we have industrial hygienists, including CIHs; we have degreed engineers, including PEs; we have masters-prepared ergonomists, we have immediately adjacent certified occupational health nurses, we have board certified occupational physicians, and we have a variety of people available to be able to deal with whatever issues come up.

Our purpose is in a number of directions. The main purpose is to identify and abate hazards, and that is what we do for ergonomics. You might ask how many ergonomic studies we do. The answer I would give you is every one because when you go into a facility and look at the hazards that they have, you at least consider ergonomic hazards along the way.

Now, you might determine a high likelihood that someone is going to get killed from a confined space problem and that repetitive motion disorders are sort of a second- or third-tier issue with this company, so you put your effort in that. However, wherever you go, you need to take a look at that.

Throughout the consultation program in general, consultants, safety consultant or industrial hygiene, are supposed to have had at least some basic ergonomic training. The OSHA Training Institute has a course which the staff throughout in general take, so they are familiar with these types of issues. Again, in some states you may not have a masters-prepared ergonomist, but you will at least have someone who can get an introduction and can start to evaluate the workplace for ergonomic hazards.

Along with that, we provide expertise in trying to deal with control measures, that is probably the main thing that consultation is for; I mean, abatement assistance, you can use whatever terminology you like to do. We try to stay away from terms that are similar to what compliance calls things, so we try not to call it inspections and we really try not to call it abatement. But it is all the same thing. You look at a hazard and determine how you can control it.

The first thing is to identify if the hazard is there, but the real work comes in trying to look at potential alternatives and solutions. We don't have nice stock answers that we can apply from engineering textbooks with high reliability. People complain about ventilation as being somewhat nebulous; however, I can sit down and do an awful lot of ventilation calculations to figure air flow and reducing an air contaminant as compared to being able to do calculations on exactly how I am going to reduce potential ergonomic hazards. However, again, providing that kind of assistance is something that we are available for.

Another thing that we do, and again a very important part that consultation can do somewhat

differently, or at least in conjunction with a lot of the other resources, is help focus effort. We complain about vendors all the time. You will have someone come in the door and want to sell you the newest widget in order to take care of your problem. Often the sales person will guarantee you that it will take care of your problem and forget anything else.

Well, at least we are a resource that can have a balanced perspective on certain things so that you can get a better outside judgment call regarding where you really need to focus effort and where you may not need to focus effort. That is one of the things that we can do for you.

Our main purpose is to try to make employers self-sufficient. We are not there to be the health and safety program of a company. We are not there to be ergonomists or the industrial hygienist. We are there to help you learn what you need to do and to help develop your own capability to deal with health and safety issues in your specific company.

We go out and identify a variety of hazards. We do repetitive motion disorders. We do noise hazards. These are the types of things that we look at on a regular basis. We provide ergonomic program assistance. From my perspective, at least as far as repetitive motion disorders are concerned, you will always hear me talk about it in a context of an overall health and safety program. Personally, I think it is almost impossible to implement an ergonomics program if you don't have a health and safety program in the company to start with. I just can't fathom it.

What kinds of activities might we do? We do a variety of things. Visual inspections are probably the most common thing. Walking into a facility to see what may or may not be there. We do training of employers, we do "train the trainer" types of training, and we do training of employees so they are aware of potential hazards, again, in the context of trying to get an employer started.

We work with companies that have less than ten employees on a fairly regular basis. Going into a company with three employees and an owner, they usually don't know what they need to do at all. So certainly providing some basic training on what the health hazards are; yes, the tingling in your arm in the middle of the night might actually be something associated with all those types of issues.

We can do videotaping to try to analyze what is going on. We can do task analysis. I have just gone through the procurement process to get some motion analysis equipment so we will be able to do more detailed motion analysis. We recommend control measures.

One of the pieces I didn't put up here because it is integrated completely with what we do is employee interview. We interview employees, we interview the employer. We talk with people to try to find out what is going on at a specific worksite. That is so embedded in our process that we don't even think of it as a separate type of activity.

Who have we helped over the last number of years? Again, I was brought on ten years ago as a

masters-prepared ergonomist and going from that perspective. We have worked with a large variety of companies. We have done apparel manufacturing and a variety of sewing operations. In fact there is sewing, assembly, operations, as well as some welding operations, which is when we talk about nonionizing radiation. Again, you have hazards that go together.

We clearly have office ergonomic issues. Office problems are somewhat repetitive, but it is not uncommon for us to sit and talk to an office of four or five people in order to deal with the problems. That is the office where life is very, very different, because everything is flexible. There is no standardization and getting people to be aware of what is going on is sometimes a challenge.

There is a variety of electronics operations in Wisconsin, especially electronics assembly. They do wire harness assembly. We have worked with those companies. We have done a number of things in health care, and in fact sort of being loaned off to our own department. Our department operates hospitals as well as facilities for people with mental disabilities. So we have done some work within our own department in those facilities, especially dealing with patient handling issues. We have worked with metal fabrication companies that do a variety of kinds of manufacturing operations.

How do you get in touch with us if you want to? The web is the place to find us. Since this was a meeting where the only place you could actually register was to get on the web and download it, or find someone to download it for you, then I figure that most people can at least use the web site.

There is information on the general program available on the OSHA home page. But there is a consultation project directory which gives the phone numbers and addresses, points of contact within each state of the program within your state. If you don't have that, you certainly can call the regional office that covers your specific location, and they will be able to provide you information with the specific points of contact.

I think that what we are going to do is have questions and answers at the end. So that is basically my introduction to the consultation program.

MS. GIBSON: Thank you, George.

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Leslie Nichols, Great Lakes Center for Occupational and Environmental Safety and Health

MS. GIBSON: Our next speaker is Leslie Nichols, who is the Program Director for Continuing Education for the Great Lakes Center for Occupational and Environmental Safety and Health at the University of Illinois at Chicago School of Public Health.

Ms. Nichols has almost 20 years of experience in occupational safety and health. Her background includes enforcement at the Illinois Department of Labor, program implementation with the City of Chicago Health Department, and 10 years in training with the University of Illinois.

Leslie Nichols.

MS. NICHOLS: Thank you, and welcome to Chicago. When they asked me to speak today, they said that they were going to be at the Sheraton Hotel on the river. I said, "It's perfect. It's a great location, it's beautiful, it's on the lake front, it's on the river." I said, "But why is it in January? Why isn't it in June?"

I am here to talk about ergonomic resources available through the ERC. How many of you are familiar with ERC?

One. I will go into some detail about what those are.

As the introduction indicated, I am with the Great Lakes Center for Occupational and Environmental Safety and Health. We are the regional ERC for Illinois, Southern Wisconsin, Missouri, and Northern Indiana.

I am going to talk about what an ERC is, and about what you should take away from this talk. At the very end, I will go through a demonstration of how to access ERCs on the internet. I think that will be the most valuable resource you can take away. Since some of you are from Chicago but others are from other parts of the country, in either case, you are represented by an ERC and I will help you find where those are.

I am with the University of Illinois at Chicago. We are also known as the Illinois Educational Research Center. We are also known as the Illinois ERC, and we are also known as the Great Lakes Center for Occupational and Environmental Safety and Health. ERCs are recognized under a variety of names. Your area might be called the University of California at Berkeley ERC or it might be called the Northern California ERC. Just so you are aware that the name of your ERC could be something different depending on the catalog or the internet or the program that you are looking at.

ERCs were created out of the OSHA Act in 1970 with the creation of OSHA and NIOSH. The Act gave direction to NIOSH to develop a pool of professionals that have both technical skills as well as research skills. ERCs were developed, and their mission is to provide training, for professionals and technicals, as well as research areas.

ERCs and NIOSH are highly successful in fulfilling this mandate. They train professionals in the field of industrial hygiene and safety, as well as medicine and nursing specialties relevant to occupational settings. ERCs have successfully developed academic programs and provided

graduate students setting in which to conduct research and gain technical experiences.

Components of an ERC are training for technical and research, conducting research and providing services. The final component, and I think that this was mentioned as well by George, is the interdisciplinary nature of the program. It is a program that includes medicine, nursing, industrial hygiene and safety in addressing the problems in ergonomics. ERCs provide an interdisciplinary approach to addressing problems.

There are 14 ERCs in the country. They are housed at 27 to 30 universities. They represent all of the 10 Departments of The Health and Human Services Regions. That means there is an ERC that represents your region.

Where are they located? ERCs are mostly on either coast. So how do they deal with the middle? The 14 ERCs are represented by the stars on the map. You can see Illinois, here on Lake Michigan. In the handouts that I have given you, you have a packet of these overheads, and it shows the universities. The Great Lakes Center provides service to Missouri, Illinois, Wisconsin and Indiana.

Specific ergonomic activities. Again, the definition of an ERC is to provide academic training. Some of the ERCs have developed specialty course work in ergonomics. They have MS programs and Ph.D. programs. Three universities that have academic programs in ergonomics include the University of Cincinnati, University of Michigan, and Northern California ERC.

The occupational safety and ergonomics program at Cincinnati is an interdisciplinary program offered in the Department of Environmental Health and Mechanical, Industrial and Nuclear Engineering. It is an interdisciplinary approach to dealing with the problem. The curriculum is designed to provide a dual emphasis on health and engineering aspects of ergonomics and safety, and the program prepares students to meet the current and future ergonomic concerns of the workplace. The University of Cincinnati also offers a certificate program in ergonomics.

If you are looking for people to come to your company or to assist you, there are people now that have masters and Ph.D.s that are trained in ergonomics specifically.

Michigan's program is probably the oldest program. It has an MS and a Ph.D. program offered in industrial operations and engineering program. This program provides academic degree training.

In addition to the academic research and service components of the ERC, all ERCs also must provide continuing education. Continuing education is usually in the form of short courses, one- to five- to ten-day courses that are offered intensively.

Please refer to the green course catalogs. Those catalogs list all 14 ERCs and a complete course listing of all the courses that that particular ERC offers as a short course. The catalog provides information on how to contact a particular ERC to get more information. In the back of the

catalog you will find a directory. The index includes ergonomics, cumulative trauma, back injury, as well as several other topics to direct you to the ERC that provides training.

Almost all of the ERCs provide at least one short course in ergonomics. One example is a five day industrial ergonomics and human factors in occupational health and safety course provided by Harvard. Minnesota provides a five day cumulative trauma disorders course. There is an advanced industrial ergonomics course provided by us at the University of Illinois. This is a two-day course. The UIC also has a two-day course in nursing and ergonomics in health care. The University has offered a special one-day six-hour course on ergonomics in patient lifting. Finally, the University of Cincinnati offers a two day practical ergonomics risk assessment course. As you can see there are a wide range of topics in continuing education offered over one-day to five-day courses.

I refer you to the catalog in which you can use to identify programs. I think if you look in the catalog, you will be able to find the courses and some descriptions for the courses you might be most interested in.

We have touched on the training and the research and the service components of ERC. How do you find what you need to know about an ERC? You can go to the worldwide web and the NIOSH home page. You may have bookmarked this on your computer.

How many people here have computers and internet access? Everyone. This is a wonderful way to find out what the ERCs have to offer and what is new in ergonomics. You can go to the NIOSH home page, I have provided you with the address. I recommend that you reference this when you are looking for the ERCs, because the page is not necessarily easy to find. ERCs are listed under extramural programs. Once at extramural programs, click on training. You can reach the ERCs, the educational resource centers. There you can get information on academic programs as well as the continuing education programs.

Finally, I have given you the Great Lakes Center for Occupational and Environmental Safety and Health home page address. You can call up our home page and see the courses and the opportunities we have as well as providing a link to NIOSH.

I think that is it, unless there are any questions which will be saved to the end. Thank you.

MS. GIBSON: Thank you, Leslie.

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Angie Waldorf, North Carolina Department of Labor

MS. GIBSON: Our next speakers are actually a team of speakers. The first one is Angie Waldorf, who is with the North Carolina Department of Labor. She is the Assistant Deputy Commissioner for Occupational Safety and Health, and she is Chair of the Ergonomics Resource



Center Advisory Board. She is an attorney. I told her it was risky saying that at a safety and health conference, but she said it was okay. She went to North Carolina State and the University of North Carolina at Chapel Hill. She worked 12 years with the American Petroleum Institute as an environmental attorney.

Angie.

MS. WALDORF: Thank you. I am Angie Waldorf. In addition to being an attorney, which I am sure there is no love lost, I am also in enforcement, among other things. I am probably one of the few speakers here that would get up and say that, but I am very comfortable with it because I think in North Carolina we have done what the rest of the country is struggling with. We sat down with all the parties, labor, industry, years ago and said, "This is a real problem and we need to address it."

They say a picture is worth a thousand words, and I was trying to think of a way to capture the concept of ergonomics and ergonomic problems in a way that is very graphic and will grab people. I was thinking that a jelly fish reminded me of what it is like to work in this field. It is very hard to get your hands on, it is very slippery, and if you are not careful it will sting you. In my position, I have the opportunity to look at a number of ergonomic problems and a number of industries. I have sat across the table with people that were adamantly convinced that buying back belts was an effective ergonomic program and protected their employees. They were very, very sincere in this belief so they got chairs for their employees and thought that this was an effective ergonomic program. I guess one of the take-home points that I want to make, and I was told that there would be a variety of people here from novices to very sophisticated, is that if you are in the beginning stages of this problem, make sure that you don't have the one-product-wonder-approach to ergonomics. When you realize that you have a problem, it is baffling.

From a regulatory point of view, it's like standing in the middle of a football field with all the lights on and looking for the exit. It is very hard to know how to start and how to proceed. So taking a deep breath and taking a reasoned and prioritized approach is very critical. That is exactly what we did in North Carolina four years ago. We felt we had a tiger by the tail. We had people that were becoming permanently disabled. We had poultry workers, textile workers at our doorstep saying, "What are you going to do?" We had cases stacking up and complaints stacking up, and we had a serious problem.

We really didn't know how serious the problem was. We were seeing the tip of the iceberg. But we sat down and said, "You know, this is an opportunity." Maybe an unprecedented opportunity because so little had been done that it was an open field. We did not have a lot of precedent sitting there that we had to deal with, so we took a fresh sheet of paper and said we were going to have a comprehensive approach and provide our citizens the type of protection and assistance they needed to solve this problem.

Typically, we came up with the carrot-and-stick approach. We decided that enforcement had to be a part of the solution. There are companies out there that just don't understand, but our enforcement was going to be different from what we had done in the past. We were not going to stop at the videotape and the OSHA 200 log. When we go in, we do massive symptom surveys, we talk to employees. In one company, out of 1,800 line workers, we interviewed 900.

We find out what is going on, and it is very helpful for us in analyzing the deficiencies in a program. We feel that our program evaluations are perhaps going to have a greater chance withstanding legal challenge than maybe some others. However, that was not our preferred approach, so we came up with alternatives that we say are our first opportunities, or give you the first bite of the apple, through the Ergonomic Resource Center, which I will talk about later, and our cooperative assessment program. Part of our enforcement action is to use specially trained members who have received graduate level training specifically in the area of ergonomics.

If you are new in this area and want to know if you have a problem, look at yourself in the mirror. Do you have a lot of recordables saying pain, wrist hurts, back hurts. Is there a lot of absenteeism in certain portions of your facility. What do your workers' compensation claims tell you? Will people leave your facility making \$8 an hour to go work for somebody in a law office making \$6 an hour? Is your productivity suffering in certain areas, and are people in pain?

Why implement an ergonomics program? When we were taking that comprehensive approach to ergonomics four years ago we said we were going to solve this problem because it was serious, one of the things that we did was to look at ourselves and we did our own research. We went to our workers' compensation data banks. We looked at the numbers, and what we found from our perspective was startling and scary.

For back related CTDs, the average workers' comp payout in North Carolina in 1994 was \$16,881. The average lost work days were 138, and 92 percent of the cases were closed as disabling, meaning there was some permanent disability associated with the claim.

For carpal tunnel syndrome, the average payout was \$13,920; 112 average number of lost work days; and 85 percent of the cases were classified as disabling. What our research has indicated is that fewer and fewer cases are being closed every year while more and more cases are being recorded. So you have these workers' compensation cases that are going on for years and the price tag keeps going up.

If money is not an incentive for you to implement an ergonomic program that is effective, may I encourage you to think about the indirect costs that you are suffering: lost productivity, recruitment, training, management time, and those all important legal fees. We project that 60 percent of the total cost of an ergonomic program to your company, and it doesn't matter if you are a government entity because we have cited government entities before in North Carolina, or a private employer, are indirect costs. So what you write on your check is only a portion of what it costs.

What are the ingredients of a successful program? You are going to see this over and over and over again. I am convinced after my years of on-the-job training in this field that you have to have everyone on them. We have gone into companies that have emphasized one ingredient over the other and they were not totally successful. I cannot think of one you can leave out, and management commitment is right at the top. If you don't have it, it is not going to be successful.

How do we know it works? Been there, done that. Perdue Farms, Jim McCauley is a speaker here, was cited by us in 1989. Within the first two years of their implementing a settlement agreement that included the elements that I covered previously, they reduced their workers' compensation payouts by 70 percent. They are a self-funded company. That was money they were able to retain to give additional benefits to their employees, which they did. It is a company that, although we cited and went through some very hard times, is very, very supportive of North Carolina in the development of its comprehensive approach to ergonomics. I encourage you if you see Jim to talk with him.

Kentucky Derby Hosiery is another company we cited. Gary Moore was supposed to be my partner today. Walter had to come on the last minute and he has been a good sport about it. Kentucky Derby Hosiery reduced their lost work days from 1,500 to zero while tripling their work force.

Companies that we have cited, instead of being adversarial -- the first reaction is, jump in the lake. But when we get past that, we have established good working relationships with them and demonstrated that this is in everybody's best interest.

The North Carolina Ergonomics Resource Center has been like a child to me. It is a center I was very much involved in creating. It was a finalist in the Innovations in American Government Award Program by Harvard and Ford Foundation in 1996. It has been a program that has been talked about because it is comprehensive. We wanted to create a one-stop shopping center where our employers could get whatever they needed to solve their ergonomics problem.

We developed it with the consultation and advice of industry and labor. These are the elements that these people said it needed to have. We serve as an umbrella organization and utilize the services of private consultants. There is a vendor room. Believe it or not, we have a room where there is all kinds of stuff. You can come in, pick it up, play with it, and check it out without somebody pushing you to purchase it.

We have a laboratory, one of the most sophisticated laboratories in the South, with very sophisticated equipment that measure force and range of motion. We do a lot of publications. We have encouraged other states, other jurisdictions, to replicate us. I brought Walter here today to tell you what a resource like this means to a company. And it has been very economical for the taxpayers of North Carolina because it is primarily funded through fees. We have demonstrated to the employers that come and use it that it is worth their time and their money to make these investments.

If you have a facility in North Carolina, I encourage you to call and take advantage of the Ergonomic Resource Center. I can promise you that if it is out there and the help is available, we will find a way to get that help to you.

Another program that we have developed is our Ergonomics Cooperative Assessment Program. I was delighted to hear Brad this morning talk about how we were going to build partnerships. That is exactly what we are doing in North Carolina. This is used during our enforcement activity. When we come into a facility that shows a lot of potential for good faith and genuinely wants to work on their ergonomic problem, we will sit down in the course of the inspection and say: this is your one-time opportunity to have a settlement with us without the benefit of a fine or a citation. So it is a pre-citation agreement that has all the elements and requires you to do the management commitment and the training.

It is pre-citation. You never get a citation on your record. You enter exactly the same agreement that you enter into if you had gone through the enforcement process. We just do it without that and the two years of wrangling and tangling. We feel it is a win-win situation. Believe it or not, the press also thinks it is a win-win. I have included on your chairs what I think is a remarkable front page article from our hometown newspaper about our program and an editorial that appeared on Monday about North Carolina's approach to ergonomics. I am a bureaucrat and am not used to getting good news.

What are the best reasons to implement an effective ergonomics program? I am a lawyer, I honestly believe it is the law. I believe it is your legal obligation to have an effective program. We have taken about 60 ergonomic enforcement actions and cited in about 20 of those cases. The remaining 40, the majority of them, we worked out something, either with a letter or a cooperative assessment program.

It is the right thing to do. I basically believe that most American industries are moral, they do not want to cripple their work force. There is no question that this is the right thing to do, if that is not reason enough, it is cost effective and will save you money.

Effective ergonomics programs work. I am in a position to see the evidence of that on a daily basis. I receive handwritten letters from employees talking about it, the benefits of it, or the problems in not having one.

At this time, I brought my own personal witness here so that you all know that what I said is true. Walter is going to come up and talk about how the North Carolina partnerships have worked with an actual company that has actual employees.

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Walter Burlington, Rocco Enterprises

MS. GIBSON: Walter Burlington is a graduate of Villanova University, has 22 years in

the human resources management field in textiles and poultry, 2 very ergonomically-challenged fields. That was as tactful as I could get. He is currently Human Resource Manager for Rocco Quality Foods, a poultry processor in St. Pauls, North Carolina

MR. BURLINGTON: Thank you.

I appreciate Angie and the North Carolina Department of Labor for giving me the opportunity to come and tell you our story.

Before we get into that, I want to tell you a little bit about Rocco Enterprises. Rocco is located in Harrisonburg, Virginia, in the beautiful Shenandoah Valley. It is a food processing company whose primary products are chickens and turkeys, poultry. There are four processing plants and a distribution center, and we have about 3,800 people.

The St. Pauls, North Carolina operation where I am located began processing turkeys in January of 1990; however, before we even began processing turkeys, we were learning about what this word "ergonomics" means. In the late 1989 and early 1990s, North Carolina was sort of a hot bed of ergonomics, basically because of the citations that Perdue had received and about two years of negotiations there.

So we decided as a company, not only in North Carolina but in our other locations, that we were going to take a proactive approach to ergonomics rather than sit back and wait for our friends at the Department of Labor to come in and cite us.

We began meeting with a gentleman by the name of Mohammed Ayub, Dr. Ayub, who is a noted ergonomist and professor of industrial engineering at North Carolina State University. We met with him so that we could conduct job analysis and develop an ergonomic program at our plant from the very day we began.

The program that we developed was called Feeling Good. There was a slide presentation that we presented not only to supervisors but to every employee in the work force. We started an ergonomic action team. We started a work hardening program. We started a restricted duty program. We implemented an exercise program and a plant-wide job rotation program over a period of a year, year and a half. It wasn't all at once, it was implemented gradually.

We were fortunate, as I said, that we were able to implement this full scale ergonomic program from the ground up in a brand new plant with a work force that didn't really know a lot about poultry. This, we feel, was a tremendous advantage. We didn't have to go through changing things that had been ongoing for 20 or 30 years. We started from the ground up.

So I think you can tell that Rocco was committed to ergonomics, implementing it at St. Pauls as well as at the other facilities, the other plants. Dr. Ayub was a very big influence in the development of our program and its continued success. I mention Dr. Ayub because he was the

founding director of the North Carolina Ergonomics Resource Center.

In October of 1994, Rocco became the first charter member of the Center. We felt then, as we do today, that we would greatly benefit from being a part of this "partnership" with OSHA, with North Carolina State University, and with other businesses and industries in North Carolina.

North Carolina OSHA reached out and said how can we help improve the safety, the productivity and the well being of the workers in North Carolina rather than using the traditional punitive, adversarial role. Well, OSHA got together with the North Carolina State University and began the Ergonomics Center to support industry in their pursuit for humanizing the workplace.

Their goal was simply to emphasize applied research from the university, identify, analyze and correct ergonomic deficiencies, and to act as a bridge between that technology that we get from the universities and education and an information exchange between the university, OSHA and industry. Again, a true partnership.

Now, this really sounds good, doesn't it? But really what does it mean to us? What does it mean to industry in North Carolina? It means, number one, that we have a resource for training, where several courses are offered at the Center or at the plant. I received a brochure about two weeks ago on 1997 ergonomic training programs at the Center. Courses such as advanced ergonomics for manufacturing, ergonomic team leader training, managing employees with musculoskeletal disorders. That's just the tip of the iceberg of the kind of resources, the kind of training that these folks have put together for us.

It is also a place where we can go look at new product information. And as you mentioned, they have the laboratory where they have tools, the vendor room, which is a tremendous opportunity to go in and play. We bring people up there from our line and we say, "Try these scissors out, try these knives out," and you don't have the pressure of sales people.

Consultative assistance ranges from having one of their ergonomists come in and do a full ergonomic assessment to maybe just talking about specific risk factors and problems. It is not related to OSHA enforcement or even OSHA consultative. The folks go back to the Center. They don't go and tell OSHA enforcement, "Oh, they've got all kinds of problems." They help us get those problems resolved, so that if OSHA comes in we are ahead of the game.

So, again, what does this all mean to us? I have a slide that is going to really tell the story to you. It is not a fancy slide. I didn't have a lot of time to work on it, but it is pretty simple.

If you look at 1990 when we started our operations, there was about \$115,000 only on CTD costs. We had a lot of other problems, too, but on CTD it was \$115,000. If you take a look at the trend down in 1996, we are talking about \$15,000. We had a blip in '93. We did a lot of "tell us your pain, tell us your problems" kind of thing. We didn't run from it. We gave surveys. We did symptom surveys. We said, "Tell us what's wrong." So we had a little bit of a blip. But I

think if you look at the overall trend, what can you say, it's fantastic.

When we talk about saving money, we saved a lot of money by being proactive, by getting the help of the Ergo Center and moving on with the program rather than hiding and saying, "We don't have a problem."

So we attribute our success to our ergonomic foundations that were laid back in 1990 and '91, and our continued emphasis on the fundamentals, the exercises, the rotations. I am going to tell you standing right here, Friday when I go back to work, I'm going to review Monday, Tuesday, Wednesday and Thursday's rotations, my nurse and I. We review them weekly to make sure they meet the standards of the program. You hear a lot of overall, but I am telling you some meat and potatoes, rotations, exercises, breaks, the kinds of things that help people minimize repetitive motion injuries.

Finally, our continued partnership with the North Carolina Ergonomics Resources Center is also a big help in where we are today.

I want to thank you for allowing me to share with you our success.

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Sheree Gibson, American Industrial Hygiene Association

MR. BURLINGTON: Our final speaker today is Sheree Gibson. Sheree is an ergonomics consultant with 20 years of experience in engineering and ergonomics. She is a registered professional engineer. She is certified in professional ergonomics. She has a B.S. in mechanical engineering and an M.S.E. in applied ergonomics. She is currently the Chair of the Ergonomics Committee for the AIHA and a member of the ANSI Z365 Committee. Both of those are opportunities that I have had to at least work with Sheree, and I think that she will be able to give us a perspective of what it is like coming from a consultant's point of view.

MS. GIBSON: How to select an ergonomics consultant. When I was asked to do this as Chair of the Ergonomics Committee for AIHA, I called OSHA back and said, "I'm real flattered folks, but I am an ergonomics consultant." OSHA's response was, "Well, that's okay. Who better than you could tell us how to go about hiring somebody."

So I am going to start with "when do you actually hire an ergonomics consultant?" I am going to surprise you. The answer is not right off the bat. I am not going to tell all the people in the audience to go out and hire an ergonomics consultant.

What I think you should do is evaluate if you are ready. The first thing you need to figure out is, is there something free out there already that you are already paying for in some other way. You need to determine that you have objectives that a consultant can meet that you cannot with internal resources. You don't have an ergonomist on staff. How many people out here have an ergonomist on staff?

I didn't think so. There aren't too many of us out there, so it was kind of an easy question that I had a feeling I knew the answer to. If you need an ergonomist and you don't have somebody on staff, that is one of the criteria. If you cannot get more help from your insurance company, some of you may be self-insured and may have a problem because your insurance company is you, but if you belong to a national insurance company for workers' comp, for example, they can sometimes help you with some assistance. They may have an ergonomist or somebody who works as an ergonomics consultant.

If OSHA cannot help you, the state consultation program, if that is not available for you, maybe you are too big an employer or maybe you have used all the resources that you can and they are really saying, "Okay. Now you're on your own, go hire somebody," that is a clue that it may be time to go hire a consultant.

Now, this is important and most people overlook this. Is your company ready to do what the consultant suggests, or at least listen to them and evaluate it? The reason I ask this is a lot of folks think that they can go out and hire an ergonomist, a consultant, and they pay a lot of money



for this. Then they put that report somewhere in a file. I will tell you as a consultant, that is my nightmare. Because, why did I do this? Yes, I got paid for it, but I really prefer to work with people who are going to do something.

The other reason I don't recommend this is if you do that and the folks like Angie from compliance come knocking on your door, you have just made their case for them. One of the things they are going to ask you is, "Have you ever had any ergonomic analyses done?" You are going to have to, because you have a legal obligation to, cough up this report. You have just made at least half of their legal case for them, and they can give you a citation a lot more easily. So you don't want to do this (hiring a consultant) unless you are serious about it.

Sometimes you have a problem that is going to require considerable ergonomic expertise that you can't get from an insurance company person. It may be that you are going to require more than OSHA can give you. Not everybody is as lucky as Wisconsin in having ergonomists on staff. It is actually a rarity. I work in South Carolina. South Carolina doesn't have any ergonomists. They use me when they need help.

Now, the first thing to do is define your needs and your expectations. This is going to help you and it is definitely going to help the consultant. You need to figure out ahead of time a little bit about what you want. The first question you should ask yourself is "what is your company's vision for ergonomics?" Are you interested in doing it from a safety standpoint to reduce injuries? Are you trying to do it for quality or productivity problems or are you worried about turnover? Are you worried about being cited by OSHA? You need to figure out why you are there.

Then, "what are you trying to accomplish?" Literally, if I'm going to do a whole program or I'm going to dip my foot in the water and I'm going to see what happens, do a little bit of education maybe and get started.

The third question you need to ask yourself was alluded to by several people this morning. You need to find out if senior management is committed to doing this and to doing something to help. Because if they are not committed, I hate to say it is going to doom your project, but it is probably going to put it on the terminal list anyway. You need to have that management commitment.

You also need to figure out who is going to be involved in this. If you have a union representative, how you are going to involve them, how you are going to involve your employees, senior management and how much they are going to be doing? Have somebody from purchasing on your team. How much is engineering going to do? That's important. What sort of resources are you going to provide?

No ergonomist, no matter how good they are, can work in a vacuum. If we are coming in from outside, we need to know certain things. We need a lot of information. What's the line speed,

how many widgets do you make an hour, how often do you rotate, if you rotate, how long have these people been on the job? All sorts of information. So, number one, you have to have a liaison that the person can talk to, somebody that can answer their questions, because they are going to have a lot of them. We are incredibly nosy that way, I guess.

You are going to need to figure out what you are going to do and what the ergonomist is going to do, because if you have a lot of money you can hire somebody who will do a lot of stuff. But if you have a very limited amount of money, you may decide, well, what I want to do is, I want to train my engineering staff. I want to make myself self-sufficient very quickly.

That is going to make me recognize, okay, these people have a limited number of funds and this is how we are going to do it, this is the best use of their funds. We are going to use their engineers to do all the projects. We are going to use their human resources to implement some of the training and other things.

Now, I asked other consultants, "Tell me what makes you uncomfortable," because there are certain things that all of us have gotten involved in, sometimes inadvertently, that are almost a red flag. We need to have warning bells going off. Consultants can do certain things, and certain things need to be left inside that company.

Consultants are very good at performing audits. They can come in just like an OSHA inspector would and walk through your facility and look around. It is a great introduction to an ergonomist. Have them tell you what they see before somebody with an ergonomics degree and a compliance officer's credentials come in at the same time.

You don't have to give that sort of information a citation-level urgency. You can have some time if an ergonomist, a consultant, tells you to deal with it without feeling like you've only got 90 days to alleviate this. So it may be to your advantage to do that.

They can do training. That is one of the things that a lot of us get involved in performing training. Not just the kind of training that you do with an hourly employee, although that is one of the things, but management training. To talk to your senior management, talk dollars, talk savings and productivity and quality. Talk about things to your engineers, talk their language.

One of the clues I will tell you here is, and I have had several people tell me this, if you want an engineer to be trained in ergonomics, have an engineer do it. Because engineers talk engineering-ese. We literally have a shorthand for things and we have a lot better credibility. So when you go to pick your ergonomist, you may want to look for somebody who is an engineer if you are going to do engineering training.

Have the consultant help you develop a plan of action, or a program if you want to call it that. I call it modifying your process more often than not, but that is important. A lot of people are going to need some help in doing that. So you are going to look for somebody who has experience.

Perform analyses and recommend solutions. That's what most of us think about when we talk about hiring a consultant, whether it is in a department or throughout your plant, or whether it is a particular job that is causing you headaches.

Determine the effectiveness of the solutions and help check the plans for new operations. This is one of the best uses of a consultant. Ask them, if you are going to build a new line, to look over the plans for the line. To talk to the engineers. To make sure you are not creating the same problems all over again that somebody else did five years ago when they put in your last line.

Like I said, there are some things that send chills up any ergonomist's back, and one of those things is being asked to run an ergonomics program. Now, some people don't tell you that is what they are asking, but they really expect you to run their program. It won't work. No one outside an organization can run something as critical as an ergonomics program.

It has to be somebody within the line organization. The responsibility has to be there. So don't ask a consultant or expect a consultant to do it. They can't. Obviously, they would have to be on site and they would have to be part of the organization in such a way that they had certain responsibilities but also certain strengths that you can't when outside. Don't ask them to work without assistance. The worst thing in the world is to have a consultant show up at your front gate and there is nobody there to meet him.

Produce change without company commitment. The company has to commit to making something happen. I had a client who complained to me one time and said, "You know, we didn't get any reduction at all after you were in."

I said, "Really? Did you implement a, b, c and d?"

And they went, "Well, no, why would we do that?"

"Did you read your report?"

"Well, no."

Don't expect miracles. We are not magicians. No one can implement a change if you are not willing to do the things that are required.

Now, how do you find good consultants? Lacking fortune tellers and crystal balls, usually the yellow pages are probably not the best place to go looking for ergonomic consultants. Well, the first thing I would do is take advantage of this opportunity. You have colleagues who are in the safety profession, no doubt. Ask them if they have hired a consultant. The best recommendation you can get is from somebody else who has already hired one, who has worked with them, who knows how they work, that they were dependable. That is the best snapshot you are ever going to get without ever spending a dime. Make some phone calls.

Contact a professional society. The American Industrial Hygiene Association, the American Society of Safety Engineers, the Human Factors and Ergonomics Society all have listings of consultants. But you don't know anything about them other than they have a listing. They belong to the organization and they have a listing in the directory. It is a place to start if you want somebody local, maybe. It may help you compile a list, but it is not going to help you narrow it down much.

Attend professional meetings like this. Talk to people. Mill around with people tonight or on the breaks and talk to people. Ask them who they have worked with, who they liked. That is probably one of the best things that you can do. If you go to a meeting, especially one on ergonomics, talk to the speakers. Read newsletters, journals, things like that. There are a lot of folks out there who are in the ergonomics field who are writing articles. If you see a practical article and the person is a consultant, put them on your list.

So now you have a list. How do you pick the right one? Well, maybe you don't have a good set of darts. You have to go to something else. I would recommend doing a couple of things. The first thing is, if you are talking about local consultants, set up a visit. Have them walk through your plant. Let them find out what they are getting into. That is really critical.

Now, sometimes it is not feasible. You may be in Arkansas and the consultant that you really have your eye on is in South Carolina and you don't have the money to spend to have say five different consultants fly out. They are not really willing to spend \$800 or \$1,000 to do that. So set up a protracted phone call. Call them ahead of time and say, "Hey, look, I'd like to talk to you about this. When is a good time for you?"

Explain your goals and your resources. They need to know ahead of time. You don't have to tell them how much money you have to spend but say, "Look, I think I can handle training maybe this year, and maybe next year we will talk about an audit system or something like that."

Ask them about their academic background, their certifications and their experience. Academic background is important for a couple of things. You are probably looking for somebody who has at least a master's, and maybe a Ph.D., in ergonomics. There are people out there who don't have that kind of a background but who may be practicing ergonomists. In that case, if they don't have the academic background, I would expect a lot of experience.

Certifications are one of the shortcuts, probably, to looking at academic backgrounds. Somebody has already checked these people out and found them to be at least minimally qualified. Those of us who have gone through the certification experience would like to think more than minimally qualify.

CPEs, the Certificate in Professional Ergonomics is one of the groups that does -- a certification that literally is based on a lot of experience, test scores, academics. They have already checked them out. So you can sort of assume that they have some basic understanding of the field.

Experience. If you are looking for somebody to help you set up a program, look for somebody who has already set up some programs, whether as the consultant or when they worked in-house for somebody. You probably don't want to have somebody who is right out of school because although they may be cheaper on an hourly rate, you may find out that you are paying to educate them. Look at experience and say, "Okay. Can I afford to educate this person? How complicated is my process?"

Above all, check their references. If they don't offer you any, ask for them. Call the people, at least one or two of them. Find out how they performed in the past. You don't want somebody who has gone through a whole series of jobs and basically doesn't have anything that they can point to that was a success. You don't want somebody who is going to cost you an arm and a leg and then not give you anything that is feasible and implementable.

Pick someone you are comfortable with. You are going to be working with this person at least for, I would guess, a couple of days, if not a longer period. In some cases, we are talking about a relationship that may span years. If little warning bells are going off and you are not comfortable with the person, I would think again and look a little longer.

Consider the size of the firm, the location that they are in and the cost involved. Size is important from one standpoint, and I think probably one standpoint alone. If you have a situation where you need to get something done, say you are a major tire company, you have 20 plants throughout the country, and you need them done by October, because OSHA has been in to cite you and you only have until October to get all this stuff set up, look for a big firm. A one-person firm can't do it. Look for somebody who has multiple people that they can send.

Now, it may be that a one-person firm could network with other folks and mobilize, but it is probably easier for you to pick a big firm. On the other hand, if you deal with a small firm, you have another advantage in that you are probably going to be dealing with the same person time and time again, because they have much lower turnover. Some big firms have a real turnover problem.

Location can be important if it is an ongoing thing where you are going to have them in for a long period of time. Otherwise, travel is usually such a small part of the equation it doesn't really make a big difference.

Be cognizant of the fact that people do charge different rates. If they are on either end of the spectrum, I would be a little wary. A cheap consultant can be very expensive. I have had folks who had me in after they have had another consultant who might have charged half my hourly rate. And I will be very honest with you. When I asked them why, their answer was, "Oh, yeah, they charged \$50 an hour or \$25 an hour or something, but I couldn't use anything they gave me."

Well, the problem with that is not just that you wasted your money, and their answer was to totally automate your line, it is worse than that. Again you have something on paper now that

has to be fessed up to if you have continued injuries. It is a major legal liability.

Am I right? Angie is over there going uh-huh, yeah. This is how to make my case. So a "cheap consultant" can be very expensive in the long run.

Beware of the consultant who says they do it all. If you are looking for a generalist, fine. Go for a safety person, an industrial hygiene person, who does ergonomics on the side. If you are looking for somebody who really has a lot of ergonomics experience, hire an ergonomist. It makes sense. Very few of us are jacks of all trades.

Beware of the person who has a much lower hourly rate. As I said, they probably have a reason. There has to be some reason why they are charging half of what anybody else does. On the other hand, there are people who charge three or four times the norm. I wouldn't pay for that, just as a consumer. There are a lot of folks who are in a relatively reasonable range, and I would look for that. Also, somebody who has a low hourly rate has to be making up for it somewhere and it may be that they bill you for every phone call.

Beware of somebody with little or no experience. As I said, they can sometimes get you in problems. Beware of a consultant who doesn't return phone calls. If you make phone calls to somebody and they are not returned before they have a contract, when they are the most eager to get your work, they are not going to return them after you have a problem, after they have already been paid. You will never see them again. You want to avoid those fly-by-night folks.

Now, that said, there are a lot of good ergonomic consultants out there who can help you. A good ergonomist, I like to think, is a pearl without price. Okay. Maybe I was pushing that one a little bit. But they can save you a lot of time and money. They can save you a lot of grief. It is much better to have a consultant tell you what is wrong with your process than a compliance officer. It is much cheaper, too.

One of the things most people don't realize is, it doesn't cost \$20,000 to bring a consultant in. It depends on what you want, what you need. It can be a very inexpensive, couple of thousand dollars, to have an audit of a facility. If you want a thumbnail sketch, that is what they can provide, as long as you tell them that.

They can help you reduce injuries, they can help you increase productivity, and ergonomic consultants can definitely increase your quality in a lot of cases. They can be a valuable asset to your safety team. I would advise you, if you are at that point, to go looking for one.

Thank you.

If anybody has any questions, since the whole session has been recorded, the request has been made that you go to the mike, identify yourself, and ask the question. Any of our panelists would be happy to answer them.

Any questions of any of us? If not, thank you for your attendance and we look forward to seeing you the rest of the day.

(Whereupon, the session ended.)





## Manufacturing 2

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Jo Spiceland, Charleston Forge

MR. McCAULEY: Our first presenter for this afternoon is Jo Spiceland. Jo, as she's called, is with Charleston Forge in Boone, North Carolina. Jo has been with them for about five years now. It's a small company, a furniture manufacturer, household furniture. She's going to go through some of the things that, as a small manufacturer, she's had to address with her company. Jo.

MS. SPICELAND: Thank you, Jim. By now you've heard a lot of expertise, and I'm not trying to belittle the expertise you've heard, but that's not what you'll hear from me. As Jim said, I do represent a very small company, and you'll hear from me a very common sense approach. In fact, what you see on the screen up there gives you an indication of exactly how I feel, very much out of my league. I'm trying to stay in line but maybe not in step.

I have been asked to present the small manufacturer's view of ergonomics, and that's what you will hear from me. As Jim said, we're a furniture manufacturer. However, we do not take a traditional approach to anything about doing business, including ergonomics. In fact, compared to the larger more traditional companies you heard about this morning, you'll find that we are very non-traditional, and I will give you some examples of that.

One thing we do have in common with small manufacturers is that most managers at small companies, like myself, wear many hats. Ergonomics is simply one of those hats rather than being a specialty field as some of the other gentlemen that you have heard and will hear today. If you represent a small company, hopefully, you will be able to identify with some of what you hear me say. The working definition that we use of ergonomics is similar to what you did hear this morning in that we try to fit the job to the person rather than the person to the job.

This is a basic approach that can be applied at even the smallest of companies. If you are at the very beginning stages of solving ergonomic concerns at your company, you may be wondering where to begin. And I hope that I can give you some basic principles to help you with that today. I am here to tell you, however, that an ergonomic program can be administered successfully even by small companies, and it doesn't have to cost a fortune. In fact, a successful ergonomic program actually saves a company money.

You do not have to choose between protecting the bottom line and protecting your employees. Rather, we have found that the two go hand in hand. Every injury that is prevented saves money not only in terms of workers' compensation claims and premiums but in increased employee

comfort which leads to increased productivity and reduced turnover.

As Jim mentioned, the company I work with is in the mountain town of Boone, North Carolina. It is a privately held furniture manufacturer that began quite literally as a mom and pop operation. Twelve years ago, the owners of Charleston Forge, a man and his wife, produced the first baker's rack in their garage. They then snuck that baker's rack into the furniture market in High Point, North Carolina. If any of you are also representatives of furniture companies, you understand that that is basically the furniture capital of the world.

They set up a temporary showroom in a hallway and from that first furniture market, we acquired such customers that are still with us today, as Bloomingdales Department Stores and Spiegel Catalog Company. Charleston Forge has achieved astounding success since that time. Now, only 12 years later, we operate five facilities, including two manufacturing facilities and employ 150 people. We manufacture metal furniture which we sell wholesale to furniture stores, catalog companies and interior decorators. Most people, when they think of metal furniture, think in terms of the chairs that you're sitting in or patio furniture.

However, as you can see, we do not manufacture institutional or patio furniture. Our product line varies from beds such as this to dining tables and chairs to baker racks such as this. And this, by the way, is the same model that was introduced from our owner's garage 12 years ago. It's still one of our top selling items.

We call this piece a hutch. It has significantly more wood with it than the other pieces. We do not work with the wood, however. We purchased that wood unit assembled and finished, and then we add the metal accents and complete the piece. The last category of our product line is occasional tables such as this table you see here.

The processes we go through to manufacture this furniture include cutting the steel which arrives at our facility in anywhere from 10 to 20 foot lengths. These cut parts are then bent into appropriate shapes. Some of them have to be heated or forged, therefore our name. Some of them are bent cold. The pieces are then assembled with a mig-welding process. They then go through a process we call finishing which is actually preparing the furniture to be painted. It is then painted, and we use a powder coating system for that, then packed and shipped.

In the early days, Charleston Forge operated on a shoestring budget as I'm sure many small companies do. And even at times ignored general safety concerns when necessary to get the product out the door. As we grew, however, we began to see where that approach was taking us. We were facing rising workers' compensation costs, increased employee turnover and increased regulatory concerns. Today, however, the success of the company has allowed us to move beyond the shoestring approach.

We now have the resources to do it right the first time, but we face a continual struggle to break the old unsafe habits of some of our employees as well as some unsafe management practices.

When I arrived on the scene almost five years ago, my job was strictly human resources. I was responsible for such things as payroll, health insurance administration, hiring; the typical personnel sort of jobs. At that time, I had no training in safety or ergonomics, but as evidence of our nontraditional way of doing business, I was soon given the opportunity to oversee the safety program as well as compliance with our environmental regulations, and this was on top of everything I was already doing.

At that time, the only apparent attempt to control ergonomic risks was limited job rotation. However, that provided limited success as well. I was aware of continuing ergonomic problems from a review of our OSHA logs but was not at that time able to give it the priority focus it deserved, because I had so many other things to learn. As I mentioned, having had no training in safety, I had to learn everything about OSHA, from fire safety to hazard communication to machine guarding. I also had to learn all the Environmental Protection Agency regulations.

But while I was in this early learning phase, other managers took what was basically a back door approach to solving ergonomic concerns, at least in one particular job. They modified this job for productivity reasons. However, along with the productivity improvements, I saw a drastic improvement in morale, turnover and injury rates, particularly the cumulative trauma disorders. This led me to become actively involved with ergonomics for two basic reasons. By then I had developed a genuine concern for our employees, but I also saw the potential for saving money.

I was convinced that improvements could be made in other areas of our company as well. Although our small town offers limited professional resources, I was able to enlist the help of local medical professionals to get me started. I invited several physical therapists and physicians to come to our plant and look at jobs with me that I knew had a history of problems. Several of these professionals agreed to help. And, in fact, they did so free of charge. Until this day, I'm not sure why they were willing to help us free of charge, but am genuinely grateful for the assistance and foundation that they provided to me.

They helped me identify several major risk factors that I'm sure you're already aware of, inadequate illumination, poor workstation design leading to awkward postures, excessive gripping, impact or vibration and lifting concerns. I took what I learned from them and expanded the focus. I began extensive reading about ergonomics, including the then proposed ergonomic standard and was able to develop a company-wide program.

I completed the list of potential problems and began to search for control strategies. I found that the control strategies for the most part identify themselves. This is the common sense approach that I mentioned to you earlier. If you're having a problem with vibration jobs, there are many products on the market available to absorb that vibration. And with us being a metal fabrication shop, we're able to do a lot of tool modification or even tool manufacturing as well as equipment modifications if those are identified as being needed.

Throughout our ergonomic program, if multiple potential problems are identified with a

particular task, I identify the possible solutions, whether they be tool modification or adjusted illumination and simply prioritize those based on cost as well as time needed for implementation. Obviously, adjusting lighting would be a much quicker and less expensive adjustment than purchasing or modifying tools. If I could have my slides, please.

That is the original job that we modified for productivity reasons. That employee is operating a wire brush to polish the steel on that chair to prepare it to be painted. It is a pneumatic brush, and as you can see, it's requiring that she use both hands to grip it. It also provided a great deal of vibration.

At one time, we had 30 full-time employees doing nothing but brushing the furniture. Needless to say, we had experienced multiple cases of Carpal Tunnel Syndrome associated with this task.

The next shot shows an up close version of the same task. She's continuing to brush the furniture. In 1994, we purchased and installed this piece of machinery which is a shot blast machine. It is similar to the sand blasting process that you may be familiar with. You can see, compared to the employees, that's a relatively large piece of machinery. And for a small company like us, it was a major capital investment. In fact, we actually had to expand the facility to accommodate that piece of machinery, but we were eventually able to replace all 30 of the brushes with simply two operators of this machine.

Now, when I say we replaced the employees, we were fortunate in that over the period of several months that it took us to fine tune this machine, we were able to reassign the employees into other areas of the company. This machine works by a process of loading the furniture onto a rotating work surface that you can see. The door is then closed, and the machine is turned on, and it circulates a metal shot, very similar to sand, throughout the interior cavity and polishes the furniture.

The next job that we addressed was in our welding department. This gentleman is welding together a baker's rack. I worked with our employee who designs and modifies the jigs which are used to hold the parts in place, because I knew that we had had a history of back injuries associated with this job. I worked with the jig designer to make them height adjustable so that the work surface is more comfortable for whoever is operating it. The way this works, the employee takes the parts and clamps them into place and then goes through and welds each joint. When it is near completion and he's ready to finish the welding and remove it from the jig, he is able to stand the jig in an almost vertical position to complete whatever welding needs to be done. Then when he's ready to remove the article from the jig, he simply pulls it towards himself rather than having to lift it from the original horizontal position. This has not eliminated our exposure to back injury, because it is still a very heavy baker's rack. Some of our pieces are six feet wide, but it is a much less risky position to be pulling it towards you rather than having to lift it.

Over a period of the next several months, we were able to address most of the initially identified

problems that we encountered. Our program today consists of several aspects. One unique aspect is that we do no formal across the board training on ergonomics of our work force. I currently work only with an employee committee that works with me on general safety concerns as well as ergonomics. I have educated them on the risk factors and how to observe a task to identify these risk factors. They now help me with that task and are often able to suggest solutions.

They also work with employees in their area to teach better work practices as well as providing feedback to me on employee acceptance of the ergonomic controls. This employee acceptance is not always forthcoming, and I'll give you a recent example of that. The welding department representative on the safety committee recently experienced a back injury himself. Fortunately, it was not serious but it did involve him missing a day and a half of work, and it was a result of him welding a piece of furniture with a jig, and this jig was in use for the very first time.

When he attempted to remove the table from the jig, it caught, and he strained his back. Well, as is our custom in our safety committee, at the next meeting, we discussed his injury from the preventive standpoint of how can we fix this so that it doesn't happen again. We were able to come up with several possible solutions to prevent it from happening again. However, that injured employee, and it was a very frustrating experience to me, voiced that he felt it was unavoidable. That there was nothing that could have prevented him being hurt or that would prevent another person from possibly being hurt.

I voiced my frustration to this employee that if we were going to take approach, we were wasting our time. He later resigned from the committee, I'm sorry to say, and I now have a different representative of that department on the committee. I do hope to be able to convince that original injured employee that we can prevent this type of injury, but I'll have to continue to work on that.

Another aspect of our program is that I continue to use outside expertise where possible. I'm currently working with our workers' compensation carrier to identify possible solutions to an on-going problem in our warehouse. We're continuing to experience back injuries related to material handling in that area. If we should decide that hoisting equipment is the best solution, I hope that our comp carrier will be able to help me justify the cost of that equipment to upper management.

Another aspect of our program that's more preventive in nature is that I am becoming increasingly involved in the planning stages of equipment purchase or modification decisions as well as workstation design. I try to be sure that the safety or ergonomic concerns are taken into consideration when these decisions are being made. I also plan to continue to work with our jig designer to hopefully prevent such injuries as that employee sustained when the jig was used the first time, particularly when we introduce new products.

Another avenue I'm pursuing is through our state OSHA Program. I recently learned that our Consultative Services Bureau has an ergonomist that is available for consultation free of charge.

I have learned, however, that we only have one such individual in the whole state, and he has a great backlog. I have requested his assistance, though, and look forward to his input.

We have experienced some success with our program. We began our program in 1993. So as you can see, prior to that time, we had a great many ergonomic-type injuries. The red column indicates hand or wrist injuries. The dark blue column is back injuries, and the other category is something I've lumped together and just named it other, involving such things as shoulder injuries or abdominal strains. As I said, we began our program in '93, and we did experience some success. In 1994, it doesn't look quite so good, but I can at least attempt to justify that.

For six months out of the year, we employed a second shift that year. We learned the hard way that we were not doing adequate training or supervision of that group of employees. In the latter part of '94, we absorbed them onto the first shift and did more training and supervision. And so, in 1995, we had no ergonomic-type injuries. Now, in 1996, we have again seen some cases. However, you'll see that the 1996 lost days are minimal. Therefore, these injuries are being reported early while they are more easily treated.

In the earlier years, you can see that we did have some significant severity, with a great deal of lost time associated with the injuries that we had sustained.

Where do we go from here? I plan to build on the foundation we've started with expanded education and training and continue my involvement on the front end of purchase considerations. To be honest, like employee acceptance of controls at times, it is a challenge to get upper management to accept my involvement in the planning stages. They're not used to thinking in those terms. They're used to thinking productivity only. But I'm convinced and will have to convince them that in ergonomics, like all aspects of doing business, it's better to do it right the first time.

The most important suggestion I can make to you today, particularly if you're a small company in the beginning stages, is that it is never too late or too early to start an ergonomic program. The payback is there. As I said earlier, I'm convinced a successful ergonomic program saves money and reduces workers' compensation costs, but mostly in increased employee comfort and productivity even for a small company. If you're just beginning to address these concerns at your company, don't let anything deter you even if you don't think you're up to the challenge.

If financial resources are limited, as they were with my company, search out and utilize free help when and where it's available. As I mentioned, the workers' comp carrier or local medical professionals may be available for this service. Educate yourself on the risk factors. Once you're familiar with the concepts, you'll find that solutions come almost naturally.

Thank you.

MR. McCauley: Talk about wearing a couple of hats. Thanks, Jo.

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### Rab Cross, Cross Associates

MR. McCAULEY: Our next presenter is Dr. Rab Cross. Dr. Cross or Rab, as he likes to be called, received his medical degree in 1973 from the University of San Francisco. He did his undergrad in engineering and applied physics. Then he went into the occupational medicine and has been there since 1984. He was nationally certified in ergonomics in 1994, and now he has set out in the wild blue wonder as a consultant with clients in office construction and manufacturing. Dr. Cross.

DR. CROSS: Thank you, Jim. This presentation is about manufacturing ergonomics, and the company that I represent is called Lunt Silversmiths. It's located in Greenfield, Massachusetts which is in the western part of the state. Lunt employs about 100 individuals in the manufacturing area. It is non-unionized. They manufacture flatware and hollow-ware, high quality silver-plated products, and they have many high-end customers to whom they market.

Lunt Silversmiths in the winter of 1992 got a wake up call after a meeting of the Board. It turned out that they had been losing over the years an awful lot of money in workers' compensation. They contacted me and asked me if I would explain to them what on earth ergonomics was, and maybe they would be interested in doing something in the ergonomics area at their company.

So I sat down with them, and we decided that initially, we would do the following: analyze the OSHA 200 Log; discuss with HR, plant management and supervision the fact that I was going to be going out and observing the jobs, taking pictures of people and getting some good input from the employees, what bothers them, what hurts them, how they've gotten hurt, how have other people gotten hurt in the past.

The records analysis, primarily the OSHA 200 Log was very telling. I did one from '84 to '92. And in summary, back injuries were number one, with 640 days lost, and they clustered in three departments, the making room which is where they make their product, the machine room where they fashion the dies used in the presses and the stamping machines, and the hollowware department where they handle larger items that are silver plated.

The record review also showed some significant wrist injuries with 235 days lost. They occurred in the trim room, the cutlery room and the hollowware room, and all three of these rooms share in common the fact that they are working with polishing wheels, grinding wheels, buffing wheels, coloring wheels, seated or standing, holding the product against, usually cloth wheels, for various kinds of finishing.

The CFO calculated the direct costs and the indirect costs and looked at his financial records, and he was getting upwards in the neighborhood of seven figures that were lost to this problem of

workplace injuries. So he felt that something had to be done, and to his credit, he decided to convince top management to bite the bullet on this whole issue of workplace injuries and ergonomics.

Well, it was agreed that I would take my slides from the workplace, and I would provide some training and education to supervisors and employees, engineering and maintenance. HR would be there for each presentation. We were going to share right up front with the employees what the statistics were. The employees were going to look at slides of themselves as they work. I would use some illustrated anatomy slides, and I would use 2-D and 3-D which are bio-mechanical programs, to simulate these people in their various tasks and see what the back and extremity forces were.

The goal was to enlist some participation by everybody in turning around the rather dismal statistics they'd had at Lunt Silversmiths.

We went out first of all to the machine room. This is Russell Dodge, and Russell is holding a die, a part of a die. The die is what they put silver stock or brass stock on, and then various types of presses or stamping machines pound out the product. I said, "Russell, why are you carrying that? How much does it weigh?" "Aw, Rab," he said, "It weights about 50 pounds." I said, "Come on, come on, Russell. Let's go weigh it." Well, it turned out to weigh 96 pounds. Had people been hurt lifting these dies? You bet they had, and they had tons of them. I mean, they have dies, dies, dies, dies and dies. And some of them are big, some of them are small. They're generally stacked on shelves from floor to 10-12' high.

Generally, it had been the custom for one person, or maybe two people, to lift these by hand, carry them to the work benches, clean them up, polish them up, put them into use, and then after they had been used, bring them back and stack them on the shelves again. Many of these weight well over 100 pounds, some in the neighborhood of 150 pounds. These were very heavy lifting tasks that correlated with the statistics of injury.

A second area where some back injuries had occurred was in the molding room, handling lead ingots. An employee had ruptured a disc picking up these boxes of lead ingots. Unfortunately, he didn't pick them up just single-handedly by brick. He picked up a big box of ingots. We simulated that with biomechanical software.

Without spending too much time on the program, you can basically put a person into the position representative of their job. You can simulate their task. You can enter the weight that they lift, the number of hands they use, what angle of force they're applying. You can even put in the individual height and weight, and thanks to the computer, just push F4.

In the bottom right-hand corner is a rectangle representing lumbar disc forces. The first third represents low risk forces. The middle, third, is a questionable area. The far right third of the rectangle represents significant risk of disc rupture. With this simulation, there is high likelihood



of rupturing a disc doing that task. And sure enough that's what happened to the individual who was involved with the lead ingots.

There's a scar on his back from disc surgery. He, in fact, required a fusion. This slide shows where they took bone grafts from his low back. So the biomechanical prediction is borne out. It was a terribly high risk job that we identified. (Top management had to sit down and agonize through all these slides with me preparatory to investing money in equipment and job changes.)

Part of my message to the employees during the training program was, "The Older I Get, the Better I was." Now, the way I twist that around is people do a lot of stupid things when they lift. And particularly, males have a terrible macho attitude toward lifting. Remember, Russell said, "Oh, it's 50 pounds." Well, it was 96 pounds. The macho attitude traverses generations of employees. The older guys expect more out of the younger guys, and the younger guys try to put out and then they hurt themselves, and it continues. The cycle has to be broken.

Emphasize to the employees, stop lifting such heavy objects. People are getting hurt. Look at yourself. Look at the people around you. Look at the statistics. Let's do things differently.

So they did things differently. These are two lift devices that they used. Here is one of the dies that they had been carrying around by hand for decades and decades. Now they use lifts all the time. Lunt bought several of these lifts. And one of the employees called me just the other day knowing I was coming out here. And he said, "You know, Rab, the best thing you ever did for us in the machine room was to get those lifts. We don't lift these dies by hand anymore." And they haven't had a back injury out there since.

Those dies are made out of steel. And the steel is delivered to the company in this little back entrance. It's off-loaded from trucks, and they slide these big long bars of steel down this little chute into a basement area known as the steel room.

These big, heavy, heavy bars of steel slide down the chute and out on the racks. There is a chain fall used to move each bar. Bars eventually are brought over to saw and are cut into small lengths of steel. They then take these lengths of steel, and they put them through tempering and hardening processes. This bar weighs 90 to 100 pounds, the bar Ernie is indicating in the slide.

In the past, employees would grasp these pieces of steel with tongs. Here's Joey holding a bar with a tong over one of the heat treatment furnaces. He would slide the bar down in the furnace and later pull it out again. There's some tremendous potential for shoulder injury. During training, I said to Joey, "You know, there's a high likelihood that you are going to severely strain the muscles in your shoulder, if not have a rotator cuff injury. And if your shoulder fails, then, the strain are going to be translated into your upper mid or even lower back." I said, "Joey, I don't know the answer, but you need to fix this."

I returned to the steel room several months later to see that they now have a metal track that runs overhead from furnace to oil quench. In that track, they've got a pulley suspended. They handle these pieces of steel in a two-man process, using a pulley and tongs attached to a cable that goes on the pulley. One person will pull on the end of the cable, thereby holding the weight of the steel. He has mechanical advantage thanks to the pulley. Meanwhile Joey guides the steel down into the furnace and later brings it back out again.

"So what do you think, Doc, did I reduce my risk?" I said, "You did a wonderful job, Joey. I wouldn't have known what to do or how to do it." These employees have great mechanical knowledge, and they can convert my ideas into equipment! That's one reason I enjoy working closely with employees.

Getting down into the cellar place was not easy. There's this circular stairway. It's like a DNA helix coming down. One of the things that these employees did was carry down heavy bags, 80 or 90 pounds of steel chips. They use these chips in some of their gnessling process. Well, they had to use two hands to hold onto the bag. (Obviously, they weren't using one hand to hold onto the rail, so it was a dangerous process indeed.)

Just recently they showed me their latest innovation. Here is a large box, down in the cellar; and here is a chute, coming down from the top level. Now, upstairs, employees will take the bag of these chips, dump them down a little hole (which is disguised as a heat vent) right down through the chute and into the box downstairs. Pretty simple, works well, no fuss, no muss, no back injuries and no falls down the stairs.

It used to be they were just a silverware company. Recently, they purchased a stainless steel flatware company. And this is the new warehousing area. The warehouse workers had pallet movers and box movers, but there's no lift equipment. There are a number of racks or shelves where they store boxes of stainless steel products. And the bigger boxes they set in different areas to unload them as they need.

Well, they were expecting these huge shipments to come in, so they were moving these large boxes out of the way. George injured his back placing one of these big boxes up into a very awkward area. Two men did the process, but they were lifting and twisting while stacking this box, which was 160 pounds, up at about shoulder height. Fortunately, George did not have a serious disc injury, but he required restricted duty for some time.

The obvious solution was to get a lift. They've already obtained a lift in the warehouse; that happened quickly. (They don't want to go back to the era of back injuries again.) Furthermore, now George is using a back belt. I'm not the biggest fan of back belts. I think they're over-used. I think they're misused. I think there's a lot of hype to them, but they can keep you from twisting into disadvantage positions and postures. And so, the employees in the warehousing area, are offered back belts (with some instruction from me about bio-mechanics and reasonable expectation for lifting and strength).

As part of the ergonomics process, I used subjective questionnaires. Regarding sore backs, a consistent complaint was made about the chairs. "Doc, we need better chairs. These things are killing us."

This is one of the old-style chairs that they had. It is hard with a minimally adjustable back, hardwood seat, nothing contoured whatsoever, providing minimal lumbar support.

Most grinding operations were performed seated. You can see how little back support one gets from the chair. This employee gets support only from one little part (digging into his back). And this was true for most employees in the manufacturing era.

Here is one of the typical old chairs. Russell had padded his with a cushion from high school that his son brought home, and he's been sitting on that cushion for many years. He'd worn it right down to nothing.

Well, the recommendation to Lunt was that they needed better chairs. So they selected, with my recommendation, chairs from Tiffin. They chose a height adjustable chair. The backrest is nicely adjustable. The seat pan will lengthen, and the seat pan will also tilt, and there's an optional ring for leg support on the chair.

Here this employee is sitting in one of the new Tiffin chairs. He experienced back problems and missed almost a year of work (a non-work related back injury). He truly appreciates his new chair, being able to change adjustments for his tasks and maintain back support.

And here's Gary Jefferson. Gary also has had back problems over the years. In fact, he used to work standing, because he couldn't sit for long in the old chairs. But he too loves his Tiffin chair. He uses it. He uses the controls. He changes adjustments as needed, and he even has an inclined foot rest. So after the lift devices, good seating for the manufacturing area has been one of the best improvements for reducing back complaints.

The OSHA 200 log indicated some neck injuries. (This is another illustrated anatomy slide that I used with employees during training.) Neck injuries were generally not severe, but rather a lot of muscle strains. Also several employees had non-work related cervical problems, and were experiencing aggravation in the workplace.

Here's one example. This is Norm McCloud, and Norm is doing a finishing operation on handles. And I think you can appreciate his head and neck are almost bent over to 90°. And he said, "Rab, my neck and shoulders are just killing me from doing this." And so, I approached the maintenance team, who have been extremely helpful in terms of implementing my recommendations.

Maintenance developed an inclined adjustable support for the little jig that Norm uses as part of

his finishing process. He holds the handle against the jig and then operates a powered tool for the grinding process. Now that he uses the inclined support, Norm has straightened right up. The inclined support is used to this day without any further complaints of neck problems. Simple solution. I can't tell you how much that cost, but it certainly is not over \$20 or \$30, including the time to make it.

Maintenance was also were very helpful to Jerome. Jerome said, "My back is killing me." As he loaded racks with flatware, he was bent way over, due to a low table. He said, "You know, I've been complaining about this table for a couple of years. It's killing my back." Shortly thereafter, maintenance brought the height of the table way up. Jerome no longer bends over. Simple intervention, minimal cost, a couple of pieces of pipe basically put onto the table legs to raise it up.

Not all problems are simple. In particular, cumulative trauma disorders are not simple, and I'm not here to tell you they are.

This is an employee from Lunt Silversmiths, and that's a scar on his hand. This is a post-surgical scar from Carpal Tunnel Syndrome. This was a longstanding problem and, gradually, he had tingling, pain, numbness in the hand, and then he got power loss. When one gets power loss, one needs surgery. So he had an operation.

But he lost minimal time. This employee wants to work, even after surgery. He's not interested in going out on comp. He's got splints on both wrists. He's pushing around a cart of flatware from one area to another, even wearing these splints. He's been an example for the entire plant. And he is probably going to have to have surgery on his left wrist as well. He got this from wheel work, working against the wheels doing buffing, polishing operations.

This is one of the illustrated anatomy slides that I used in the training for the employees. There's a terrible amount of misunderstanding and lack of knowledge as to what these cumulative trauma injuries are, what's Carpal Tunnel Syndrome, what are the tendons, where are the nerves? So I can show them, for instance, that many of the nerves start up in the neck, come out through the armpit, course down through the arm, run through the elbow, down the forearm, through this small area in the wrist which is the carpal tunnel, and go down to the fingers.

There are also multiple tendons in the wrist, in the elbow and in the shoulder, as seen in this anatomy slide.

And here is the slide I use to explain Carpal Tunnel Syndrome. True Carpal Tunnel Syndrome means that the nerve going through the wrist, called the median nerve, has been traumatized, compressed, blood supply cut off. This results in pain, tingling, numbness in this distribution, the thumb, index, middle and part of the ring finger, mostly on the palm of the hand.

My point to employees is that there are two phases of Carpal Tunnel Syndrome. There's an early

reversible phase, often intermittent, characterized by tingling in the fingers and hands, numbness in the fingers and hand, pain in the wrist, and stiffness. These symptoms occur at nighttime and at rest. Early reporting means that employees must speak up sooner rather than later. The symptoms are not normal, and very likely fixable in the early stage. On the other hand, if people get to the late stage, they're often surgical.

The symptoms are persistent. People have hand and finger pain and numbness. They get clumsy handling things. They have power loss, muscle atrophy. They lose that muscle at the base of their thumb. They become surgical cases. The goal is to keep people from surgery by getting them to report early. And you know, that works.

This is Larry. Larry came to me several months ago, And said, "Rab, my forearm is killing me." Fortunately, as a physician, I have the opportunity to examine these people as well as hear their complaints. So I examined Larry, and I determined he had tendinitis in his elbow, known as tennis elbow or a lateral epicondylitis. I suggested he get a tennis elbow splint, which he did, and has been wearing it and has been working with it.

Now, how did he get that injury? Shoveling snow back in Massachusetts is how he got it. It was primarily non-work related. However, in Massachusetts, if your job reasonably contributes to even a small percentage of your injury, then the employer may be held responsible. Fortunately, we were able to intervene quickly, and avoid any serious problem. He's been working steadily, not in pain, and his elbow is getting better.

Another employee came to me several months ago. He said, "Rab, you know, I'm having a lot of pain in my wrist and forearm." I examined him, and determined that he had tendinitis in his wrist. He did not have Carpal Tunnel Syndrome. I went to look at his job, the one he said was bothering him. He uses a small power saw for trimming the edges of handles, and he was in the habit of accumulating seven, eight, nine, sometimes even ten handles in his hand progressively as he finished them. So he tended to stack them up in his hand, grasping them tightly.

So he was continually gripping, exerting constant force and using the flexors in his wrist. The solution was a little change in job performance. We put a small box near the saw, very close to the operator. He learned to hold only one blade at a time. The pain in his wrist went away. Again, early reporting makes avoidance easier.

Here's a clamping operation. This shows Gary. Gary actually ended up in trouble from a clamping operation, repeatedly closing vice grips. The handle hit right on the palm, right over the area of the Carpal Tunnel, right on the media nerve. The clamping task had been done by hand for many decades.

An engineering consultant developed a fairly simple tool which, when pressed down on the top of the vice grip handles as it hits across the top of the vice grips, the clamping operation occurs without manual squeezing. It took a little time to convince employees to use this, because they

were used to doing the job manually. We hope that problem has been eliminated. Even so, employees use some impact gloves on their hands, so I believe they still perform some of the clamping by hand.

The biggest problem at Lunt Silversmiths for upper extremity injuries and Carpal Tunnel Syndrome, is working with wheels. Wheel work was worse before they had adjustable chairs. But even with the chairs, the task remains very hand-wrist intensive.

There's no way that they are going to eliminate manual finishing. Tiffany buys this flatware, so it has to be finely finished. When using wheels, the wrists are angled, they're twisted, they're moving around, they're gripping. Finishing is repetitive work, day after day, after day.

Now some employees have done it for decades and no problems. Other people get in trouble. I'm of the opinion that the answer has to do with balancing these employees in their work station and getting them so that they can adjust and adapt back and forth from one position to another. I find that inches and angles make quite a difference for these upper extremity injuries.

One approach was to get an adjustable table. The finishers like it, and have requested several more adjustable tables for some of their pumice box operations. This table is crank adjustable so they bring it up and down, raising and lowering the wheel. (Mike, who uses the table, swears he won't part with it no matter who's having trouble throughout the company.)

Most finishers now use an inclined footrest along with the adjustable Tiffin chairs whether work is done at a computer or a grinding wheel, there's nothing like an inclined foot rest. It keeps your back against the back support. Many finishers also use an arm rest that was made in-house. It's adjustable up and down. It will also adjust horizontally. The employee can adjust to different positions depending on the size of the product being finished. Finishers also needed better illumination. They got some additional lights so they can see better and don't have to bend their head down as much.

To reduce hand force, Lunt is experimenting with different grades of pumice. They have determined that the supplier changed the pumice material about three years ago, and it's a finer pumice. It doesn't abrade as well, so finishers are having to bear down harder, using more hand force. And so, they're looking at going back to the old style pumice again; this may require less hand force.

So what's the bottom line? The bottom is that total injuries at Lunt have dropped down nicely from 35 to 17 in four years. The total lost work days have dropped considerably from over 300 to less than 50. With total lost work days reduced, that's bound to save a lot of money.

I analyzed the injuries by types: cumulative trauma, back injuries and then "other". Other injuries are primarily lacerations with a few dermatitis cases. The back injuries went from 7 to 3 to 2 to 2. The upper extremity problems are 13, 16, 10 and 10 - dropping slowly. And even the "other"

injuries dropped down very nicely.

I have also analyzed lost-time injuries versus no lost-time. Lunt went from 7 lost time injuries to 8 lost time injuries to 4 lost time injuries and then no lost time injuries.

We can further show that of those lost day cases, The number of lost work days per lost day case has dropped. The number of restricted days per lost day case has increased. So supervisors are more consistently using the employees for restricted duty work. Employees continue to report symptoms early.

There has evolved a nice parallel between the total lost days and the total lost workers' comp dollars for Lunt. They went from \$192,500 now down to \$27,100 expended for worker's comp costs. The money saved has more than paid for my time and for the ergonomic improvements that have been made.

The Lunt experience has been a success story. Lunt is pleased with the results of the ergonomics. The employees are pleased with the improvements. Even the head of manufacturing is pleased with ergonomics, because it's not disrupted his production. Lunt has agreed to have a continuing process of ergonomics. (Not a project, not a program, not a one shot deal.) It's a continuing process, as Lunt develops new product lines and employees do new tasks.

It's been a pleasure working at Lunt Silversmiths. It's been a pleasure for me medically as well as in terms of ergonomics to see that these employees don't continue to have so many injuries that cause lost days or require medical attention.

Thank you very much.

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Jim McCauley, Perdue, Inc.

My name is Jim McCauley. I am the Director of Safety for Perdue Farms out of Salisbury, Maryland. For you people up here in the mid-west, that's P-E-R-D-U-E. You know, we're criticized quite a bit, because we're not astute as P-U-R-D-U-E, but we define that as them being the boiler makers and we're the broiler makers.

In 1989, North Carolina OSHA came into two of our five plants in North Carolina. We were located in five different states at that particular time, and they conducted an ergonomic audit. They cited us, and we have been into ergonomics for a couple of years and were trying some things out. As typical, since we didn't have a written program, they cited us, and we ended up paying about \$46,000 in penalties. We finally entered into an agreement, a voluntary agreement, as the lawyers call it, in 1991.

Now, bear in mind, we were cited in '89. We entered into an agreement in 1991. The agreement that we worked out with North Carolina, I think, is the secret to our whole success. North Carolina did not come in there and mandate that we do this, we do that and give us a time that we had to do it in. What we did, we sat down and tried to look at the problems and take an approach to solve those problems. It is kind of like Rab said, make sure we had an on-going process and not just do something and put it down on a piece of paper and then kind of forget about it next month.

So we put in a process. When we got through putting in what we thought would make a good ergonomic program, we said, well, look, if it's going to work for two plants, which we thought it would, why don't we put the other three plants in North Carolina in the same agreement, which they allowed us to do. We were doing business in four other states. So we said, hey, if it's good for North Carolina, why isn't it good for Indiana, Virginia, Delaware and Maryland? And so, we drew in the whole company. At that time, we had nine different plants. So we put them all under the same type of an agreement that we had with the five plants in North Carolina.

Today, what I'd like to do is just present an overview, if you might, what this agreement was with North Carolina, how we went about it, and the results that we have achieved with this program. As of January '95, this agreement expired with North Carolina. We tried to go back into a new and voluntary agreement with them, but they have other programs now which supersede that. Our new program is basically the same, we just fine tuned the old one, because you're going to learn that what you think is going to work, may or may not work.

Another feature about North Carolina, if it didn't work, they allowed us to sit down and tell them what we thought might work a little bit differently, and they allowed us to do it. One of the things that we do was on the Ergo Committee, to get the employee involvement. They asked that the committee serve only six months and then get another committee.

We were finding out that we were doing so much training to get people oriented into ergonomics to be on the committee, but no sooner did we feel secure and they feel secure about ergonomics, they were being moved off the committee. We had 10, 12 new people coming on board for the Ergonomic Committee. So we went to North Carolina, and we changed it to where we had the people serving on the committee for 12 months, and it really worked out well, because they were able to really get involved.

We also staggered the time members served on the committee so we did not have to change the whole committee at one time.

The first thing we did was to education all of our associates about ergonomics. Education is an absolute, not only just the hourly associates but for the management team. We first had to educate the very top level. Frank Perdue was heading up our company at that time. He has since gone into semi-retirement, and his son, Jim, is now running the company. But Frank really bought into it. Jim has also bought into it, and it's now endorsed from the very top, down into the



management levels at the particular plants.

I think some of the other people this morning made mention that you have to have management involvement. And in my opinion, that's an absolute. If you can't get management to believe in it, you're going to have a hard job trying to sell it to the rank and file out there on the floor.

Education, we spent a lot of time bringing people off the floor initially to educate them into ergonomics, because we had not done that at the time they were hired. Now that we've gone through that, every time a person is hired at any of our plants, they go through an orientation program.

Part of that orientation is to school them into ergonomics. Normally, that's handled by the safety supervisor and the medical staff, normally, a licensed nurse in each of the plants. Once we get them into the classroom situation, and it is a classroom situation, we really dwell on the idea that it has to be their program. They have to be personally responsible for themselves. We try to tell them what they can expect as far as soreness is concerned. But it's up to them to make sure that their supervisor knows when they start getting sore so they can go to the nurse's office and to get into a pre-treatment type of thing, a medical intervention, if you might. We've also schooled our supervisors that they can't allow a person that they know is having pain to continue working. They have to take them off the floor. And if they have to, escort them to the medical office so that the nurse can take a look at them. We found that by early intervention, we prevent a lot of full blown CTS cases. We have prevented a lot of surgeries. We're a company now of about 18,000 people, and at one time, we were having somewhere between three to five surgeries a month throughout the company for CTS.

Now, we have three or four surgeries a year throughout the whole company. It's been drastically reduced, because we're intervening early, and we're not necessarily removing them from the work force when we do that. Because we work with the medical providers, our nurses inside the plants, as well as the doctors on the outside that are treating our people.

I don't know about you, but we found that in our plants -- most of our plants are located in the rural areas, Carpal Tunnel was something most of the doctors had read about in their medical journals and really didn't know that much more about it. And we would have our associates go to them and right away, it was surgery. There was no kind of nerve conduction test or anything else performed. They were doing a full blown release of a hand, like Rab was showing you. And some cases, they were doing it on both wrists at the same time. So you know what that did for that person at that point.

The next thing we started is what we call "ramp-in." Ramp-in is, for lack of another word, job conditioning. This is to prepare our people to go out there on the floor and do their job. As we described this morning, we're not assembling cars, we're disassembling chickens. And when you disassemble chickens, it's a lot of manual work that has to go into it. So we try and condition our people.

We use a lot of scissors. We use a lot of knives, and this has to be fine trimming, because we do turn out some of the best chicken in the world. I know Tyson's out there, and I'm sure they would agree with that. No, they're -- they have pretty good chicken. But we do a ramp-in so we can get them hardened for their job. The secret there is that we say we harden them, condition them, ramp them, in on their jobs.

That's plural. That's not singular. Because the people, as they are learning, they're learning two or more jobs initially. Because once we get into the ramp-in, then they're going to rotate on a particular schedule into other selected jobs.

You have to go through your plant and actually look at and score your jobs. This job being illustrated is a breast machine operator. We're doing a risk factor scoring here so we can find out how we're going to classify this particular job. And if you'll notice, we've taken everything there, the fingers, the wrist, the elbows, the shoulders, the back, the neck, and we're scoring it. Then we come down, and we get a total score for the job which is 135 or a high risk job. We do that because we want to be able to put the associate into the rotation schedule for other jobs so they will not be using the same group of muscles that they were using on the previous job. So changing jobs is not the thing to do. Illustration: We had a line that associates were working and the chickens were coming from the left of the people. They were rehanging, as we call it. And so, we told the supervisor they would have to be rotated.

Well, the supervisor thought he was an ergonomist, so he had it figured out that he would take his people from this side of the line, and then during rotation put them on the other side of the line. That way, the chickens were coming from the right instead of from the left. Well, that didn't cut it. So what we've done is that the "X's," and there's another part to this, but I'm not going to go through the whole thing. The "X's" say they are jobs that cannot be rotated into.

So if you go to the top, the stack off in the cooler, it'll go across. And then it'll say all those "X's" at the top, they're jobs that they cannot rotate into. But it identifies the jobs that can be used for rotation such as the "Box Icer," the "Breast Pack," and "Wing Pack." So that we now give the plants the freedom to look at where they want to rotate their people, and they can do it knowing that they can do it safely, because the jobs have been identified. We do the rotation based upon the type of severity that the people are exposed to.

So you could take a person that is a very high risk, i.e., a person using a knife to trim, particularly breast meat, that they may be rotated on an hourly basis every hour and a half. Somebody else in the "Tray Pack" may be rotated every two and half hours. The actual job dictates how often the associate will be rotated. Some are rotated every hour, some every hour and a half, some every two or two and a half hours. There are some jobs that are classified as low risk that may not require rotation.

What's been said this morning is still true. You still have to worry about productivity. And since we can't engineer out every problem that we have in the plant, we're doing what OSHA describes

as administrative controls, and we're doing it through job rotation. There's a lot of controversy I'm sure as some say that rotation's not the best way to lessen the exposure. I beg to differ with that, and I'm going to show you some statistics later on as to what we have experienced through rotation.

We have also implemented a "ramp-in" program, and we use the same definition as we did on the score sheet there as to what's very high risk, high risk, moderate risk, low risk, et cetera. Because there's going to be a difference in the actual ramped-in time. So that when a person comes on board and they're being ramped in, you'll see that for a low risk, moderate risk job that the first week, it's no more than one consecutive hour, et cetera. And then the second week they go into no more than two, two and half hours before they're rotated into their second job. Then if you would look at the high risk and the very high risk jobs, you'll notice that they don't go into regular speed until the fourth week.

Now, you know, this is getting into the pockets of the plant people, because of production supposedly. But again, we can prove that even though we have decreased productivity with new hires, we keep the new hires longer. They're able to really produce for us and give us some money back for the training that we've done.

The other thing is medical intervention, and I can't stress this enough. We've hired a full-time medical director who is something similar to Rab. He was an internist practicing medicine there in Salisbury. He has defined an algorithm for the nurses so that basically all our nurses treat our associates who have expressed some concern about soreness, swelling, etc. in the same manner. They must follow that protocol without exception. So there's nobody out there trying new sciences or new arts that we're not aware of. These are time tested and proven.

This is a busy graph, if you might, and I'm not going to stand here and try to explain it to you. But what I'm trying to show you is that there is a very definite process that our nurses must follow in treating people when they first come to the nurses office. There's a very defined policy that we have. Then there's a defined policy as to when they actually have to be sent to the outside people, medical people, to be addressed also.

If you don't have medical intervention, you don't have good follow up. Then you have a problem. Let me tell you one thing. We've had doctors that work with our people on workers' comp, and we've brought them into our plants nearest to them so they could actually see the work process that was taking place inside the plant. They had heard a lot of horror stories before. They thought they knew what the chicken industry was all about. When they came into our plants and saw what we were doing and how we were working with the associates, they really changed their minds. They saw all the things we have talked about actually taking place. To say the least, they were impressed. The doctors became willing to work with us to treat our associates conservatively. There must be a second opinion before any surgery for CTS can be performed. We've had people go out and have surgery done on one day and actually had been directed to go back to work the following day.

Because the doctor knew what kind of restrictions to place on that person. The doctors will tell you that normally, the best therapy is to get the associates back to work, not leave them out there worrying about their job, worrying about getting 75 percent of their pay under workers' compensation. They come back, and they get their full pay. But the doctors know that we're going to adhere to any restrictions that they place on them. And that's saying quite a bit when the doctors trust you enough to have the people come back in there. Bear in mind, and Rab will probably vouch for this one. Those doctors are not paid by Perdue. They're paid through workers' compensation. And their first responsibility is to their patient, not to Perdue. So, they're not going to give us any special concessions just because we go out there and treat them to lunch or something like that.

The next thing was to make sure that proper reporting was being done. Like everybody else, we could give you horror stories about what was not being recorded that should have been recorded, et cetera. We've actually put the responsibility on the nurses, because they're the ones who see the patients. And we have lost one nurse, because she was fudging a little bit on what was recordable and what wasn't recordable, and we made it very clear at the outset that there was not going to be any playing of games with the recordability.

One thing that we haven't done -- we did do, because North Carolina asked us to, but it became an administrative nightmare. You were always dealing with problems that happened months before. Symptom surveys. We have plants with about 3,000 people in one plant. We did the symptom surveys, and then I would wait for them to tell me what they actually found out from the symptom survey. In 18 months, I'm still waiting to find out, because, these surveys are not yes, no, 1, 2, 3 or whatever. It's telling me what your symptoms are. And by the time you analyze 3,000 symptoms and try to get them into some kind of order, it was history. And we were losing a lot of people, because we were not able to react to their particular pain.

What we do now is on a weekly basis look at the OSHA 200, the nurse and the safety supervisor, to see if there are any trends. We also tell them not only look at the 200, but look at the nurse's register. Because the nurses have to record everybody that comes into the office even if they do nothing but dispense aspirins. It needs to be recorded so that we can look at trends and try and nip them before they actually cause a particular problem.

The other thing, employee participation. It's been said many times, so I'm not going to really get into it that deep. But if you don't get the people in the plants to buy into it and participate, and you're not going to get them to buy into it unless they are participating, then you're just blowing smoke, and you're really not going to get anything out of your programs. It's been said that people that are involved in their own destiny will do a better job for you quality wise and everything else. So let's let that go at that.

One of the things that was not mentioned too much and that was task forces this morning. And we do use a lot of task force. Rab said something about the people there at his places, but if we have a particular ergo problem, we'll go to the associates that are involved in that problem and set

them up as a task force to offer us suggestions on how to resolve that problem. And they're only given one problem to resolve, because we don't want them looking at everything else. We have the ergo committee to do that, but the task force deals strictly with that particular task.

I'm not going to stand here and tell you that every suggestion that they turn back into the ergo committee is adopted, because sometimes they generate more of a problem, because they think it's a quick fix, and it really isn't over the long run. So task forces are something that we need to have there.

The graph is from an outside source, so this is not something that we have generated inside. We are self-insured, but we have somebody else actually administer the workers' comp payments and everything else for us. And this is a group of other companies, because we are self-insured, that have formed this co-insurance kind of thing, and we meet twice a year. And if you'll look up there, it will show you the solid yellow line is the industry average. That's the poultry processing industry average for lost work time cases. A little less than 12, but pretty close to it.

If you'll look, then, at the dotted line, this is the council that I'm talking about that we're members of. And if you'll look, then, at the red, that's Perdue itself. Now, this is strictly lost time worked cases. At first, we were measuring and trying to go on total recordable cases, and at first, we were measuring and trying to go on total recordable cases, and at the same time, I think it was mentioned this morning, were trying to get them into the nurse. So you're telling the supervisor, let's cut down on the recordable, but get them in there to see the nurse.

Well, what are you saying to them? So now, we do keep the other figures, by the way. But for our goals and everything, for our people, we're going strictly on the lost work day cases. I had a slide there I was going to put up, but I'm out of time. We had six different plants this year go with a million or more man hours without a lost time illness or accident. And so, I think that pretty much speaks for itself.

That's all for my presentation. I appreciate it. Thank you very much.

(Whereupon the Manufacturing #2 session was concluded.)



## Maritime

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Welcome by Dan Cimmino, Newport News Shipbuilding

MR. CIMMINO: --- Newport News Shipbuilding, and I'll be the moderator and one of the speakers. I'd like to remind everybody that we have an intimate group here, but it's not a sign of how popular we are. It's just that we appeal to a more select audience. So you should all feel very privileged, and you're among the elite if you're interested in maritime ergonomics. We have some excellent speakers here. We have Chico McGill from the International Brotherhood of Electrical Workers and also Karl Ziegfried from Bath Iron Works.

We're going to be talking about three different viewpoints of ergonomics applied in the maritime industry. I'd also like to point out, though, although the program is specific to the maritime industry, it's applicable to a lot of other non-traditional industries such as aircraft construction which is where I came from basically. A lot of the ergonomic training out there is based on assembly line type operations where you measure your production cycles in seconds and minutes. In a ship construction, your cycles are measured in months and years so it's more of a construction process. In the fixes, the way you study the jobs, the way you modify the jobs, you have to take a different approach than taught at most seminars. So I hope you'll find it interesting.

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Chico McGill, International Brotherhood of Electrical Workers

MR. CIMMINO: I'll introduce our first speaker, William or Chico McGill, as he likes to be called, is a Safety Committee Chairman as well as the Assistant Business Manager for Local Union 733 of the International Brotherhood of Electrical Workers representing over 1,800 electrical workers at Ingalls Shipbuilding in Pascagoula, Mississippi. He has been in his current position since 1987, and he has been associated with the Union for the past 22 years.

He has served as an instructor for the International Brotherhood of Electrical Workers in OSHA and injury reporting, hazard communication community right to know, accident investigation, basic industrial hygiene and asbestos in the workplace. In addition, he has actively aided the National Safety Council Labor Division by assisting in the rewriting of the book and home study course called "Protecting Workers' Lives." He is a long time member of the National Safety Council Labor Division and has received the Outstanding Service to Safety Award in 1990 as well as the Distinguished Service to Safety Award in 1994.

He is currently on the Board of Directors of the National Safety Council representing the labor division of which he is the current Vice Chairperson as well as a member of the Executive Board

of Labor Division. In 1993, the President of the IBEW appointed Chico to the National Shipbuilding Research Program, Ship Production Panel Number 5 which is Human Resources Innovation. In February 1995, Secretary of Labor, Robert Reich, appointed Chico to the Maritime Advisory Committee to OSHA.

When the committee was again rechartered, he was again appointed to serve as labor representative on the committee. I'd like you all to welcome Chico McGill.

MR. MCGILL: Thank you, Dan. I appreciate that introduction. First of all, I appreciate the opportunity to speak to you today regarding our industry and ergonomic programs and their successes, especially along with such distinguished colleagues as Karl and Dan. I do have some handouts in the back. Feel free to pick them up at any time.

The ability to drive down our workers health and safety costs to the employer, to aid and implementing solutions to help detract from or in fact eliminate the employees' pain and suffering physically, mentally as well as economically, and at the same time to create the environment that gives our workers the safe and healthful culture in their every day work life, is nothing but positive for all parties and is the driving concern of labor representatives. This not only increases our ability to be more productive in doing the work but also aids in our ability to be more competitive in the bidding processes due to lower compensation costs.

The Union has a definite interest in seeing that these things come to play. If we have work that has been gained at competitive bidding, then not only is management the benefit but labor to benefits by having their bargaining unit employees active and employed and thus, also contributing to the collective bargaining process. When this is achieved with the reduction of injuries and illness, then we, both labor and management, have fulfilled our moral responsibility to our workers. Safety and health is the most common ground that we can agree on.

It's affects are felt both by labor and management economically in a most positive manner. Dollar saved, productivity gain and it affects the culture of our workers with a positive message of concern for their interest and well being. I must tell you that sometimes throughout the outline and just say how I feel and be brutally frank about it. So I feel that I should tell you a little bit about myself and where I get my opinions and concerns, and that way you'll see where I fom, where my conversation comes from today.

I'm known to my friends in the industry as Chico as you already know. And I've been employed at Ingalls Shipbuilding and the Ship Repair industry since 1974 after completing a tour in the military. I entered shipbuilding during its time of intense buildup. Ingalls at that time employing some 23,000 workers under cost plus contract. In a primarily government contract-based shipyard, I have also seen the industry in its years of decline.

During low times, I worked in other industries such as construction, being a framing carpenter in the chemical industry where, as a maintenance electrician, I learned and became interested in



safety issues. In that position, working in a team concept participation management style work site, from 1980 to 1984, I formed strong opinions relating to employee involvement and the positive effect it can have on the company in the workplace, especially on safety issues.

The employers I worked with had a sense of feeling that I call "ownership in their surroundings and responsibilities." When the focus was on achieving things as a team or unit, I, personally as a worker, experienced a very positive environment.

As you know, I'm presently the Assistant Business Manager and Safety Representative for our Local. I've held that position for over nine years. I have the privilege of representing the electricians along with Rick Tira at Ingalls Shipbuilding in Pascagoula. In this position, I've also been the Local Union Representative at the Labor Division of the National Safety Council. It's exposed me to many success stories of union involvement in safety programs that have led to solutions regarding ergonomic problems.

The United Auto Workers, together with Ford Motor Company and their "Fitting Jobs To People" commitment, made during their 1987 collective bargaining agreement, is one of those instances. It called for a joint effort to reduce injuries and illnesses through the implementation of ergonomic principles on the job and in job design. In the agreement, the formation and training of jointly administered local ergonomics committees were agreed to and implemented.

They also developed an "Ergonomics Process Jog Improvement Guide." It listed the effects of poor job design, identified priority jobs, evaluated job stresses, developed solutions and implemented those solutions and documented the effects of those efforts, as well as the follow up to those things. From the top down, they committed to the necessary training to improve ergonomic problems. This commitment continues today.

The International Association of Machinist and Aerospace Workers at Boeing in their joint labor/management committees have addressed areas in the aircraft industry. In my home state, the Boilermakers have teamed with management in a boiler plant to address ergonomic needs.

In addressing ergonomic issues at home, one incident stands out most in my mind and that's of the United Food and Commercial Workers. Their struggle over ergonomic concerns in the catfish industry led to a formal complaint and citations being issued. In addressing the concerns in that issue, it is my understanding some jobs were replaced automated cutters and many design changes to jobs and tooling for jobs occurred. Also, interesting on the side of the ergonomic coin, is the efforts the company went through to find someone medically qualified who could evaluate and reach decisions on illnesses, injuries of ergonomic concern and issue. So the treatment could be had that identified those traumas.

I also sit on the Maritime Advisory Committee to OSHA as one of two representatives of labor and serve as Vice-Chairperson of the National Shipbuilding Research Program Ship Production Panel 5, Human Resource Innovation.

Because of my participation with the National Shipbuilding Research Program and the Labor Division of the National Safety Council, I feel from a labor perspective that in our country and in our industry, we, labor and management are moving forward in addressing the ergonomic, health and safety issues as well as repeated trauma disorders. These groups have helped formulate where I feel we are in the industry regarding ergonomics.

It is important to consider my relationship as a representative with our employer and our contractual environment and plant culture to understand my impressions of what we at Ingalls, labor and management, have done since I first heard the word ergonomics and became responsible for it some nine years ago. The positive side is where I believe, we at Ingalls, are going at this point in our labor management relationship concerning safety issues.

Our source of influence into safety and health problems at Ingalls is our contract. This establishes a joint safety and health committee and gives us direct input into the review of plant safety problems and procedures. It ensures our being able to give input and make recommendations for change in safety and health matters. For example, in 1990, we were very effective in reducing foot related injuries when we agreed to and aided in the writing of the company's Safety Shoe Program.

This required the proper foot protection described as steel-toed leather shoes with uppers, dependent on the job classification, six to eight inches for welders, be worn in any production area, and that would be shops, ships, sub-assembly, platens, wet docks, warehouses, steel yards, tool rooms, launch pontoon, also the training center, in any posted foot hazard area as well as any job site outside of the Ingalls confines where Ingalls has a contract and work is being done.

The initial cost to implement that program as well as providing safety shoes to all the employees at half price was reportedly around \$260,000. That initial investment was recovered in the first six to nine months of the program, and this was six years ago. The incidence of foot injuries has been drastically reduced and is almost the situation that very seldom occurs at Ingalls.

Since 1989, we also have a "Work Restriction Program" in place. The program places employees with restrictions due to industrial related injuries and illnesses in temporary light duty classifications. The temporary duties are framed around the employees' ability to perform job functions with the restrictions imposed. This is only for a set number of weeks and can only be extended with approval of the Director of Industrial Relations Services.

In our bargaining unit, safety and labor has gotten together and collectively reviewed work sites. Some years ago, they reviewed the Identification Nameplate Operation in our --- shop. We looked at the aspects of lifting, lighting, bench work, and made some improvements with the aid of the companies industrial hygienist, Randy Abrams, who happen to come from the steel industry, and after being laid off, pursued industrial hygiene. He was very sensitive to the workers and what the workers' were. Coming from the steel industry, he also had a good feel for how to adjust things for the worker.

Our installing components in the overheads of the ships we build, by doing them inverted or upside down, has reduced having to place the employee's torso in hyper-extended positions such as reaching overhead on ladders. This has, I know as a craftsman, reduced strain and stress on employees making a safer way to perform their tasks in the building of our ships. This is based on my personal knowledge, having performed work as a combination electrician in the shipyard.

The company has designed and produced job safe practice work sheets to explain the proper way to perform cable pulling tasks and provide back supports, explaining what the supports are intended to do in aiding the employee, noting that support belts are just something to be worn when needed and considered as a tool and not something that you wear every day all the time.

I'm sorry I don't have figures of compensation costs or savings as a result of measures implemented at Ingalls. However, I'm sure if you contact my counterpart, Glen Harris, whose address and phone number is on my references and handout, he'll be glad to discuss with you how we've impacted compensation costs at Ingalls Shipbuilding.

Do I, as a safety representative, feel we're doing all we can to address ergonomic issues at the company? No, I don't. Do I feel that my company is moving in a positive manner and direction that will lead us to address those matters more significantly in the future? Yes, I do. And let me give you an example how. Ingalls is a company that is changing, changing it's culture and how it does business. They have invested, I would say at this point, hundreds of thousands of dollars in, what I call, personal enhancement training or covey training, Seven Habits of Effective Leadership.

It teaches people how to treat others as they would like to be treated, noting that the benefits of those which enhances productivity in a working environment. Communication skills and commitment to word are part of the new culture. As is stated in the Mission Statement at Ingalls: "To our employees, our greatest asset, we commit to open communication, team work, mutual trust, respect, recognition and opportunities for personal growth." This, my friends, is a changing culture. We, in labor, hope to add to these positive changes. Let me give you an example of how we've done that.

Currently, Ingalls Safety Department, with the involvement of craft management and labor representation, has established a steering committee to present to executive levels of management a proposal that would establish teams of a mix of craft management, safety personnel and craft employees to target safety and health concerns and aid in the elimination of hazards in the teams particular workplace or craft. Proposed training in the area of hazard evaluation and job design, with direct input and aid from the safety department to the teams, will enable them to address specific hazards such as ergonomic problems.

The Safety Department will make available to these teams information on industrial illnesses and injuries. Areas of repeated occurrences can be evaluated for causal factors and addressed for recommendations for improvement. This is currently being drafted and created for

recommendation as we speak here today. I feel this is a very positive step in addressing the concerns that we have here today as well as the concerns that I have back in my company.

I've discussed first-hand knowledge of my company, and I've told you of learning experiences from other organizations to the National Safety Council. But the most profound conclusions that I have reached have come from my involvement with the National Shipbuilding Research Program. It receives its funding through DOD's Advanced Research Project or ARP. It consists of eight Ship Production Panels, the one I served on being Human Resource Innovation. There are several observations to be gained through the projects this panel has covered.

This panel is made up of management personnel directly responsible for human resources in their yards as well as management safety and health personnel, along with labor in the form of myself and other experienced shipyard craftsmen from various international Unions such as the Pipefitters, the Boilermakers, the Machinist, to name but a few. I must not forget we have consultant groups, participants from NIOSH, OSHA, the Maritime Standards Group and also participation from the Navy.

Shipyards from both the Shipbuilders Council of America and the American Shipbuilders Association also are representative on the committee. The purpose of this group is to examine both content and process in the realm of human resource innovation, to recommend projects that will aid in the study of human resource innovations in the country today and to disseminate new managerial practices and organizational concepts developed for implementation with the United States Shipyard.

A project completed by this group and published in 1991, 0318, is titled "The Survey: The Principal Elements of Ship Safety Programs of Nine Major American Shipyard." The purpose of the project was to collect detailed information on the principle elements of safety programs in the nine participating yards. Identify core elements common to the most programs, identify the managerial philosophies, provide base-line information for comparison by others in the industry, and bring about the awareness of new initiatives.

Unfortunately, in the report, there are only a few references that would be considered to touch ergonomic concerns. One that does is a new work facility design or improvement of existing facilities. While seven have what would be considered qualified management or engineering personnel evaluate those designs for safety, the rest do not. Employees who are subject to these changes are not asked to evaluate the design. This illustrating to me that while we talked about ergonomics at that time, we, in the industry, had, in my opinion, not yet placed it on the front burner.

Other SP-5 projects have also addressed safety issues. In 1987, a project titled "Organizational Innovations in Shipyard Safety" was published. It evaluated the ability of small work teams to identify and find solutions for safety related problems in the shipyard environment. While effective, the report indicates the group selected contained no craft employees, with maybe the

exception of a lead man. Once again, effective, but even though some efforts to work design reduced some problems, ergonomics was not the principle concern.

The project that starts to generate employee participation was in June of 1990 published by the NSRP, and it addresses directly employee involvement in safety action teams and illustrates their successes in some ergonomic areas so much so that the teams were decided to keep going even after the project was completed. I still, however, feel that the importance of the issue was not realized by the industry as a whole until the proposed development of the General Industry Standard directed at the subject of ergonomics.

At our SP-5 Panel meetings, it became apparent to me how a proposed standard such as the General Industry Standard would affect our already declining shipbuilding industry. It was also made apparent too, I might add, by the construction industry, as well as our industry, that because of our particular methods of construction, unlike manufacturing industries, which are due to postures, temperatures, working conditions and the entire shipbuilding process, the requirements of a standard, as had been proposed, would be too demanding on the industry considering the criteria outlined in most signal risk factors.

It would be almost impossible to comply within our industry and would be most cost prohibitive. Having been made aware of such concern in 1995, the SP-5 Panel recommended a project abstract be drafted and approved for submission which was titled "Shipbuilding and Ship Repair Ergonomic Study." That was developed and was to be pursued by Bath Iron Works. The purpose of the project was to address areas in shipbuilding and ship repair that fall out of the scope of controlled environments such as shops or workbenches.

Identifying the fact that once construction begins on the ship itself, the environmental control become almost impossible to implement. The project was to help identify alternative methods for our industry. The first project I had known to address solely ergonomics in shipbuilding. Since the ergonomics standard dies, the project was not pursued. However, I am glad to say that at the last SP-5 Panel meeting, there was subcommittee formed by Chuck Rupy, the Chairman, to address safety problems in shipbuilding.

They have asked that that project be revisited, and Bath Iron Works has been asked to resubmit it to be proposed and to be followed up on. Also of interest is the article in this months "Safety and Health Magazine" published by the National Safety Council. Patrick Tyson, who spoke earlier today, was the acting head of OSHA in the Regan administration. He wrote the article and it was titled simply "Brace Yourself for the Return of Ergonomics."

It basically states that cumulative trauma disorders seem to be climbing. The problem is becoming more recognized by health and safety professional, such as us here today, and the article further states that it is believed that we may have a standard developed that will be more acceptable to the business community than the original proposed standard. The same original proposed standard that, to this speaker, brought the ergonomic issue to the front of the plate.

In summation, let me say I feel we, both labor and management, have come to a point that we are working and should be together to reach an agreement on the subject of ergonomics. I feel that NSRP, in the form of the SP-5 Panel, has brought the industry in focus, ready to do research on the issue, ready to give us a better understanding of the vast needs and issues of ergonomics.

We must remember to address this issue, the shop floor is a where a whole resource of information lies. The idea of accomplishments and successes achieved by other industries in ergonomics should influence us in the industry. We, both labor and management, must strive to cooperate, learn and adjust to the directions that will strengthen our worker base through truly making a safer and healthier work place.

Do I feel that we, both labor and management, as an industry, have addressed ergonomics issues? Yes, but not in the manner in which we are today. Do I feel that we are going to address the issues the same tomorrow? No, I feel that we're making positive steps to address it better in the future.

Thank you very much.

MR. CIMMINO: Thank you, Chico.

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Karl Ziegfried, Bath Iron Works

MR. CIMMINO: The next speaker I would like to introduce is Mr. Karl Ziegfried. Karl is the corporate ergonomist for Bath Iron Works in Bath, Maine. He has been apply ergonomic interventions at the shipyard for over eight years and is responsible for ergonomic program development, direction and training. Karl is the Chairperson for the Corporate Ergonomic Task Force on Cumulative Trauma Disorders and consultant for Bath Iron Works ADA Compliance Committee.

During his career, he has performed over 500 ergonomic analyses, developed and presented training for employees on office as well as production ergonomics. He has also acted as Project Leader on multiple ergonomic intervention projects. Please welcome Karl Ziegfried.

MR. ZIEGFRIED: Thank you, Dan. Can we shut the lights out? Is there somebody back there that can -- pay no attention to that voice behind the curtain.

As Dan mentioned, my name is Karl Ziegfried from BIW. While we try to get the design -- is there a human factors engineer that can help Brian back here with the lights?

BIW is located in Bath, Maine on the shore of the Kenebec River. Right now, we're a defense contractor primarily. I say primarily, because we unfortunately at this point can't compete in the commercial market, but we're certainly trying to go forward with that. We do everything by unit

construction as most folks within the shipbuilding industry does. The thing that makes BIW somewhat unique is the way that we launch our ships. We still launch them stern first. It goes down a set of ways. It's quite a monumental feat, and it's very prestigious to actually watch, but it is somewhat archaic. And we're looking actually to advance into that.

We've recently been purchased by General Dynamics Corporation. So we are an affiliate of them now. This is some of the units that we build inside. Also, we do build units outside. And when you're dealing with units in the outside, you're dealing with a lot of different weather factors, especially in Maine. Obviously, everybody has been talking here at the conference thus far about coming to Chicago in January. Well, actually, we came to Chicago and it kind of warmed up a little bit.

This is the show of an outside unit being constructed. One of the first things that we did in BIW when we first started the program was to develop some type of a database, because we had to find out exactly where our injuries were occurring, what was the major causes of those injuries. So we, in fact, did that. And right now our injury rates for 1996, I just got them, for lost time injuries -- and we use lost time injury rate as the key factor.

Ergonomic injuries was 2.6 and for actual cumulative trauma disorders, it was .89. So we've been able to actually see a very large decrease in these injuries since we started keeping track specifically of ergonomic injuries in 1992.

When we actually developed the database, these are the key factors that we put in or the key words that we put in. Anytime an employee comes into the medical department and says in their injury description that they were doing one of these tasks, it is keyed in as an ergonomic injury. So we're counting ergonomic injuries as including head and neck strains and stresses all the way down to tarsal tunnel in the feet. Okay. I mean, we count all, not all, but most back injuries that are not traumatic in nature as an ergonomic injury, groins, strains, et cetera. So we try to keep things very, very complete.

BIW has very much a team work affair, very much of what Chico was talking about here just previously involving the worker. We had to go forward in 1992 when we had the Chairman of the Board, then, Buzz Fitzgerald, sitting down talking about ergonomics at a Board meeting. It certainly gave us a real good shot in the arm. We basically attacked that in a way of showing them that good ergonomics meant that you were going to actually increase quality and improve our competitiveness. And we've been able to show that time and time again.

To the Union folks, we basically preach that certainly their workers are going to be healthier, safer and are going to be able to do the things that they like to do, not only at the shipyard and remain viable, but also at home with their families. So it's a real good relationship that we basically built up.

When we looked at it, we knew that there were certain barriers when it comes to an ergonomic

process. And again, I refer to it as a process just as they referred to it earlier today. A program has a definite start and stop. Okay. And when you're dealing with ergonomics, it's a continual process, and it certainly has been at BIW. Once you have the leadership commitment and developing clear and realistic goals, we did form a joint Union Committee or a joint Ergonomics Committee. And it basically was comprised of Union folks as well as salaried folks. And we go on out, and I have a slide here in a second that's going to show all this in a little bit better detail.

But basically, worker and supervisor involvement is absolutely key. There's probably no better ergonomist that work in the shipyards or in general industry for that matter other than the workers themselves and the supervisors. There's a way to do it easier if you tell them what you're trying to eliminate. You show them what you're trying to eliminate, bring them into the process, you're going to be successful.

Rigorous problem-solving processes is important. Expertise on the Ergonomics Committee is also real good. And again, start small and expand slowly.

This is what we used for the problem-solving and decision-making. It's a Kepner Trago form. Is anybody in here familiar with Kepner Trago form of problem analysis? No. It's actually pretty complete, and you don't need to be an expert in it in any problem-solving, but it certainly helps. I mean, if you go on out into a large industry and you have 8,300 employees, which is what BIW is currently at, you need to be able to break it down somehow. And this is one of the processes that we do that we use along with comparing actual injuries.

This shows you the actual process. We do have a core team. The core team is made up of safety professionals, engineering folks, tool engineers. It's made up of a chief steward at one of the off-site plants and another worker and myself. When we're going out, we identify an area that needs to be changed. We will go in and we will pull workers and supervision from that area and train them also in basic ergonomics. And we involve them into the process as well.

Then once making up the Union team, we go on out. We do evaluations. A lot of the times, the workers and the folks on the shop floor will actually go in. In one of the real large projects that we did, we actually had team meetings where we brought in all the workers from the floor. We trained them in the basics of ergonomics, and we told them what we were trying to get rid of. And then we opened up the floor. Said, okay, what would you do to make your job better? This is what we're trying to actually do.

We used their ideas. We brought them into the process and actually we made our designs and re-designs at that point. After we did the designs and actually re-designed, we made little pilot workstations. Again, we started small instead of changing a whole line. We set up three mock workstations with the involvement of the employees. We rotated all the employees through those workstations, met with them again and said, what did you like? What did you dislike? And then took those things and modified the stations a little bit more.



We did not listen to everything. We did not go with everything the employees told us, but we basically worked with them to work through the process. A lot of their ideas were very good ones. Went through the recommendation approval cycle. Basically, the entire team coordinated the implementation. And after we did so, we reanalyzed the changes to make sure what we did was correct.

The measurement tools that we use on each one of our projects are one or multiple of these factors. Precaution levels: As mentioned earlier -- and a lot of this stuff I know might be redundant, because a lot of folks have talked about -- the process is the process for most folks. But when you're dealing with industry and you're trying to get a buy-in, the first thing you look at is production levels. We've been able to basically pay for each one of the projects just on efficiency gains, not to mention the amount of lost injuries that we've been able to do.

Injury and illness dollars is also a good thing to tap into to. You can get that information from your workers' comp area or from your own insurance company.

Product quality actually does go up.

Scope of Work: And I put scope of work down there, because in one of the areas that we looked at, we didn't see a real significant decrease in or increase in efficiencies. But what we actually found was that the scope of work has changed or they're doing more items or more things to the item before going out to the ship.

Employee Morale: It's a hard thing to put a dollar figure on, but it's a real easy thing to measure. You walk through an area after being there for a while and people start walking up to you and start saying hello and asking you how you're doing, employee morale is good. And if anybody ever has gotten into the psycho-social issues concerning injury and injury management, you want to get employee morale as high as possible.

Last but not least is risk factors. You can also go in and do another risk factor analysis. The one in the proposed draft is the proposed ergonomic draft is a real good one to use if you just want to measure your stages. You basically do one before and do one after and compare notes.

Shipbuilding is unique like Dan pointed out, because you have three different types of environments where in most industries you might only have two. In shipbuilding, you certainly have an office environment. You have a shop or fab environment, and you have a shipboard environment. Your methods that you actually use or the control strategies that you use in each of these areas are different. Certainly, in the office environment, it's fairly easy to control the environment.

When you can control the environment, you can basically effect problems in an engineering or workstation design control. You can also use administrative controls quite easily in an office type of environment, especially when you have total control.

When you're dealing in a shop environment, you still have control to a point. You have control to a point prior to the ship being or prior to unit construction. Everything that is basically fabricated to put into the unit, you can use. There's where you can basically jump down through workstation design. This is the lift table that we put in on a drilling operation. And I have a bunch of slides here I'm going to buzz through here fairly quickly to show you some of the changes that we've made.

A lot times in a shop environment, you can invoke engineering controls. You can effect the process. Okay. You can redesign things, look at material handling issues. So it becomes quite effective.

And then we have shipboard. I'm sure that each one of my distinguished panel would agree if we were to ergonomically design a ship, it would barely fit into the ocean. Okay. I mean, it would humongous. There would not be any of this type of operation. By the way, he's in the overhead. The slide is in the correct way and basically trying to get something done in the overhead. This is a fact of life when it comes to shipbuilding, and this is where we would have had a major problem had the ergo standard gone through the way it was.

It's extremely difficult to effect engineering changes in a shipboard environment. What we have done is we've tried to provide the workers with the proper tools or the right kind of tools to do the job. We've preached on a lot of administrative controls to effect change. So there are things you can do. I'm not -- please don't get me wrong. I'm not saying that, oh, well, there's nothing you can do. There are things that you can do, but it gets a lot more difficult as these areas start to get more confined.

Picture for a second working on the top of your chair and then two seconds from now having to crawl underneath all of these chairs to get to the back door. There, you have shipbuilding. Okay. When it gets into that type of environment, so you need to work a lot on education and training. At BIW, we have basically put everybody in the facility through some form of either back training and/or cumulative trauma schools. Here, we basically go through and we explain to them what the associated job hazards are. We want these people to know what the hazards are.

We give them talks and we talk about static postures. You can see from that first slide why static postures would be real important. We let them know what they are in ways that they can basically get rid of those static postures.

Types of Cumulative Trauma Disorders: And I put signal risk factors up here. We want them to know these things.

Identification of Symptoms: We want people to identify their symptoms so that they can seek help if, in fact, they're having problems early. We know that early intervention is key. The average back injury at BIW without lost time is right around \$800. With lost time, it's right up over \$20,000. That's a major difference.

Injury Reporting: We basically let them know how to report an injury although most folks in a production environment I found are much more willing to actually report injuries than folks in the office environment.

And last but not least is Injury Prevention Techniques: We basically show them how to prevent these things from happening. At BIW, we have a thing called "Fit for Work." Every morning 12 minutes prior to work, we go through and they can do some exercises which is paid for right through BIW. It's quite effective actually. It just basically gets people warmed up prior to work.

We also do training for managers. A lot of times, we do the training with the employees and the managers present. And then in some instances, we've actually brought managers in and train nothing but managers. 'Cause sometimes, the subject topic is a little bit different. We key on the who, what and why and where of cumulative trauma disorders. We also let them know whose responsibility it is for safety and health programs. Basically, everybody's but we really key very heavily on the managers.

Company and Area Statistics: I knew I was going to tongue-tied on that one. But basically, if you can show statistics from one area in another area, a lot of times you can managers trying to compete against each other. That's a real healthy type of competition.

And then Financial Impact to Ergo Injuries: One you show them that the average ergonomic injury cost over, lost time injury cost over \$20,000, and we're looking at reducing overhead as much as possible at BIW to remain competitive, it has an impact.

Bottom Line Reducing Injury is definitely -- improves quality and production. We've shown that on several different occasions.

Now, these are just a bunch of slides, and I might go through these fairly quickly. But these are slides of just some of the things that we've been able to implement, well, at least for the past six years. The first two years was basically getting going. These are portable, or not portable, but fixed saw horses that we have in one of our assembly buildings. Basically, every piece of steel prior to being welded has to have a pneumatic grinding run across it. Prior to those saw horses being in place, all that stuff was done directly on the ground.

You folks understand the biomechanics of working in a bent over posture and kneeling versus standing upright like this gentleman is doing. Every time I walk through a shop and I see a piece of work that they're actually doing something on saw horses, it kind of brings a little smile to me. Because four years ago, you wouldn't see this. Everything was still done on the ground.

For some reason, we had in our mentality that if you got it up in the air, it was going to take up more room until they actually started doing it. Or it was going to take more time. Actually, we've shown that you've been able to reduce time, increase operator comfort and basically get the

job done faster.

Again, this is just a person painting a piece of -- bent on a set of saw horses.

Pallets: How many of you folks in here have an area where you use pallets? Okay. I mean, when you're dealing with pallets, everything generally is on the floor which either means it's loaded on the floor or unloaded on the floor. If you're lucky enough, a forklift does it all for you. What we did here, these are moveable Q-tables that we have and they're on wheels. So basically, they can wheel them around. You can use it for actually moving around material handling aspects. And this is right at 30 inches, so it's at a perfect height for the start of a lift.

Chico mentioned building units inverted. This is a shot of an inverted unit. Basically, people here are working on a ceiling. If you can imagine putting all this pipe in the overhead with your back hyper-extended, the benefits of working down instead of up.

This is another thing that we were able to do that actually helped the folks that were shipboard. This is an old welding unit. We used to have a 12 inch wheel of welding wire on here. The total weight was about 90 pounds. We've gone to the smaller suitcase feeder and to a smaller reel. Basically, we have reduced the amount of scrap basically, going from the welding wire. And we've reduced the weight to 35 pounds. So that was a significant improvement.

And then we actually fabricated this unit to basically sit the suitcase feeders in so we can lift it aboard ship so people don't have to worry about climbing up seven flights of steps to get onto the ways, go through the cardiac stress of basically doing that. Basically, the crane just picks it up and moves it to where it needs to go.

In one of the main areas that we worked on in the door shop, folks out there were actually getting an injury, a back injury, on an average of once every two weeks, there was a back injury. It was a terrible, terrible situation. Folks were basically moving things by hand. This shows you how they used to flip a small piece of door frame over. What we did was we basically modified a couple of engine stands and made a jig to hook onto it. And basically, the person just sits there and turns the lever now and rotate the door.

Same scenario here. All this was actually done by hand. This is the old way of doing it. It was either horizontal or vertical. Basically, we've attached some engine stands to it, and now that can stop at any degree. Actually, we've increased efficiency there. It used to take them 40 hours to build doors. Now, we're down to about 31 hours to build the door.

Needle Gun: Basically, prior to, and this is just a real simple easy fix, this is a piece of pipe threaded rod. Of course, it's done safely where the person is using a needle gun standing up instead of kneeling down. Okay. There is no reason to have to kneel down to actually needle gun which basically just takes off the scale from welds.

These are tools that we're experimenting with. This is a standard tool. This is what they call an ergonomic tool. It has composite handle. The air is basically being driven out the back. It's pneumatic. It's a pneumatic brush. Most of the folks that are using these tools now do like them. We've made a very large investment of these at BIW.

It's an air gun. I only really have one of these in, but we're looking at it basically for blow down purposes. Instead of using just a thumb, you can employ two fingers on the lever.

This is dyna-pack machine. It goes well over 50 pounds. Prior to having this wheel unit on here, everything was carried by hand. Now, you can basically just push it down and wheel it around. I think you can get the idea here that a lot of things that we have done are small. Okay. They're little things that we have done that we've implemented over the years that over the long run has made a significant difference in our injuries. Our injuries are consistently going down. They're in a downward trend.

This is basically two suction cups on either side of this with a hydraulic ram to push this steel down. Before this, we used to use hammers and wedges to actually beat the steel to get it down even with the plate. Now, you basically just put this in, plug it in, pump it up and you're done.

These are transfer balls in front of a shear. Put a sheet on there, it's real easy to move it around and push it forward. Okay. It reduces a lot of stress. And again, transfer balls on top of the table to move sheets.

Cranes: Cranes are the best technique I can possibly think of to actually move material. The best way, I'm sure everybody will agree, the best lift is no lift -- is no weight anyway.

In one of the other areas that we did, these are all jib cranes. You can't see this real clearly, but this is in the pipe shop. We tried to provide each area with two methods of lifting things mechanically. These are jib cranes. There's also an overhead bridge crane in there. Okay. We've seen significant decreases in injuries there also.

Tool Bouncer: On this reamer machine. It's a beveler, a pipe beveler. It goes over 40 pounds. Before we put this counter balance in there. Basically, they were holding it by hand.

Pipe Carts: We actually fabricated up. If you can look at all this spaghetti type of pipe that's here. Prior to putting these carts in, everything was just piled onto the floor. Try to get a piece of pipe out of that. Okay. It was terrible. Not only was it frustrating and time consuming, it was also hazardous for the employees to actually do the tugging and the pulling. These carts have made a big difference, these --- type carts we designed.

This is in front of a shear. It's an old table in front of the shear. And basically, what we did was we put another Southworth lift table behind the shear on a roller. So basically, the parts come,

they fall onto the shear. The employee then pulls the unit back. We have handles that you insert here. You pull the unit back and basically press a pedal, and it comes up to unload it. Prior to that, all the unloading was done directly down flat on the ground in a bent over posture.

This is a dandy lift. These are great. Little carts to use. You can pump them up with your feet to the appropriate work height. They work good for moving material around. We've even used them in some areas as temporary work benches.

If you get a lot of material delivered in these metal or any types of boxes, I really recommend this type of set up. This is an easy reach. Basically, the machine is designed to tilt the product up. So instead of bending over, the person can remove the product standing in an upright position. It really cuts down on all the bending that's performed.

Last but not least are the things that I probably dislike the most. These are what they call metal dogs. Throughout the shipyard, for many years, they used these items to pound, to basically secure the framework down prior to doing welding. And these dogs weigh between – well, some of them only weigh three or four pounds. The ones here weigh 12 to 15 pounds, and they would take a sledge hammer and drive them down into the steel table. This is an acorn -- it's a cast iron table.

A lot of stress was being done, so what we did was we actually purchased a clamp. We modified it. We cut the bottom off of it, and we constructed our own dye so it will actually slip into the table and basically employ, puts it down. It's a ratch-type clamp. You ratchet it closed. It's nice and secure. It doesn't move. Okay. We basically eliminated the need for people to pound on dogs.

This is how the clamp comes, and this is another table design that we actually came up with. You see, there's little stars on the table on the table top. This was an employee's idea about doing the stars versus doing a ridge which one of our engineers came up with. Basically, you can just walk on in there, slide one of those clamps in and basically hold it down into place. We did have to put those everywhere we possibly could, or we basically designed them to make sure that it had total coverage on the table so they work quite well.

This is our modified workstation with a lift table with a table top, and it works out quite well.

Q-tables: We use them as much as possible to get the product to there. Once the product is done, we toss them in these boxes which is fine, because those are moved by a crane. You don't have to bend over to do that.

Slag Hammer: This is a little thing that we did was we actually had to design and patent a spring for the handle. I got the idea basically just from my wood stove actually and reducing shock where people use it to pound on welds. Basically, we had to design and patent out own spring handle for this just to reduce us a little bit of stress, a little bit of shock. And again, this is

something that can be used shipboard as well.

Those are things that we've done at BIW, and it's been quite successful. Any questions? Thank you.

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#### Dan Cimmino, Newport News Shipbuilding

MR. ZIEGFRIED: Now, it is my pleasure to introduce Dan Cimmino. He is a 1986 graduate from Connecticut State University and has a Bachelor of Science degree in manufacturing engineering technology. He has studied ergonomics with the University of Michigan, Biomechanics Corporation of America, the Joyce Institute and the Ergonomic Technologies Corporation. His experience in manufacturing engineering includes planning of machine parts, numerical control planning, programming, bonding assemblies, composite parts, hydraulic systems and special tooling.

In 1991, he designed and implemented an ergonomics program for one of the country's largest aircraft manufacturers. The program was extremely successful and since then, other companies have adopted similar programs. Dan served as Chairman of the National Center for Manufacturing Sciences Collaborative Project on improvement of hand tools. Project participants included Ford, General Motors, Chryslers, Lockheed, Ingersoll Rand and the United Technologies.

Dan is currently employed as Corporate Ergonomist at Newport News Shipbuilding where he has designed and implemented a successful ergonomics program. He is also a member of the Virginia Center for Orthopedic Research. Dan Cimmino.

Thank you, Karl. I'd just like to add one thing about Karl's presentation. I had the privilege of visiting Karl up at Bath Iron Works and got to see his work up there first-hand. And I could assure you his changes are very effective and very widespread. Also, the people aspect of it is very important, and it was very evident and that everywhere we went, everybody had a smile on their face and was saying hi to Karl. And it really showed that the work he did was very much appreciated. Lights, please.

I'm going to talk about ergonomics at Newport News Shipbuilding, and basically, we're going to tell you a little bit about Newport News Shipbuilding, review some of the challenges and particularly the maritime industry having to do with ergonomics, go over the structure of the program and then show some of the methods of the implementations, the modifications we've made and then review the results.

Newport News Shipbuilding is a participant in OSHA's Voluntary Protection Program at the star level which is the highest level where VPP is the largest participant at about 18,000 employees,

and we're the only shipyard in the program. And that's something we're all very proud of. We're also America's largest privately owned shipyard. We're now independent of TENNECO. We are our own corporation traded on the stock exchange. This is a picture of the yard. It stretches about two miles along the James River and is about 550 acres.

These are two of our products, the carrier Kennedy and the submarine Houston. In addition to these, we've designed, built, overhauled, repaired tug boats, the yachts, cruise ships and tankers.

Getting at the ergonomics, in the maritime industry, there are some unique challenges that are different than other industries as I eluded to before. It's not an assembly line. They're long product design lead times. Some of our products we're building were designed 25 years ago. And as you all know, many times the design drives the process design. So it leaves you with limited opportunities to change the process because the design defines the manufacturing process.

In addition, shipbuilding is a very hazardous industry to begin with. Aside from ergonomics, I'm sure you've all been to shipyards. If you haven't everything there is heavy. Everything there is a lot of times dirty. It's a harsh environment with conventional safety and industrial hygiene aspects also. So it presents some unique challenges. But these would be components of any ergonomics program anywhere.

And I'd like to point out, it's not an exhaustive list, but I think it's a core list, for example, medical management. That would be it's own presentation. But these would be essential elements, and I'll hit on them one at a time.

The first one I'll talk about is program leadership. There should be one person in charge, and that's absolutely crucial. A lot of times when a company wants to have a new program or a new process, they send everybody to training. And the premise behind training or education is when you get back from the training, you're supposed to do something different than you used to or something in addition to what you used to. And unless there's somebody in charge pushing the program, everybody's going to come back and just look at each other and do what they used to do all the time anyway. You need to have somebody in charge to keep it fresh, to keep the projects on the front burner. They could come from a lot of different departments. I'm kind of prejudiced to manufacturing engineering, because I spent a lot of time in manufacturing engineering. That's an excellent department, because manufacturing engineers are very familiar with product design and the process design. But any of these departments are good candidates. It's important to have a written plan. After the plan is written, it's important to communicate that plan.

In addition to that, management commitment is essential. And you need real management commitment, not the kind and the speeches and the posters, because that commitment is free. Everybody gets that, but real management commitment to devote resources, peoples' time, money to solving the problems. And judging by the size of the ergonomic problems in the shipbuilding industry based on lost time injuries, workers' compensation costs and just plain hurting people. It



shouldn't be hard to gain management commitment.

Education I think is the key to success in an ergonomics program. And I think everybody needs some level of education. Every employee of Newport News Shipbuilding has received some education. Management is critical in educating the management, and some of this is just to understand what an ergonomic disorder is. Because a lot of times they're difficult to understand. You don't see any blood. You don't see any missing fingers or arms. And all you have is somebody complaining about pain.

And they may be very effective at shipbuilding and fitting and pipe fitting, what not. But maybe they're not doctors. Maybe they're not ergonomist. So some education to understand the nature of these disorders will help them understand that they are real and they are controllable. In addition, as I said, the employee population needs some form of training, and the purpose of that is to understand what ergonomics is, what the risk factors are and who to go to if they think they have a problem -- very, very important.

We have a lot of different avenues to train. This is one of them. This is a photo of a --- this is my buddy, James Ward, Ginger Strickland. Some people in the audience are here also. But we have a lot of different avenues to train. This is a voluntary night school. I believe it's 12 classes long, four hours per class. We have a health and safety task team which we'll talk about in a minute. These teams meet -- most of them meet weekly. We have a take home course that people can take home and study all different aspects of safety.

In addition to ergonomics, there's industrial hygiene fire protection machine guarding, all sorts of things. We have a program at our clinic. When somebody goes in with a back injury, they don't leave the clinic until they see a video on back ergonomics and wrist ergonomics and so on. It's a little bit reactive, but it is effective.

These are other methods of training, some internal publications. We have monthly safety bulletins that come out. We have a company newspaper that comes out monthly. We have special, what we call spotlight news, that come out periodically when there's a subject of interest. So any avenue that we could use to educate the people, we try to exploit.

Employee Involvement: As it's been said probably a couple dozen times today is absolutely critical. And there's some reasons for that, and they go well beyond the PR and good will in trying to keep them informed. It's more of a team work approach making them part of the decision-making process. Why? Well, they know the job better than anywhere else. As a manufacturing engineer I am well aware that in any process, there are two separate processes. And one is the process that the engineer envisioned or designed. Then there's the actual process on the floor. And the people on the floor really know that process inside out.

The other thing is they, a lot of times have good suggestions if anyone bothers to ask them. If they think their role is merely following orders, well, they're going to follow orders even if they

know there's a better way to do the job and it's not in the best interest of the company. Ask them for good ideas, and believe me, you'll get ideas.

And the job modifications are much more likely to succeed if you get their input. Because they're more likely to accept and approve on the modifications rather than pick on them and try to make them not work, which happens if you try to force them into it, it's not going to work. Make them part of the process, it will work.

This is how a lot --- it says, you weren't listening. I said, don't fall. That's not employee involvement. This is how a lot of safety programs run. It's not a good way to run a safety program. It's an even worse way to run an ergonomics program. As I said, we have a lot -- we have a 42 health and safety task teams. They run about 15 members each, and they -- most of them meet weekly. The majority of the members are hourly employees, and many of the teams are led by hourly employees. In my opinion, they should all be led hourly employees, and there's a reason for that.

If you think about it, the supervisor or the foreman, he's in charge of the department anyway. So if you have a health and safety task team or an ergonomics program, that program's about change. And if you put the person who's in charge, in charge of that team, well, he's already in charge. You're not going to get new ideas. If you put an hourly person in charge, you're more likely to get new ideas, better ideas.

In addition, if you look at the objectives which is to hurt less people, there are different reasons for that to be an objective. And a lot of times, the management aspect of that is well, we want to save money. We don't want to hurt people, but what you hear more often than not, is saving money, increasing productivity, et cetera. But in my opinion, the hourly employees have a lot more at stake, because it's their own health and well-being.

And I think if you ask yourself what's more important, are we going to meet the quarterly targets for injury or am I going to lose the use of my right arm? I think most people are going to side with the health and safety of their own body. So I think they really have more of a vested interest.

This is one of our task teams. This is the electrical task team. Janice Parker and Melanie Harris are leaders of this team, do a fantastic job. And this is our President, Bill Fricks. We have recognition programs. They won the President's Award last year for outstanding work. I don't like to leave anybody out, so I wanted to go through the rest of the task teams and show them to you. I bet I had a couple of you nervous. But we are proud of all of our task teams, and they really do a fantastic job.

And they have responsibilities. As I said, it's not just PR. They have a lot of responsibilities. They perform inspections of areas. They perform accident investigations, job safety analysis, and they're responsible for coming up with and sometimes implementing job modifications. And as I

said, it's serious work. And a lot of times when they're a member of the team, they don't understand it's serious work. And a lot of people, such as myself, will come in and educate them to get them up to speed, what to look for, what to do.

And when you teach ergonomics, a lot of times, I'll give a textbook type example of a before and after, how to fix it. And somebody will say, whoa, you can't fix these problems. I'll ask for an example, what are some problems out there? They say, oh, there's no way you could fix that problem. And I love hearing that, because I have a simple answer to that. I said, "Well, I'm not going to fix it. You are." I said, "You're not here for no reason. You're here because we need you. We need you to help us fix these problems. If we didn't need you, you wouldn't be here at all."

And just about every time I hear that, that particular problem that that particular individual complained about ends up coming up with a fantastic idea to solve the problem. That happened a lot of different times.

As far as the implementation, I advocate what I like to call low-tech ergonomics which is a common sense approach. Which is when you find a problem, spend less time measuring it and more time fixing it. I'm an engineer. I love high-tech toys. I love computers, all those sorts of things, but sometimes we might get carried away with the analysis. If I see an operation, and I see a guy in an extended risk posture applying a lot of force, I know enough to say, "That's not good, and we have to fix that."

If I buy a bunch of fancy toys, and I find out that it's extended 38.7 degrees and there's 42 pounds of force, it still leads to the same place. I have to fix that job, and there was a problem. So my evaluations are very simple. And what I say, if you can do these four things, your job evaluations are complete enough. And that is to quantify the risks, to highlight the problems, to prioritize and justify workplace modifications. So if you could do these four things, it's an effective evaluation.

I'd like to run through a few case studies of some things that we've done and before and after in most cases. This is an example of -- this is an empty spool, but when this spool is full, it's Mr. Lynch is carrying 35 pounds the way this was. And what this is an automatic welding machine. And as you can see, it has to be loaded over his head which is not good. So a simple fix will lower where you install it. Right. Elbow height is the best height. Again, it's not high-tech but very effective.

I'll tell you a funny story. When I went to the walk-through and I identified this, they modified the machine. And it was about chest height, shoulder height. So being the good guy that I am, I said, "That's a real good job you guys did." I mean, it's much better, because it did lower the risk. However, I kind of told the guy I was with, "You know, it would be better if it was elbow height." And he says, "Hey, you know, you messed it up anyway." But if you go through the shop now, you'll see every one of them at elbow height, not high-tech but very effective.

This is another larger automated welding machine. I mean, you only see about a quarter of the machine here. But the before picture is what you see in yellow, and the after is in orange. And the operation here was the same thing, to load the spool of weld wire on a machine. These spools weigh about 70 pounds. And previously, there was a vertical ladder that the guy had to hold the spool and climb up the vertical ladder. Then when he got to the top -- you see Mr. Kirkland here.

There was a bar where this chain is now, and he'd have to extend over to -- and reach over the bar and bend over to install it. Not very good. So what we did is, obviously, we installed the staircase. So he climbs up the stairs rather than carry it up the vertical ladder. And then we extended the platform so he could belly right up to the work and install it a better posture. Again, not high-tech but very effective.

This is an example of wire feeders that we use. They weight about 66 pounds. The spools weigh about 35 pounds. Carrying them around in the ship units is cumbersome. It's hazardous in addition to the risks of injuries. It tires people out, fatigue, et cetera. So what we're starting to do is get these Gantry units.

This is a Gantry crane that carries nothing but the wire feed units. You can't see it very clearly, but it eliminates the lifting completely. If a bigger unit is under there, they could work on the top part of the unit. Workers are less fatigued. There's also less to trip over. There's less stuff on the deck that people could trip over, reducing a tripping hazard.

This is similar to Karl's. I shared his hate of dogs, and these dogs are used on the acorn table, the welding table, the same as him, to hold these covers. And this is a straightening operation to flatten out these covers so they'd be water tight. And the right way the process is they bang these dogs in place with this big hammer. Then they heat it up with a torch, and then they bang it again with a big hammer until it's straight.

And one little test I like to do when I look at these processes is to look at the process, then look at the calendar. And I say, okay. Well, the calendar says 1997. How old is this process? All right. And if the answer is not at least in the '90's, I say, well, there's probably some room for improvement there.

And what Mr. Cutler came up with was an idea for a straightener table. And this rolls back and forth both in this axis and this axis, and there's a hydraulic ram to use as straightening. So it eliminates a lot of stress on the operator. You get a much higher productivity, and you end up with higher quality products. Right. Very important.

This is another one. We had these chain links that are welded to I-beam sections. And I was teaching class, and I was mentioning how rotation of the form isn't good. It leads to tennis elbow. And this guy, Mr. Galloway, said, "Well, I do that all day." And someone popped up and said, "See, that's a problem you can't fix. You have to do that." I said, "Really, let's go take a

look at it." And after looking at the job, what he's doing is grinding the welds down on either side of the chain.

And when these jobs come in -- he's doing this for months at a time. After looking at the job, looking at the blueprints and consulting with engineering and quality, it turned out that the grinding was totally unnecessary. So by eliminating that process, we significantly improved the productivity, reduced the flow time obviously and proved the product quality because we reduced the risk of over grinding and eliminated the wear and tear on the individual. Like I said, not high-tech but very effective.

This is welding booth application where we started to play with counter-balances. Some of our restricted duty workers work in booths. And what we did is we installed counter-balances to accept the weight of the welding torch. We still have to work on this little bit. As you've heard a lot of times before, ergonomic implementation isn't usually a one time fix. Usually, it takes a couple of iterations to get it just right. What we have to work on here is the harness that holds the torch.

I'll caution you when you use these, because they'll fix one problem and cause another as a lot of ergonomic problems do. And as you know, what a counter-balance is designed to do is accept the weight of the tool. So if you let go of the tool, that tool will be hanging in space wherever you left it. And, therefore, is a hazard because the guy could bump into it.

But what this guy did, on his own initiative, is he manufactured his own holder for the welding torch. So when he's not using it, that goes in the holder, eliminating the hazard, which I think is a very good example of the value of education to the employees, giving them ownership of the process and empowering him to make the changes he needs. Excellent work. I can't see enough of that.

And these are three of the guys who worked on that project, Mr. Sherman and Mr. Moody, Mr. Baker. And if you noticed, in every slide, I try to mention some of the people in there. And the reason is simple. The people is where it's at, and if you don't have the people involved in the ergonomic process, there's a lot of room for improvement. And you're not getting the most out of your program.

This is a fancy chair, and one of the guys in our shipyard named it the "Super Bucket." We have a lot of floor work, and if you're like our shipyard, you have a lot of guys sitting on a five gallon buckets. This chair, you sit on. It looks like it's backwards. This is spring loaded, and there's a padded piece in the chest. It's not a perfect posture to work in, but we have jobs where people do floor level work for months at a time. And where we've used this chair, we have had a guy who said when he takes a break, it will take him five minutes just to stand up straight.

It takes him that long just to loosen up again. With this chair, he gets right up. So it's been real effective. This is just a mock up, just to show how it's used. It could also be used in different

configurations as a conventional chair. You could sit it in it sideways, real important to mix up the posture, and that chair facilitates it. I mean, you could even lay down on the chair and have that on your chest occasionally.

This is a change that we implemented when we had a new crane. Most of our cranes, you have to climb a vertical ladder to get to. This one, we installed stairs. Easier to get up and down to. If somebody -- a restricted worker has a problem with his knee, no vertical ladder. There's no problem, because we have stairs. In addition, it gets hot in the summer. The operator could bring his cooler up with him so he could have Gatorade or whatever on hot days. Little things add up. Little changes make big differences.

In addition, we reconfigured the crane controls. I don't have a before picture for you, but as you can see, these is where the controls were cut off. Previously, he couldn't see what he was doing. He had to twist himself up like a pretzel just to see what he was doing, putting him at risk to an ergonomic injury to his neck and back and increasing the likelihood of an incident with the crane itself.

But we modified it. We moved the chair back so it's a sit/stand workstation. We have the controls where he could use them comfortably, and he could also see what he's doing. This is Mr. Parker. He was real happy after we changed that for him.

This is an example of a typical unit, and some of the things we're trying to do. After identifying problems -- one of the problems, this guy up here is working on top of the unit on his hands and knees. And he's probably working the whole shift on his hands and knees. And down below, you have guys working over head, and more than likely, he's working the whole shift over head.

Neither are real good postures to work in, but if he switches with this guy at lunch time, you reduce your exposure to each of the postures by 50 percent which is an idea we're trying to implement. The workers are very receptive to that idea.

This is a picture of our maintenance department task team. This is Mr. Hugh Byrd, a buddy of mine. And they had a problem with back injuries in their area, and they decided to make a training course so they can train their department in back injuries. And with my help and the help of other people in the department, we helped them make their own training class. I have overhead slides that show back anatomy and this illustrates why we should keep the loads close.

They didn't like the overhead slides. They wanted big posters. So we got a pile of big posters on poster board for them as part of their training. And they went, and they trained 350 people in their department. And the results of that were really fantastic.

These are months, and as you can see, there's about one every month, lost time back injury. And this yellow line represents when we had the training. And in the 16 months following the training, we haven't had one lost time back injury. Very effective. Even more effective when it's

not a safety guy or management guy explaining the back safety to him. It's one of the guys he works with every day explaining it to him. Much more effective. We had the same type of program with our welding, health and safety task team.

We have Mr. Minge here, Pete Nill. Great guys. And they developed -- they had a problem with wrist injuries. When we went from stick welding to wire feed welding, we started to have a lot more wrist injuries, because of a lot less task variety, a lot more static postures. So we did the same type of thing. And what we did was we supply them with training materials. And each member of the team, of which there's 14 members, they received the viewgraph slides.

And, then, in addition, they got the notes pages, with a picture of the viewgraph slides and the important notes. Because a lot of these guys -- I speak in front of people all the time. Some of these guys have never spoken in front of a large group before. They're a little bit intimidated. So they have notes to go by, what to point out for each slide and also a video tape explaining wrist anatomy.

The results we had from that program, not quite as effective. These are the lost time wrist injuries before, ergonomic wrist injuries before. This is the training. Not perfect results, but you can see a significant drop in the number of wrist injuries. And just keep in mind that this is education alone. This is education all by itself, teaching him how to be effective and use his own tools properly.

This is a slide. If you're like any other company, you have manufacturing employees, but you also have office employees which is a source of a lot of trouble. We have an office ergonomics program. It's also been very effective. The results of all this together over the past two years have been very good.

And this is a chart of our lost time injuries, and this is a rate over the last two years. And as you could see, we have it down very significantly. We still have lots of work to do, but the results so far have been very good.

So the conclusion, obviously implementing ergonomics in the maritime industry is an effective way to control musculoskeletal disorders. That concludes my presentation.

This is a picture of the Birmingham during a breaching maneuver.

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### Question and Answer Session

MR. CIMMINO: I'd like to open it up now and have a question and answer session and a round table discussion if we could. If you could, please speak into the microphones. We're all being recorded here. Yes.

Q: My name is Skip Wilson. I'm an ergonomic consultant with the Saunders Group, Minneapolis. I've been working with the Navy for the past seven years helping develop a corporate ergonomics program and implementing it in the last, corporate wise, in the last two years. And it's interesting that at least Karl and Dan who talked about the processes and the program that you put together. We developed a program with the Navy who doesn't build ships, but they repair them and are constantly cutting them apart and putting them back together basically with the same exposures and dangers that you have.

It's interesting that the programs that we develop from totally different starts, beginnings are almost essentially the same in terms of employee involvement and what works and what doesn't work. And I guess that's more of a comment than a question. For those of you who are in this room, if you want a model, the model of employee involvement just works 100 percent of the time. They know the jobs. They know the fixes and -- so good work.

MR. CIMMINO: Great.

Q: And I've spent time at Newport News, Norfolk, in many of the shipyards.

MR. CIMMINO: Okay. Either of you want to comment on that?

MR. ZIEGFRIED: I also believe in employee involvement. Whether it is in shipbuilding or general manufacturing, employee involvement is paramount to the success of the ergonomic process.

MR. CIMMINO: I'd also like to add that you brought up an interesting point which has to do with the maintenance of the product after it's delivered. And I was involved in a course we called "Design for Ergonomics" where we'd look at the ergonomic aspects of product design from the raw materials used to when it's manufactured in components, final assembly, use by the operators, maintenance and, then, finally, dismantling and recycling.

So eventually what you want to do is start with existing manufacturing processes and work your way up stream. And when you get to the design engineers and you could eliminate the problems in design, that's really where you want to be. I'm sorry, go ahead.

Q: That's fine. That's fine. I'm Russ Hayward. I'm with Mobile Oil Corporation, and I wanted to thank all of you for your presentations. They were excellent, but the question I have for you, Dan, is relative to these task teams. Are they based on -- are they from each department or a craft group, or -- just trying to get a sense of how these task teams --

MR. CIMMINO: We have different types of task teams. Some of them all from the same department. For instance, we'll have a welding task team or we'll have a fitting task team, all from the same trade. Then we have other task teams for a particular vessel or a particular building where we'll have a sheet metal building task team or we'll have a sea lift task team. So



different types, some of them all the same trade, some of them cross-functional.

Q: Is it voluntary or do people ask to participate?

MR. CIMMINO: It is volunteer. They're picked, but nobody is forced to participate.

Q: Okay. All right.

MR. CIMMINO: And a lot of times what we do is we find the people who may be complaining about safety or maybe are lax in safety, and those turn out to be our best team members when they start to own the process rather than sit back and take pot shots at everybody else. Very effective.

Q: Thank you.

MR. MCGILL: Dan, let me say something.

MR. CIMMINO: Chico, did you have a comment?

MR. MCGILL: Yeah. I'd like to say that at Ingalls and the teams that we're beginning to put together now, I serve on the steering committee there. One of the things that we looked at real hard was the fact of the team leader. Our teams will be made up of about six individuals, and the team leader and the employees who will be on the team, there will be a total of five hourly employee and one management personnel. And that management personnel will be somebody selected by the team, somebody that they feel very comfortable with and working with.

A lot of times it may be the person in the area that the team is formed. Right now, to begin with, we're having everybody put in like an application for these teams. And we've set a criteria for the hourly employees as far as their seniority and things of that nature, because of the fact that we have a contract in place that has certain provisions that call for that.

But basically, we look at the idea of the team leader being an hourly employee. Just as Dan was talking earlier about Newport News, how he thinks that that would be a good way to do it. So do we. And I think that's where you're going to get your best input from.

Under the National Labor Relations Act, there's certain things that you have to do in order to be able to pass it to where you don't get caught up in the legalistic of having an employee team that was strictly picked by management. Because then you run a foul of some of the National Labor Relations Act, and that's something that had to be kept in mind when we were starting to put our teams together. But as long as the Union, if you're a represented company or the employees involved in that, you get away from that mess to get into.

MR. CIMMINO: Thanks, Chico. Another question?

Q: Yeah, I'm Sean Gallagher from NIOSH, and most of what you were talking about dealt with the process of building the ship itself. I was wonder, is there any over-running of ergonomics into the actual design of the ship itself? Do you deal with people who -- that design the ships in order to make some of these types of changes come about?

MR. CIMMINO: Are we talking about the people actually using the ship?

Q: Yeah, yeah. The people using the ship or the people designing the ship to make some of these processes work.

MR. CIMMINO: I haven't done that. I concentrate on the workers building the ship, and we haven't gotten involved in the usage of the ship with the exception -- as I said earlier, when you work on a ship, you're essentially repeating processes in the manufacture. So when you make it easier to build, you then make it easier to maintain. So that aspect, yes. But the using of the ship aspect, no.

Either of you have a comment on that?

MR. MCGILL: Well, one of the things that the NSRP SP-5 Panel talked about was the fact that -- and if the workmens' compensation cost containment workshop we had was the fact that you have to look at the idea of the end product and what you're using and designing safety into those aspects of things. You know, we're hoping that that's something that they look at in the study that they do, that we're trying to get together. You know, whether that comes about or not, I'm not really sure. But certainly the question has been asked by that panel, and we are looking at that aspect.

Q: Thank you.

MR. CIMMINO: Any other questions? One more.

Q: Joy Flack with OSHA. I want to make one comment. There's a lot of talk about employee involvement, but employee involvement without employee empowerment, you soon lose the involvement. So I think you probably need to use both of those terms. And then the other question I had is when you had the VPP reviews at your facility, did they address ergonomics at their VPP or is that something that you did on your own?

MR. CIMMINO: Okay. I'll hit those one at a time. You're 100 percent correct in that without employee empowerment, involvement is useless. And if you really want to knock the wind out of a group of people, ask them to study a problem and then ignore their results. So absolutely, employee empowerment is critical.

And as far as the VPP, yes, they did look at the ergonomic program, and they awarded us a star. So they must have been happy with it. Any other questions?

MR. CIMMINO: Okay. We're about out of time also. Again, I'd like to thank NIOSH and OSHA for the opportunity to speak here. I'd like to thank my co-chair, Chico McGill and Carl Ziegfried and thank you for attending.

(Whereupon, the Maritime session was concluded.)



## Healthcare

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Welcome by Guy Fragala, Director Environmental Health & Safety  
University of Massachusetts Medical Center

MR. FRAGALA: Welcome this afternoon to today's session on health care. I would like to say good afternoon to you all.

IN UNISON: Good afternoon.

MR. FRAGALA: See, we're trying to get some interaction going. Let me try that again. Good afternoon all.

IN UNISON: Good afternoon!

MR. FRAGALA: That's a little better. So I'm very enthusiastic and pleased to have a chance to come here today to really speak on a problem that's been with us for a long time. That is the occupational injury problem within the health care industry. I've been interested in this in for a while, and I'd like to tell you about a presentation I did in one of my earlier career endeavors. I was giving a presentation on health care ergonomics to an audience of one, and that's the good news.

When I got done my presentation and was leaving, the person in the audience said, "You can't go." And I said, "Well, why not?" And they told me they were the other presenter on the program.

So we were very pleased today to see that we had a good representation from health care. Also, I'm very pleased to see that ergonomics is receiving a lot of attention, because now my mother finally knows what I do. She used to think I was in economics.

Now, when I go down and visit her in Florida, people around the pool don't ask me for financial advice any more. Okay. Now, to get to the problem that we want to discuss and that is ergonomics and health care and the occupational injury problem we have. In case anyone hasn't noticed, the health care industry is one of the leaders with regard to occupational injuries. And the majority of these injuries involve musculoskeletal problems many from patient handling tasks which will be a focus of our presentations today.

We've tried for many years to put in place certain intervention efforts. Many of these have focused on training programs and teaching people how to lift. But these really haven't shown a lot of success in reducing the magnitude of the problem. So I think we need to go further. And I think the time is right. Today, we have interest from management, from labor, from insurance carriers and from regulators to really address a serious problem, that is the musculoskeletal problem within the health care industry. And ergonomics can offer a real good direction for improvement. And I hope we're able to give you folks some good ideas.

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Eric Meittunen, Mayo Clinic

MR. FRAGALA: I'd like to now introduce our first speaker, because our main purpose of today's program is to present some cases where we've seen some successes. So we've tried to get a good mix for you. Our first speaker comes from the Mayo Clinic, a complex acute care system where, if we can put a program in place in such a facility, there are some things we can learn from that for some other types of facilities. Our speaker is Eric Meittunen who is an Environmental and Occupational Safety Coordinator with the Mayo Clinic Systems.

Eric is a relatively newcomer to health and safety, but he's already done some good work. He actually organized a session similar to this for the National Safety Congress in Orlando this year. He has studied occupational safety and health at the graduate level and holds a Masters degree in occupational safety and health. Eric has put in place a good program at his facility, and he'd like to share some of his ideas with you. I'd like to present to, Eric Meittunen.

MR. MEITTUNEN: It's a pleasure to be here. I think we should reflect upon what we learn this morning from the sessions and why this problem is really unique to the health care field. If you'll look at some of the speakers who presented this morning, we had people from Kodak, from Frito Lay and from Samsonite. One of the things that is unique to this problem is that I've never been punched or poked or prodded by any suitcase, Frito Lay bag or potato chips or anything. Not to say that all of our patients are this way, but we're working with a similar or a little different problem, and that's working with humans who actually have feelings and have comfort, too. That's the main result of the main approach of our situation here. We'd like to increase the patient comfort as much as possible.

For ourselves, we took a little different approach to it. Since we are working with patients, we took a quality approach to resolving the back injury problem.

We're utilizing the Gerand continuous improvement approach. This problem of back injuries to indicate the significance of the problem to the organization was nominated as one of Mayo's first continuous improvement projects three and half years ago. So we've been working on a solution to the problem every since. This is basically the Gerand process which we've been working on,

and we are, after three and one-half years, just finishing up now. We're working on remedying the cause. We're just breaking into holding the gains down with some of our implementations.

We'll just briefly give you a little impact statement here. The impact: We're looking for projects which has a potential to increase employee and patient satisfaction. Really, the whole nomination process for continuous improvement wasn't just to reduce back injuries or to have an ergonomic focus. Basically, we're trying to focus on the care of the patient. Primarily, we're looking for projects which have a high urgency and patient contact, and patient care services definitely have this. And then we're looking for projects with different behavioral modification facts, too, which this involved.

Thus, this was nominated as one of the top projects for the Mayo Foundation. Our mission statement was quite vague and ambiguous at first, but we reduced it down to reducing the cost of injuries for nine patient care units. We did not define any specifics as far as back injuries at this time. We just wanted to reduce injuries and the impact on the patient care aspect. We had a diverse team from nursing, administration, preventive medicine, rehabilitation, transport and also safety.

Working through the process, we analyzed our symptoms, and we were looking at injuries by body part. Finger injuries were the number one injury for this group of employees. Back injuries was number two. We looked at the injury cost, wanting the most significant impact for the organization, we found back injuries were identified as the "vital few" or the "main cost" for the organization from a work comp standpoint.

We brainstormed theories with multiple surveys and different group brainstorming sessions, and we found over 110 correlated causes identified with back injuries for care givers. We broke them down into different categories with employee procedures, patient, equipment, and then the environment.

We tested our theories and found that basically our present injury incident form didn't have enough data. So we had to step back, redesign our form, and then we did a sampling of 50 injured staff to help us define the cause of injuries and the root causes. The root causes were identified as lack of staff availability, lack of staff education, and training with follow-ups on technique and equipment, poor use of body mechanics, previous back injuries, obese patients, cluttered patient rooms, lack of staff conditioning, uncoordinated scheduling of patient tests, procedures and also surgery.

This is more on a micro basis, meaning a transporter would show up to take a patient to a test and upon arrival we didn't have enough staff present in the room to assist with the transfer. Thus, the escort or the orderly or the transporter would try to accomplish this by themselves, setting themselves up for injury.

Lack of patient knowledge: And that's not from the patient's standpoint, that's from a care giver's

standpoint. Can this person walk, stand or pivot themselves, or what assistance is going to be needed? And then other expectations during the transfer, too.

Our remedies for the problem were basically two-fold, an education process. We implemented a patient transfer team. The correlated remedy was out-sourcing physical therapy to the patient care units. Not providing and getting assistance or having assistance from an external care provider for physical therapy, but taking the physical therapist to the patient care units, specifically orthopedics. This seemed to reduce the frequency of patient transfers tremendously; and thus, if we're reducing the frequency, we're going to reduce the exposure for the care givers also.

Stepping back to the education process, we were educating three units and measuring our results. One with regular annual training, one with coach and reinforcement training, and the third, with an external consultant as a behavioral reinforcement type of training and who is there to give them reinforcement on a periodic basis. We also implemented the patient transfer team which was modeled after Bill Charney's work at San Francisco General. Bill actually came up and gave us a hand with project.

Our measures of success for the total program are the number and cost of injuries restricted in lost working days. We're getting into the qualitative information with a nurse satisfaction survey, patient satisfaction and then implementing our quality improvements process within the Department of Nursing with our education measures through staff observations. With the education measures and staff observations, we'll talk about that in the next slide.

Patient satisfaction survey: We surveyed 50 patients who were working with, or have been transferred by our transfer team. All of them had been giving favorable results to their team as far as comfort and professionalism is concerned. So coordination and communication does help.

The nurse satisfaction survey: We have results. Restricted and lost working days: We're obtaining those. The measurement period for the patient transfer team was started in September of 1996. So up until this point, our measures of success for the patient transfer team on those six patient care units that we're working with, we've had two injuries on the day shift. We are still observing some injuries on the night, evening, and weekend shifts. So our next process will be to improve the results that we're having on the nights and evening shifts, too.

Then we get into the educational measures. What we tried to accomplish here is to bring this within the Department of Nursing and measure our educational and training processes. We had various indicators such as spinal curves, and the next one is leader coordinated.

We had different specific criteria which we implemented within the Department of Nursing's Quality Assurance Program. They are the ones who are accomplishing the training, and the Nursing Department is also doing the measuring of the observations on a periodic basis within their Quality Assurance Program.



Unit One with no special intervention. Just a sampling of some of the criteria and the results. Basically, all of them have very favorable results. A little bit low on the pure reinforcement. To talk about the significance of the problem and how unique this is, we did hire an external consultant for Unit Two, but this person has basically moved on to a different project.

He has realized that this is a very unique problem, and his process really hasn't worked for health care. He was having some excellent results, but found it rather frustrating. I think that signifies the impact and the dilemmas which we do face. He has a very good reputation for reinforcement types of training in industry, but once you move into the health care field, it's totally different.

Another educational measure criteria. With these educational measures, we have fairly high results. I'll step back one minute. We have fairly high results. However, we are still experiencing moderately high injury rates among all the three units that we're working with. So we're going to measure this for another six months, and then we're going to perhaps combine the two transfer teams and the educational process.

We haven't yet started looking at equipment except for the equipment which is used with the patient transfer team: slider sheets, gate belts and some medi-lifters in areas. The reason is because we wanted the results to remain consistent with past practices.

Thus far, we have over 7,000 transfers without injury to this point. We have over 11,000 transfers that the transfer team has accomplished without injuries to the transfer team. A very positive qualitative information on the nurse satisfaction surveys, their time savers to family and staff. Working with the transfer team, we implemented a pre-work screen with our work rehab group.

We've also accomplished a behavioral interview, looking for people who are very self-confident and able to learn a technique and then promote it out there no matter what the pressures, no matter what the time factors are involved, the other pressures, the environmental pressures involved with patient transfers.

We've developed the orientation and training protocol for the team which is a five week training program, and we've educated nursing in transfer and how to work with them. We've also developed an intra-net --- organizational communication on the World Wide Web, or in this case, Intranet. We call it "Uplifting News."

Communication was the main factor involved for us and the main challenge with implementing a transfer team. These are the survey satisfaction surveys. We had 135 surveys received back from the Department of Nursing. I don't know if you can read that in the back. "Does the patient transfer team respond in a timely manner or fashion to the on-call pager request?" And we have good results: 40 percent "always" and 57 percent "most of the time".

"Does the transfer team accomplish most the cart-to-bed, chair-to-bed and patient fall transfers

between the hours that they are working? And we have, 28 percent "always" and 58 percent "most of the time". So we have fairly high results here.

"Do you feel that the supervision of the team is adequate?" And this is an indication of my work, I guess, so we hope that this is appropriate. I didn't bribe them at all, but it's a 57 percent "always" and a 37 percent "most of the time".

"Does the team interact in a positive manner with patients and families?" Sixty-three percent "always" and thirty-four percent "most of the time".

This is one factor that we really wanted to improve from a qualitative standpoint. We have seven different groups transferring patients within the organization between radiology, test and procedures, surgery and general transport. So it's very challenging.

In the past, the patient would just arrive with that transporter, and the nursing staff or the patient care staff really wouldn't be aware that they were going to return to that unit. So we've increased the efficiency of the organization also. Now, we give a call to the unit secretary. This unit secretary calls the patient transfer team and also notifies the staff that the patient will arrive soon.

"Is the transfer team adopting its transfer activities based on the physical needs of the patients?" 64 percent "always", 34 percent "most of the time". Fairly high results here.

"Does the team interact in a positive manner with you and your colleagues?" Very important, especially in front of the patient. Sixty percent "always" and thirty-five percent "most of the time". We have one or two people who are pessimists, I think.

This is a key question here. "When the transfer team is not present, do you use the transfer techniques as encouraged by the team?" Only 20 percent "always", 58 percent "most of the time", and we have "about half the time" 15 percent, and then we have 2 and 5 percent there. This is an indication that they're not using their techniques which we're promoting. Thus, we are still having the injuries on the off-shifts, too. All the steps that are involved with a patient transfer is very challenging.

"Have you needed to delay a priority to transfer?" This would be a cart-to-bed transfer or perhaps post-surgery. Fairly timely, 54 percent "sometimes" and 32 percent "never". So we can increase the results here, improve the results.

"Have you ever experienced back pain correlated to transferring patients?" And we have a few who have. Let's see, 5 percent "always", 5 percent "most of the time" and 2 percent "about half the time".

Finally, "Is your job physically easier when you do use the transfer team?" We don't have the transfer team accomplishing the transfer by themselves, they're working with the escort and the

nursing staff. Seventy-one percent "always" and twenty percent "most of the time".

In conclusion, we've had fairly good success to this point, and we're looking forward to our final data collection in the spring of this year. Then we can improve the scenario a little bit further and increase the results and try pulling the two together, basically, the education and the transfer team in addition to some newer equipment too this summer.

Thank you very much.

MR. FRAGALA: Thank you very much, Eric, for sharing your program results with us. As we proceed, I'd like you to think about the different aspects of an ergonomics program. Eric's program, again, was an acute care facility, and he really had some successes with administrative controls which are part of the solution process.

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Bernice Owen, University of Wisconsin School of Nursing

MR. FRAGALA: Our next speaker, Dr. Bernice Owen, has really been a pioneer in health care ergonomics. For many years, she's published studies, highlighting the magnitude of the problem in health care. She's also published studies on the effectiveness of some of her ergonomic solutions and has been active in evaluating lifting aid devices. She's at the University of Wisconsin, School of Nursing, and has been there for a number of years. Dr. Owen will talk about the long term care industry and also about some of the engineering controls. So would you join me in welcoming Dr. Bernice Owen.

DR. OWEN: Thank you, Guy. Like Eric and the rest of the team, I'm very glad to be here and have the opportunity to share some of the work that a team of us have been doing. It was really in the mid-80's when some intervention studies began to be done. We've had probably 39 years of descriptive work in the health care setting identifying what the problems are. Most of the studies come back that the major problems relate to the actual handling of patients and residents. That's where the bulk of the back injuries and shoulder injuries occur.

And so, we didn't need any more descriptive studies, although we still have more descriptive coming and more coming. We need a lot of intervention studies. In the mid-80's, then, NIOSH did some work in looking at a number of states with the worker comp reports. That was where they really pulled together the data then that some work needs to be done on intervention in nursing homes, long term care facilities.

And Dr. Garg, who is an industrial engineer from the Milwaukee campus and myself from the

nursing school, with a background in occupational health and safety, and also a nurse who has worked in nursing homes, we, as a team, then were funded by NIOSH to do what was supposed to be a two-year study that ended in being about a five year study, because it took us much longer to do the things we needed to do, and the design had to change.

The design that was suggested in the contract was one that is used in industry where you look at the problem, and then you go to the book and you find the answer. And then you implement the answer, and then you see if it worked. And when we went to the book, the whole answer wasn't there. There are pieces of answers, and we had to put the rest of those pieces together. So why don't I take the first slide. I'm going to quickly share two studies with you. One relates to long term care, and another relates to hospitals. By the way, with the same results. Okay.

At the time when NIOSH did the pulling together of the worker comp data, they found that nursing personnel ranked high with back injuries; (when I say nursing personnel, it was everybody, nurses, nursing assistants, personnel care workers that were involved in patient and resident care). They ranked number five for compensated back injuries in the United States, number five. Now, that means that this primarily female occupation and profession was up there with these very occupations that were very strenuous, manual material laborers, shipbuilders, miscellaneous laborers, garbage collectors, the people who lift all day long. We were up there.

And, consequently, then the contract that came out from NIOSH, the purpose was to reduce back stress for nursing personnel by changing the physical demands of the job. So we were to look at the job and figure out how could that be changed.

Now, I know that you can't see this slide, and I don't want you to see it. But I want you to note that there are a number of squares there. The top square is the goal of trying to determine what are the stressful tasks. And then to the left is another goal of trying to look at ergonomics, doing an ergonomic evaluation. That part of the study, by the way, was about a six month part of the study where we were in the clinical setting very long and very hard hours.

Then we would go to the right, and that is goal number three. Now, if we're going to reduce the physical demands of the job, we're going to have to have assistive devices. So for that goal, where are the assistive devices and what might be best for the problems that we have in this setting? And then down again to the middle of the slide is another part of goal number three. After we find what it is we need in assistive devices, we'll do a pilot to determine if this is going to work. Now, that wasn't really part of the original design, because we were supposed to know the answers.

Then the next square is the goal to do a laboratory study. Because the human subjects committee does not permit you to test out a lot of the unknown. We needed a laboratory study, and that was another whole year which was not accounted for in the original design. And then you go down to the bottom square, and that was to apply what was successful from the laboratory study back with the residents in the nursing home.

Now, the nursing home that we selected for the study was a large county home in southern Wisconsin. And in this nursing home, you primarily had residents who no longer could be taken care of in other nursing homes. They were beyond the capacity of the staff, so they were very, very difficult residents. Many of them had Alzheimer's, and many of them had a number of physical afflictions. So we felt that if we could make some progress in reducing the physical stress in this nursing home, then the results should be a bit more generalizable to those homes where there were less difficult, less taxing residents.

So what did we find? I'm going to tell you what they are. We went to the workers and said, "What are your stressful tasks?" If our job was to reduce the stressfulness, we had to find out what are the tasks that are stressful. The literature already says, patient handling task. Now, can I focus this or do you have to focus that, or is it focused? When you have tri-focals it's really hard to see from the side. You have to look straight on.

What we found, then, from the nursing assistants, and the nursing assistants are primarily the ones who do the lifting and handling of residents in the nursing home. What we found from them and what ranked the highest in stress for all parts of the body (the neck, the shoulder, the low back and the whole body) were transferring tasks; transferring from toilet to chair was ranked first. And then from chair to toilet, and transferring from chair to bed, bed to chair, and then the bathing process and the weighing process. And then it went down from there, lifting residents up in bed, etc.

Now, we knew, and we learned this morning, you don't bite off too much. And we thought, well, why don't we start with the transferring techniques. As you see, the top ones are transferring. Now actually, the weighing one also ended up to be transferring, because they were being transferred onto a weight chair. So those were the tasks we studied.

Goal number two, then, was to go into the clinical setting and really observe, describe these tasks: how frequently are they done, the frequency of three important variables of flexion over 45 degrees, rotation of the torso, and asymmetric lifting. And then, we had bio-mechanical data derived from a bio-mechanical model. NIOSH wanted us to use compressive force to L-5, S-1 as the most important variable of the study. And then there were also environmental variables. And what did we find?

These slides, I'm using for a purpose of helping you to understand the patient handling. They may be offensive to some people. I want you to look at the transfer technique. I had a woman come up and say to me one time I should not use these slides, because her mother was in a nursing home, and she did not want her mother handled in this way. And I do not show you these slides for that purpose. I want to show you what we saw and then what we did about it. And this lifting and handling is not malicious in any way whatsoever. It is not.

Now, this type of manual transfer was done about 96 percent of the time in the six months of observation. We saw a mechanical lift being used several times, and we saw a gait belt used

several times. Otherwise, everything was manual, meaning, without any assistive devices. So what the nursing assistants would do, would be to bend down and grasp the resident under the arms in the axilla area and then vertically lift the resident up; they would either push the chair out of the way or else back up and then pivot around or carry the resident to the bed, and then put the resident on the bed.

Many, many of these residents were not able to bear their own weight or they couldn't follow directions well enough and be predictable enough to bear weight. And you notice that this resident is sitting in a geriatric chair which means that the resident sits down further than in a wheel chair and back further. So the nursing assistant needs to reach down further and back further in grasping the resident, pulling her up to the edge of the chair and then vertically lifting, carrying and putting the resident down on the bed.

Again, now the task is taking place in confined work space. Remember that the first two highly ranked tasks were transferring on and off the toilet. Now, the bathrooms between the rooms were very small. These two nursing assistants are in the bathroom. They're taking this resident out of the wheel chair and going to be placing him on the toilet, there is hardly enough room for everything that's going on in there. Many times they'd push the wheel chair and then pivot around real fast and put the resident down on the toilet.

Now, you do notice that this resident is doing something you'll never want a resident to do or you want to be perceptive that the resident is doing this so you don't have an unexpected happen. And this is typical for a resident to grab and really hang on tight and, of course, she's got the grab bar. Sometimes they grab the armrest of the wheel chair the Geri chair. And if you can, look at the expression of the resident, and I would behoove you to try out on each other at some time this under the exlia transfer. It hurts. It does hurt.

And in addition, the brachial plexus is right in the exlia area. And when you put pressure on that, especially our older frail residents, it is no wonder that sometimes when a transfer is done, the resident will say, "I can't feed myself now, because I can't feel this hand." And it may be so. They may not feel their hand for quite a while as the nerves supplying feeling to the tips of the fingers comes off of that big brachial plexus.

Again, just some more. They're going to be taking the incontinent pad off. So they have lifted this resident up in the bathroom again, and they're holding her while one will reach down and pull her nighty up and take the incontinent pad off and then they will swing her around to the toilet. So there's a lot of lifting and holding. Sometimes the nursing assistants lift by themselves. It's obvious this resident does not bear weight. And think of the physical stress that must be endured by that nursing assistant who's not just pulling the resident out of a wheel chair, but a Geri chair, and doing this alone.

And once in a while, lifts were done this way. In fact, this young man, throughout the observation period, lifted this way, and it did not seem to matter how heavy the resident was.

This resident just decided she wasn't going to walk anymore while being walked to the bathroom by 2 nursing assistants. And so, they're going to take her into the bathroom, but they're going to be carrying her whole weight.

This is called a fireman's carry, and this is one that I learned, and the book will tell you, you only do this in an emergency. If there's a tornado or something and you've got to clear everybody out fast, you might use the fireman's lift technique. There's a bath blanket or sheet underneath the resident, and there are two nursing assistants.

This is a comatose resident, by the way. And they're carrying her way over to the Geri chair. I'm not exactly sure why the chair is so far away.

In addition to the lifting and handling of residents, there is a lot of bending and reaching which gets into a lot of the shoulder stress. There are also some environmental variables. They had placed new tile down on the floor of the bathrooms. It was only an eighth of an inch higher than the room floor but created enough of an impediment so the mechanical lift swayed and tipped. There were also safety bars around the toilets in the bathrooms, so the nursing assistants had to take the resident from the wheel chair or Geri chair around the safety bars and onto the toilet seat.

Okay. So that gives you a clue. I've only shown you some of the things, but it gives you a clue of what we saw. Now, what are we going to do about this in relation to those tasks that we are studying? Well, we had to locate the assistive devices and then do a pilot. What devices did we find? Well, the gait belt is used in many, many long term care facilities and in hospitals. It's a narrow canvas type of belt. Usually one belt fits all, because it is a long belt and has a big loop buckle type closure. But it does give you something to grasp if you've got it on right and tight enough. It gives you something to grasp so that you don't have to tug the resident underneath the arms. So we knew we needed to study the gait belt and the effect that the gait belt would have on the nursing assistant.

In the observation period we studied the pattern that went on in the morning for feeding, toileting and bathing and wondered if there was a way that we could eliminate some of the tasks? We found the pattern was that the residents were washed, dressed, and toileted when they got up, and then pushed down to the cafeteria to eat. And then if it was bath day, they were brought back, toileted again and then taken down to the bath area. If we could transfer onto the shower chair, and that shower chair would fit over the toilet, then they didn't have to transfer on and off the toilet. So we could eliminate some tasks. Eliminating tasks certainly does reduce the force.

Then we wanted a belt that one could use that had actual handles on it. And we worked with a company to change the loops in the front of this belt. Because time is important, we couldn't have the nursing assistants looping and securing several buckles. We needed fast released buckles, and that was called the transfer belt.

This is the most common lift used in hospitals and nursing homes (Hoyer). The handle which is

off to one side, is pumped to activate the hydraulic mechanism for lifting; the sling must stay under the patient. At the time of this study there weren't the prolific number of lifts that there are now. We wanted to test this model of lift because the caregiver could rotate a handle located between her chest and shoulder level and not have to bend to the side. The sling had to stay under the patient with lift also.

This third lift was also a manual/nonbattery-operated lift. The caregiver rotated a wheel located at chest/shoulder level for the lifting process. However, once transferred, the sling did not have to stay under the patient.

So those were the devices we then tested in the lab study. We studied these assistive devices in relation to those seven most stressful tasks e.g., those transfer ones, on and off the toilet, et cetera.

In the laboratory the subjective data we collected was the perceived exertion and physical stress; a tool similar to the board one that was used this morning from zero up to 10 was used and then comfort and security data were collected from the "patients".

(We were using senior nursing students.) We could not use patients or residents of course. So they were our subjects and also our patients. They rated their comfort and security feelings in relation to the use of different devices. We used the bio-mechanical model and, again, our major variable was compressive force.

The methods that we used in studying each of the 7 patients handling tasks (e.g., transfer from wheel chair to toilet) were under the axilla method (that was the method that presently was being used about 96 percent of the time), Gait belts, the walking transfer belt with the quick release buckles that was wide and had some handles on it with one subject making the transfer, this same walking belt but with two subjects making the transfer, (And then we used another kind of a sling, which I'm not going to talk about today), and then the three lifts.

Now, what did we find? Only the circled part is really what I need you to see in this slide - the compressive force to L-5, S-1. Now, the under the axilla lifting method with two people making the transfer, was 4751 newtons of force. Now, that's the average. Only 3400 are allowable by NIOSH. So the under the axilla lift is way over the limit for compressive force to L5/S1. The gait belt was okay. The walking belt with two people, 2,000 newtons. The walking belt with one person, 2,000 or 1,900, and then, that other sling was okay. So this was the most important variable for NIOSH. The under-the-axilla lift should be eliminated in nursing care!

Perceived stress ratings for transfer from toilet to wheel chair; this is subjective data. The scale used here was no stress = zero and nine = extreme stress. For the under the axilla lift, the perceived stress was 7.2; remember nine is the utmost stress. The gait belt, 5.9; so bio-mechanically for compressive force to L-5/S-1, compressive force to the gait belt was okay, but for perceived stress, it was not okay. The Walking isn't without any stress. The



mechanical lift which has an easy sling to put on was 1.8, pretty low. So that was some of the subjective data.

Now, what did our clients (nursing students) think? For a feeling of comfort, the scale was zero to seven; zero being very comfortable and seven, extremely uncomfortable. Comfort, 6.7, almost seven for uncomfortable feeling for the under the axilla lift. And I tell you, it is uncomfortable, and they didn't feel secure with this lift either!

Now, a big thing that's not in our favor is the time element; for the under the exlia lift, it took eight seconds. They didn't have anything to fasten. But now remember, the two people were already in the room. We did not count the time of going to find someone to help.

The "patients" are not comfortable. The gait belt was stressful to the care giver and not comfortable for the "patients." The walking belts were very comfortable, a good feeling of security, and it took 37 seconds to put it on.

The Hoyer lift was quite uncomfortable. If you ever have an opportunity, if you haven't already had the opportunity, get into a Hoyer lift. There are a lot of them around. They tip and are not comfortable. There are many more lifts available today that do not tip and the slings are easier to put on; they are much more comfortable.

The least amount of time needed was for the lift that was most comfortable. It took two and half minutes to put the sling on and to get the resident ("the patient" in this situation) up off the toilet and back into the wheel chair. That includes putting that sling on.

The next part of the study was to take into the nursing home the devices and program we found effective in the laboratory setting. We know we're going to take the lift with the easy to apply sling. We know we're going to take the wide belt with the handles, and we know we're going to bring the shower chair so we can eliminate some tasks. We're going to bring those things that were effective into the nursing home now with the real residents.

We're going to do a teaching program for all three shifts of duty. We've already got management support, and I can't overemphasize that. Management was concerned about the injuries and did want this study to go on. A good patient assessment was essential so that you know what device should be used with which resident. A good communication system was needed so that the nursing assistants knew what they were supposed to do. Adequate devices are important because no one is going to run to other units to try to find equipment.

Major findings from this nursing home study were: "Pre-intervention, there were 82 injuries per 200,000 work hours. Post-intervention, there were 47 injuries per 200,000 work hours." We did not eliminate the injuries, but we decreased them. The rating of perceived exertion was light. And the compressive force to L5/S1 was reduced to acceptable limits.

Now, I just want to touch on a hospital study. Guy tells me I've one minute to do this. Again, we went to the nursing assistants. What are your stressful pasts? Again, they're the same. In and out of bed, on and off the toilet. Here we also had lifting patients off the floor which was not mentioned in the nursing home study. And we also had the horizontal transfers, on and off gurneys and carts which we did not have in the nursing home. At the time of this study we had more mechanical lifts to choose from; this lift has a sling that just goes under the arm. It's great for toileting. Everything is there to work with easily.

This patient here weighed almost 300 pounds, and she would not permit the nursing assistants or nurses to touch her after she had experienced going down to PT and getting out of bed with this lift.

This is called the slipp. It's just silicone lubricant in between two pieces of Gortex-like materials; it reduces the friction. It goes under the draw sheet and you pull the draw sheet and the patient slides easily onto stretcher; it reduces friction. So that was for on and off carts. Most of the mechanical lifts now will indeed go to the floor and you can lift residents, patients up off the floor. And this is that belt that has handles and the quick release buckles.

Toileting in bed also came up as a stressful task and believe it or not, we found a device. The part of the device under the pelvis gets directly pumped up so the pelvis is raised and a special bed pan put underneath. The head of the bed is up just a little bit. Toileting in this manner was very comfortable and very effective. In fact, we couldn't get the patients to have a spill. It was very precise. It fit in there just perfect.

Now we have real patient reaction to the program. These responses are from patients who were unable to bear weight. We're comparing two rural hospitals, a control and an experimental. In looking at the bed to wheel chair task in experimental site, you can see that the patients are very comfortable. They averaged .8 for comfort and 1.0 for feeling of security. (The scale is zero to seven; zero being very comfortable and 7 being extremely uncomfortable, and the same with security.)

And you can look down all the patient handling tasks studied and you see an asterisk which means there is a significant difference between the experimental and control sites with comfort and security responses. Findings for injuries in the experimental hospital, eighteen months pre-intervention, there were 20 injuries, 64 lost work days and 15 restricted days.

In 18 months post-intervention, there were 12 injuries, 3 lost work days and 12 restricted days. So there are still some injuries but we decreased and decreased the severity of those injuries.

So that tells you a little bit about some possible interventions with the use of assistive devices and the whole ergonomic program. It is not just bringing in assistive devices. The staff have to be trained in them. They have to have time to use them. They have to be available. Good patient assessment must be done. It's a total program.

MS. COHEN: Thank you, Bernice. And you all will have a chance to ask Dr. Owen and Eric and our next presenter some questions in just a few minutes.

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Diane Factor, UCLA Labor Occupational Safety and Health Program

MS. COHEN: Our next presenter is Diane Factor. And what Diane is going to share with us is a great example of taking the important research work that Dr. Owen has done and putting it into real application in nursing homes in California.

Diane works with UCLA's Labor Occupational Safety and Health Program out of Los Angeles where she has been working on implementing back injury prevention programs in nursing homes in southern and northern California. She spent the past year loading up a van with samples of lifting equipment and other assisted devices and doing training with all shifts, even for the night shift, like at one o'clock in the morning, she also conducts ergonomic assessments. She's going to be sharing with you some of the successes of that program. Diane.

MS. FACTOR: We received an OSHA targeted training grant in 1995 to look particularly at long term care facilities. And what was so fortunate is because of the work of Dr. Owen and --- and the work of the Service Employees International Union, we had something tangible to go forward with. There really was an ergonomic approach developed for the long term care industry. And I've been an Industrial Hygienist for about 18 years. This was very exciting for me, because there are solutions.

There are solutions here, and so, I was very excited to see if I could really make a change. Because as we've been hearing, change takes a long time and there's a lot of resistance, but this seemed to make so much sense, this approach. We knew in California that as part of the training that certified nurse aids get, it includes a couple of modules on body mechanics. So we knew, even though people were getting training on body mechanics, the rate of injury was still enormous. So we really thought that was even more reason to go with an ergonomic approach, and Dr. Owen showed us some of the technology that she had.

I guess that was the late '80's, and we were even, also fortunate to have available to us technology, you know, now in the mid-90's. So we decided to kind of base our training on the Back Facts Manual developed by the Service Employees International Union. We looked at a number of training programs, and we thought this one was the best. And what we did is in the appendices of that there is a list of manufacturers of assist devices, transfer devices. We called them all, and low and behold, we got a lot of free literature, free videos and actually some free assist devices.

And so, we were able to have, you know what makes the training fun is a lot of show and tell and

hands-on, and that was also something we wanted to do. And then we thought -- oh, don't leave. There's our administrator leaving.

We decided to do outreach to companies directly. We said, well, we'll write a letter to the 600 nursing home facilities in Los Angeles County alone, and, why not? And we also -- we were in an article along with a couple of other people, Jamie as well, in the long term, Contemporary Long Term Care Magazine. And out of that direct mail and article in the magazine, we got calls. We got calls from nursing home administrators, from corporate people saying, we want this program. "We've tried lots of things. We've got safety consultants. We've got safety bingo, you know, that game where, if you don't report, then you get a free T.V. It doesn't work. We were using back lumbar support and worker comp costs are still, you know, over the top, out the roof. We were open." I was amazed, you know, I thought it was great.

It was also, because we're under grant, we didn't, you know, charge for our services. It's a free opportunity. So we began doing walk-through assessments at facilities all around L.A. and some in northern California, and we began working with seven different companies that represent over 100 facilities. And most of them were not represented or organized by unions, but some were. And to make a long story short, we did a lot of initial training.

Now, in our second year, we were refunded in the program to work with three primary companies that showed the most commitment. And one of these companies has union representation with Service Employees International Union. And so, we are in a really unusual and great situation of collaborating the university, the union and the corporation.

This is a company that has 28 facilities just in California. So as we began doing walk around assessments, doing record reviews, we really looked at the workers' comp data, counted injuries, you know, correlated them to, you know, job classification and where people were hurt and how much those injuries cost. And again, I was really impressed at how much nursing home facilities were spending on preventable injuries. So we began what we call our level one training which was designed really to learn from the nurse aids, to find out where they were experiencing pain on the job.

And also, I just wanted to test out if what Dr. Owen said was true in her studies about where people are experiencing pain and why. And low and behold, it matches with what we found in these training sessions. And so, we -- we're always making training a little bit fun and interesting. And so, we developed these ouch stickers, ay stickers (Spanish for ouch) and we have array stickers (Tagalog for ouch) Spanish and English were the primary languages we needed. Particularly in L.A., we needed Spanish, and we gave everybody a sticker, and we got one of the workers to stand up and be our model.

And people got to stick stickers on that person where they were feeling or are feeling pain on the job. And in two seconds, we dispensed with telling the statistics about back injury in the nursing home field. Because the bulk of the stickers were on the lower back, but they did include, you

know, shoulders and the extremities, and people had a lot of fun doing it. What are you doing?

And here was this perfect model, this person standing up with stickers all over him, and we actually started going through the motions of some of what you saw on the slides of the kinds of transfer, and lifting and movements that you have to do on the job and asked people to really -- what we were trying to do is get them to "think ergonomically" about redesigning the work, not just how they do it, because they have to lift people and they have to do, you know, this work but how these tasks could be done differently.

And we would rate the task they do.

We used Dr. Owen's list of transfer task, that priority list, and we asked them to rate it in terms of discomfort using that lickert scale zero to 10, zero being nothing at all, 10 being very hard. We also used another checklist with the same listing of tasks and we asked frequency. And what people began to realize is that they were doing some of these tasks 50, 60, 75 times a shift, one task. Then you'd add them up, the frequency of doing these tasks, you know, cumulative on a shift. Okay. And we were getting people doing a 100, 150, 200 tasks that put their back at risk on one shift. So they began to see, that's why my back hurts. Okay.

It was very, very interesting, and it also worked getting the supervision to understand what was going on and getting corporate people to think, maybe we need to re-look at how we're doing the job. So then our second level training is regarding the controls, and we purchased a couple ergonomically designed lifts, and we purchased a slip sheet that Dr. Owen showed you. We got the walking belts, the gate belts and the pelvic lift for in-bed toileting. And now I-- if you could put on the first slide.

And we designed a training where we set up stations, and the workers came in and they got to try out on each other all of these kinds of assist devices. And then what we had them do is think about your task and think about where you might be able to use an assist device. And in this facility, we had a lot of people working alone. We also found we had a lot of young workers. And so, this woman is going to get this woman out of bed by herself, and you can see she's a large resident. And she put her on a shower chair. That was good. And took her into the bathroom. And there's a picture of the shower chair which I thought was a pretty good one at that facility, easy to clean, stable.

But we showed -- this is a standing lift. This is in our training, and you can see Dr. Owen in the background. She was able to come out and help us in this training session. This is how that lift could do that task, lifting that patient up and putting her over the toilet. So you see Dr. Owen working with a nursing home worker talking about the pros and cons of this lift. And needless to say, people really liked the equipment, and they tried it out. They're all electric. They have batteries that you plug in at night and recharge. They're beautifully made pieces of equipment.

There's Dr. Owen showing someone how to do the kind of kinetic lift with the walking belt. You

get a good shot of her hand on the handle. So actually you're giving people, you know, ergonomically designed handles, something we weren't given at birth. And everybody got a chance in the training to lift each other and experience how else the job could be done. The training had to be experienced based so people would be open.

This is similar to Dr. Owen's picture of two people lifting a resident out of a wheel chair and turning her and putting her back to bed. It took a long time.

Here's another two person lift. Many steps. Getting her back to bed, leaning over, getting her comfortable. Tedious, very tedious work. You know, I've been in a lot of different industries. I primarily have worked in the manufacturing sector. This totally impresses me as one of the hardest jobs I've ever seen. These nurse aids work extremely hard. It's not only physically taxing, but emotionally taxing as well, caring for people. There they are working with a resident.

Now, this is the other lift. It's a much better version of the Hoyer lift. We also heard from companies a lot of horror stories about Hoyer lifts that had broken, dropped patients, tipped, people breaking -- residents breaking their hips after they fell out of a Hoyer. They have those chains. I mean, the whole thing. These lifts are designed so much better. They're electric. The slings are well-designed.

In our training session, we actually let people lift each other up out of chairs, feel how secure they felt in the sling, put it on and play with it. Shows a very simple panel, you know, on/off, up/down and also, you push a button and it weighs the patient. So it eliminates the whole task of putting somebody on a weight chair or a scale. You just hit the button. They would always hit the button on me in the training which I didn't like that.

And this is a woman -- this is a comatose patient who's very constricted. She's very rigid, and she soiled the bed. So she's changing her attends pad and changing the bed. It took about 25 minutes to gently roll this woman back and forth to try to clean her. You know, she sleeps with a pillow between her legs. She's very -- and then leaning over the top of the bed to lift her back up into.

I mean, this took a long time. And you just see, going around the side, lifting, pulling, pushing, nudging. She gave her wonderful care, but it was at her expense. And you could see that the lift we show in the training could be used to lift a person like that right up in the hospital bed and then you change the linens. You could clean them off. Some of the slings are porous, you know, you can use them for washing someone.

This is a couple of my co-workers who are kind of staging this for us, because we weren't able to use residents yet. But it just makes so much sense. It's just incredible. And also you can use the sling and this lift to get someone off the floor which is one of the most difficult tasks and one we saw associated with the number of injuries.

Here is another task -- pulling a resident up in bed. I mean, if you have kids, you know, sometimes you come in the morning, they're all scooted down in bed. Well, that happens a lot with residents in nursing homes. And so, here's two people lifting her under the arms to scoot her back up in bed. Not easy. They're lifting her up in bed. She's more constricted. And a lot of times, they do this alone, again, reaching over the top. It just looks so hard. Pulling her up. And so, that's where -- what Dr. Owen showed you. This slip sheet really works. You put it under the draw sheet, and it just eliminates a lot of the friction.

Here we are in a training session, using it on each other, slipping each other back and forth, up and down.

Here's another training session where we got to do that.

And finally our favorite training device, because you can imagine there's a lot of humor associated with this device where you pump up the pelvis. We would pump each other's pelvis up and feel how, you know, basically spongy bed pan worked. And it really does work. We covered the faces to protect the innocence here, but I thought they were pretty good sports to be the models in this, a really great device. I guess that's it on my slides. Thank you.

So incorporated that into the training. It made the training lively. It was really exciting for people to do. And then we gave each worker this little grid or work sheet. And we also have it in Spanish. And we asked them to list on the column on the left the room number and bed, like 16C or 20C, of all the residents they worked with. We asked them some basic questions about the condition of that patient, whether they were non-weight bearing, excessive body weight, combative, mentally impaired, unstable walking, some other special medical problem so that they would begin to think about when it might be appropriate or not appropriate to use a certain assistive device.

And then we have them check which lift, or stand, or belt, slip sheet or pelvic lift might work with that resident. And I can't tell you the value of this information. The only way we could have gotten this information is through working directly with the nurse aids. By observation, I could never have gotten this.

So we accumulated all this data in this one facility where we were working by station. So we know whether we have 48 residents in one station. This nursing home has five stations. Thirty-eight of them are non-weight bearing. We know the staffing levels on the day, the p.m. and the night shift, the ratio between resident and CNA. We know what people said they felt were the more risky task, where they had a high discomfort which validated Dr. Owen's work again, the transfers, shower chair to chair, chair to bed, bed to chair.

We knew what injuries had happened on that station in the last couple of years, injuries at work, cumulative trauma to back from patient transfer. We also got some numbers about which patients could use different assistive devices. Now what we're trying to do is to come up with a

proposal of what equipment we would propose that that facility buy per station and maybe even how many walking belts, slip sheets, and lift stands. This data is really being collected and put together by the Health and Safety Committee which is made up of workers and front level management.

We actually think that it will be a pretty modest proposal financially compared to what they're spending on back injuries. And so, what we hope to do in the next few months is actually have intervention in this one particular facility. We're working with a couple of other companies and then looking again to see how the injuries have been reduced and looking at both patient and worker discomfort surveys to see how that changed.

So thank you very much, and I'm available for questions.

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### Question and Answer Session

MS. COHEN: I know it's very close to three o'clock, but we're willing to stay until part of the break time if you guys are willing to do that and especially if you have any questions or comments for any of our three panelists. And we'd also like to hear about your success stories. We know that all of you all have been working on different ergonomic interventions where you work, and we'd really like to hear about what's been working in your different facilities as well as asking questions of our panelists.

Q: Hi, I'm Beth Stole, and I'm from Mimic Safety Services in the State of Maine. And I can tell you that our conditions were a little bit different than some that were going on here. For instance, in 1993, we had a new state fund, because we only had one insurance company in our state because we were so bad. That wasn't just health care, that was everything. And at the same time, we had the OSHA 200 pilot program where many of our health care facilities were identified as either poor or good performance, however you want to look at it.

So I think the motivation for people to correct, especially in health care, their facilities and their situation was very different. We had time factors where we had to move, and we, as an insurance company, decided to promote a no lift policy which is using the data and the support of programs that you've talked about here and; in fact, implemented a program very similar to what Diane did.

The thing that we did differently was that we had ergonomic team training which really got into the process. When we first started that process, we had diverse teams, that is, not just nursing was involved, but we had another section that was extra for nursing where we really got into the patient handling issues. One of the things that we found, and this is where the question comes in, because we have shown results that by using mechanical lifts, we went to a no lift policy, use of mechanical lifts, uses of all these devices.



One of the things we found was that our most professional staff members, and I'm a nurse, so I can say this, were the most resistant. I guess that goes back to what Eric says about resistance to change. Nobody has talked about (other than the fact that nursing isn't really in this room too much today) how do you overcome that cultural change, the processing that we need to do in nursing rapidly, because that to me is where our problem really lies.

You can get the nursing aids to participate. I mean, we're shooting them like flies out there, you know. It's nursing where the problem is that won't take the responsibility for the assessment for defining the equipment and the environment and everything else that we need to work on.

DR. OWEN: I guess I can say it, too, because I'm a nurse. That has been my biggest problem, too, nursing and the attitude. But nurses have usually gone into nursing to take care of others and often they do not take care of themselves. They are the ones who do not report injuries, and you can say, "Do you hurt at all?" They will say "Yes" but accept it as part of the job. One time after a presentation I gave, a nurse came up to me and gave me a button that said, "If you do not have back problems, you are not carrying your share of the load." And I think that kind of tells us something in a nutshell.

But I'll tell you what they're doing in England and the European united community. In '92, they had very strict directives that came out about the lifting and handling of patients, and nothing happened.

In 1996, directives came out from the Royal College of Nursing where nursing is taking the stand now and saying, thou shalt not lift patients. And they really have a no lift policy. A nurse can lose her or his license if this is not followed. The under the axilla transfer is called the "drag," and that is out. One can lose her or his license for doing the drag. And if a patient still must be manually lifted, criteria has to be set out explaining why.

What the action will be over time to get to this no lift of patients is a big question but nursing, professional nursing has been the most difficult to work with because of their attitudes. And I'm sorry to say that, but I feel often that I'm a voice crying in the wilderness for nursing.

Q: I would totally agree with that, and I think one of the things that did help us a little bit in Maine was that the OSHA program stated very clearly to the health care facilities that you will have written policies and procedures regarding patient handling. So it forced the management of those organizations to look at written policy and procedures. And so, they kind of dragged the nurses along screaming and kicking. I mean, we're still not there in some facilities, but that was at least a help. We got management support from other management other than nursing.

MS. FACTOR: I just wanted to add, in the long term care facilities that I've been working in, there aren't many nurses.

Q: Absolutely. That's why we get it to work.

MS. FACTOR: Yeah, it may be one R.N. per facility, and she's not doing a lot of patient care. She's more of a supervisor, but in California when we started, we were very close to having an ergonomics standard in the State of California. And that process was politically short-circuited in our state. I think that the main reason employers called us and wanted to participate was because of the cost, but I also think they knew a regulation was in the pike and coming down, and they wanted to be ahead of the game. I think that's very important, and I really hope that we get back on track.

Q : I come from a multi-facility. I have home health care. I have two nursing homes, and an acute care also. But a couple of things: One, I was interested in seeing those pictures of everyone lifting these poor patients under the arms. Has there ever been a study done on the number of injuries to nursing home patients as a result of that type of care? And two, I saw in one of your slides, the Beasy board, and no one mentioned that today. I wondered if anyone's had any experience, good, bad, or indifferent with the Beasy board.

The other thing is, I see a lot of problems within the nursing home as we talked a lot about lifts for a majority of these patients and a no lift policy, but that is a contradiction to a lot of families and physicians. They feel that that patient is going to get better. That they're going to be able to walk, or they have this mindset that they are capable of standing and doing things on their own. And so, then there's a controversy with family and physicians saying that they don't need that lift. Has anybody run into those type of things?

DR. OWEN: You have about five things within one. I'd like to speak to the last one that you talked about. If I encapsulate it incorrectly, tell me. How can the rehabilitation of the resident or the patient continue if you're going to put them in a lift? I get asked that all the time. Now, there are so many different kinds of lifts that you can continue with the rehabilitation of the patient. Even the CNA's, the certified nursing assistants who do not have a rehab background (they are not the restorative aids) can help to carry out the rehab plan.

The patients do not have to go backwards in therapy since we have the mechanical lifts that they can stand in, they can walk in and they can't fall down because the lift holds them up, and there's many different kinds now. I think that we can eliminate that kind of concern now, because we have the equipment that takes care of that.

I don't know of any studies that have been done on the tabulation of injuries in relation to the under axilla lift. I know a lot is hidden in terms of injuries, and I forgot your third question.

Q : It was on the Beasy board.

DR. OWEN: The Beasy board. It is a hard plastic type of a transfer board that's got a disk in it that runs on a little track. You should have upper body strength in order to use a transfer board for one thing. I can't say a lot about it. I have not studied it. I have heard pros and cons with it.

MS. FACTOR: We were given a free one and our experience with it in a couple of our initial training was that we could never get it to work. I don't know if that was us or the board. But I wasn't comfortable in using it in training.

Q: I have a couple of questions. I'm Susan Wilburn from the American Nurses Association. One, I had a call last week from a nurse who was injured, an operating room nurse, who said that her institution told her she couldn't come back to work until she could lift 250 pounds and push or pull 1,500 pounds. She sent me the ad from the newspaper, and they were advertising for operating room nurses. The ad said that that was the physical requirement of the job.

I'm wondering if any or all of you would like to comment on your advice to the administration and the institution as well as -- this nurse is represented by the State Nurse's Association as her union. And my second question -- no, I do want to hear your comments.

My second question is for Eric or for any of you. Are you seeing the increase in use of transport teams in institutions, and what kind of data do you find persuasive in terms of how many lifts per day? I was also wondering in your study, before you implemented the transport team, how many lifts on average were occurring in the institution?

MR. MEITTUNEN: I guess I have to respond to all of the above. First, I'll say good luck. Good luck finding an employee. As far as the data is concerned, I guess pre-team implementation, we did a survey of all the patient transfers 24 hours a day among the six patient care units that we've worked with. We found that upwards of 3,000 transfers in a week are taking place, and we measured the date as well as the time to see when we should schedule this transfer team. Should we schedule them during the day, at night, on weekends? We found that the most transfers occur between 8 and 4:30, so thus our time was established.

We have two teams established in a staggered start time so we can cover more of the transfers. Actually, some of them were coming in. So from a team standpoint, we're doing approximately 60 to 90 transfers a day, and that's with four individuals who should be there. In some cases, we're down to two people because of vacations.

When Bill Charney came to the organization to look at our data, he was very surprised, too. We get our patients up and moving a lot compared to what Bill's doing. So, our transfer team is doing more work than Bill's team. We still have the successful results. Bill has two men working for him, and we heard all women, and we based our criteria on the interview and also a pre-work screen. Mainly, they're confident in teaching these techniques to others.

I found, just relating back to the first question, whenever I go into an area, especially if I'm working with nurses, I ask the supervisor for the most negative and skeptical individuals to speak with first. If you can convince them that this is important, you've got it made. You don't have any problem after that, because they're going to influence everybody else.

With training, traditionally, safety is different than everything else that we've accomplish. Say you have a nursing personnel on a nursing staff who's trained, the safety aspect seems to be treated a little bit differently than other competencies. We're going to start with training the staff before we establish our competency.

Within the next couple of years, we're going to have competency at Mayo for transferring patients which would give them an overview of the availability of equipment as well as the types of techniques, bringing it back to nursing so it really isn't treated as though it's a safety or ergonomic problem or training. It's within the department of nursing, just one of those extra competencies which we have to pass in order to work in the organization in patient care.

MS. COHEN: Does anyone else want to respond to Susan's first part about the ad?

DR. OWEN: I do, because I have been asked that many, many times. And what I've done is I've sent them a copy of the article on ergonomics on the revised NIOSH formula telling them that the formula was never devised for patient care, but look what industry expects when you're loading boxes. And then point out all the variables that are important. That the weight is right in front of you and all of these others where none of it relates to patient care. You would be down to minus, I don't know how many pounds, if you ever applied that to patient care.

And that's what I do, because it's only a max of 51 pounds in industry, how could they go to 250? I've never been asked about 250. I've been asked about 100 pounds, not 250.

Q: Hi, I'm Carol Brodsky. I'm a safety investigator for Minnesota OSHA. First of all, on response to the slides, I've been there, done that. I was a nursing home worker before I became an investigator. Actually, the toughest job I ever had was a Peace Corp worker, and it still is. But that rates second as a nursing home nursing aid. It motivated me on to go on to other things in life. Anyway, my salute to the SCIU workers and all those who are out there in the front lines. In the State of Minnesota, we had a meat packing emphasis program, inspected 26 facilities over a scope of about four to five years targeting ergonomics, had great results. It's too bad that we started with the meat packing industry first versus the health care industry. They've made great strides, and a lot of it was done.

Sure, we had to do a few of the general duty citations, but after a while what was great was that the industry responded immensely, and just did some minor citations with great results. The industry does want to work, but they are looking to a lot of us for assistance and help, including, you know, the vices, et cetera. A lot of people are coming up with their own great results in terms of innovative ways to reduce the hazard.

The other thing that I have found, even with our other ergonomic inspections that are non-related to meat packing, when talking to health care workers, and this is no disrespect to the person who said, "You know, if you haven't had a worker back injury, you haven't carried your load". You know if you can talk to those employees who have worked for 20 years without a back injury and

find out what they've been doing and how they've been doing it, it's worth your time to sit down and talk to them, including inspectors, anybody there. Because there's a wealth of knowledge to be shared with those people. Everyone can benefit if you take the time to work and with them. Thanks.

MS. COHEN: Any other questions or comments?

Q: My name is Mike Halter. I work with Marsha McClaudin. This is a question directed to Eric and relates to the patient transfer teams. Could you give us a little more insight into the dynamics of the team? Who's on the team, where they're located, how long it generally takes to get them, what sort of training they have, what sort of equipment they come with, if they're doing manual transfers or if they're Sara lifts or transfer bags?

MR. MEITTUNEN: We have a diverse background from environmental services, our janitorial is what we're calling it, and also nursing assistance. I would suggest if anybody implements a patient transfer team to obtain somebody with a nursing assistant background or a patient care background. Not to say that the two of the staff who come from the environmental services background aren't competent, it's just easier to transition to patient care if you do have some background, especially with the new ruling in organization.

We're on a pager call system, so we have six units which weren't selected based on their geographic location. It was based on the injury rates that we're working with. And we've implemented that, so there's a huge distance between the patient care units. The timeliness is unbelievable, they have to really cruise down the halls in order to arrive on time. We have a paging system, numeric pagers, based on priorities. Priority one is a fall. Priority two is a cart to bed. Three could be a boost up in bed or another type of transfer. And four is an obese patient.

We have implemented eye-beams in several units with modified engine hoists in several of our units, especially the general medical areas. This seemed to help, especially in dealing with some of the larger patients. We had one who was 850 pounds last year, and this person, within the first month before we moved him to this unit, caused four back injuries. So it's really significant.

We've developed a five-week training package which is everything from caregiver relations to a whole week of just technique. We train four people just on techniques alone for a whole week. We also start them out with exercises just like Bill Charney's group does. So they're paid to exercise in the morning in warm up. The equipment we're using is just the basic equipment. We're using some medi-lifters. This is equipment that we were using before, and we haven't even looked at that yet.

We've brought in equipment, or I have, and it's gone the next week, things disappear. Gait belts, they make great luggage holders so they disappear. As a part of the process, we know we want to restock these within the patient rooms and make sure it's convenient and accessible, but we're using the gait belts, medi-lifters, and slider sheets which is similar to the slip sheet that Bernice

spoke about.

We're looking at other types of equipment, too, but we really haven't looked at the engineering aspects yet. Because we simply lose it a lot of times. It's so large of an organization that it disappears, so we want to make sure that the equipment is right and then we can implement it.

Q: When your transfer team is there, your nurses and nursing assistants do none of the transfers? All of the transfers are done by the transfer team?

MR. MEITTUNEN: It's a policy that the nurse has to be present. The nurse is in charge of the patient. The lift team is in charge of the transfer itself. And the orderly or escort or transporter is in charge of their equipment. Everybody has their roles, and based on behaviors, from the past, the nurse has suggested that they're in charge of the patient and the transporters have let it be known that they're in charge of their own equipment. So that's the way it goes, it's quite complicated. The coordination is unique every time.

Q: I'm Louise Nelson with Swedish American Health System in Rockford, Illinois. I just wanted to share something that we did. I've heard comments about nurses being resistant. I'm a nurse myself, so I can comment on this as well. Part of the process that you mentioned, Eric, in your presentation was we went to the TQM CQI philosophy or we went to the nurses, because we also found them to be the most difficult people to work with and brought them together to come up with a solution.

One of the things that we've done is what we're calling a re-engineering - such as bringing the physical therapist to the floors so they're going specifically to the units instead of the patients having to go to the physical therapy department. We've been able to decrease our transfers tremendously by that approach. And I think that by going to the nurses directly many of you are saying that nurses are a hard nut to crack, I agree that they are.

Nurses are probably the hardest people to deal with because they don't want anybody to tell them how to do it. If you involve them in that decision, that's certainly very positive.

But rather than having lift teams as you're talking about, we developed what we call team lifts. So as each department, you know, in particular, ortho-neuro, they probably have the hardest lifting of any department in a hospital. No one is allowed to do a lift by themselves. If there's any lifting to be done, they'll team lift, room 316, or whatever it is. Everybody is just expected to go participate and as a result, we have cut our back injuries by over 75 percent.

MR. MEITTUNEN: That's great.

DR. OWEN: That's great.

MS. FACTOR: Great.

DR. OWEN: In support of nursing, in our hospital study, the nurses were very cooperative, but how we did that was through a QA study, because we were looking at the effect of the change on patient care. And they did a really good job, and there definitely was a lot of cooperation; the ergonomic program did improve the quality of patient care from the nurses' perception and from

the patient's perception. Those nurses were very cooperative for they were doing it for the patients.

MR. MEITTUNEN: We seem to be bashing nurses, and I have to say that I think they are the best advocates right now. It takes some time, but once they understand that the benefits of safety in ergonomics industrial hygiene, they're some of the best supporters throughout the organization. We also, on our other units, implement this.

The lift team overhear pager announcements, but we've found that some people have selective hearing and move in the other direction when there's a lift called. So we've had marginal results with that, but it seems to have worked in some units. It depends on the morale of that group or that patient care unit.

MS. COHEN: We're going to try to summarize this session very quickly since we're so over time. Turn it back to Guy.

MR. FRAGALA: Thanks, Jamie and thanks to everyone who presented and participated. I just want to make a very brief closing statement.

We, in the health care industry, are charged with caring for and curing the sick of our society. Yet, if you'll look at the way we've treated our workers, we're really behind the times. We're not a leader with regard to our occupational safety programs, and I think we need to do a lot of catching up. If this conference was held a few years ago, we probably wouldn't have been included as a group. So I want to thank NIOSH and OSHA for including the health care industry as a group that needs ergonomics programs, and I hope that the program today was helpful to you and gave you some insights, because we need to look at the way our work is done.

We really need to re-engineer the job tasks that we have in health care. We need to change the way that work is being done. So you've begun to see some ideas, and we need to move much further very, very rapidly. Again, I want thank you all. Jamie, do you have anything else you want to add? Okay. We're going to have a closing session where all of the industries come together. It's going to happen in about five minutes, so you may want to get over there. Thanks again, and I hope this was worthwhile.

(Whereupon, the Health Care session was concluded.)



## Training

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Laura Stock, University of California

MS. STOCK: I guess we're going to get started right on time, because we have a lot of speakers and we want to be sure to have enough time at the end for a discussion. My name is Laura Stock, and I'm the Associate Director of the Labor Occupational Health Program in Berkeley. We're part of the School of Public Health, University of California. And I've been involved in doing training on ergonomics for workers and joint labor management, committees and professionals and academic groups for the past 13 years or so. And also been involved in a lot of policy development work which people may or may not been following. It's been a lot of activity in California recently.

California just passed, I guess, the first ergonomics standard just about a month ago and was about to be implemented this month except just last week, the Office of Administrative Law in California returned it to the Standards Board, asking them to start over and do it again because of certain problems with that standard. And we're not going to cover those issues, now but I'd be happy to discuss anything people had questions about that at any time later.

While there's been a lot of controversy about ergonomics over the last couple of years, almost everybody has agreed that training is an important element of any comprehensive program. It's been the one area in which a lot of people have agreed. But to despite this almost universal acceptance of the importance of training, there is still a great variety in how people define that training and what goals and objectives that training is designed to meet. To some managers who believe that workers have a very limited role in addressing health and safety on the job, training is really meant to educate workers about company health and safety policies and to get workers to comply with existing safety rules.

In contrast, others like those who are going to be speaking to you today, recognize that workers have a very critical role to play in any comprehensive ergonomics program. And that workers are, in fact, the experts when it comes to identifying hazards and identifying solutions. They know that technical experts do not know the job from daily experience, and they cannot possibly anticipate the full range of problems and the full range of potential solutions.

Good training can unleash the wealth of knowledge held by workers and has as its goal to empower workers to be active participants in all elements of a comprehensive program. This kind of training not only involves setting action oriented objectives but also using participatory training methods that incorporate adult education principles. It draws on the expertise of learners

and provides opportunities for participants to practice using information and skills that they're learning.

We're going to be able to hear how this kind of training has not only enhanced but made possible effective ergonomic programs. I would like to make one final comment which is that while training is necessary, we also know that training is not sufficient. There are unfortunately too many examples of companies for whom training is the only hazard control strategy. For example, there's the back injury prevention program that uses only training and safe lifting techniques as a strategy to control back injuries.

Clearly, training has to be part of a larger program that focuses on changing not just individual behavior but on hazardous working conditions. And again, we're fortunate to be able to hear from people today who are involved in that kind of training.

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Paula Coleman, Carpenters Health and Safety Fund

MS. STOCK: So with those remarks, I'd like to introduce our first panelist. Paula Coleman is with the Carpenter's Health and Safety Fund. She's been working for 17 years in the field of occupational safety and health with a number of different unions from ILGWU all the way to the Carpenter's and she has written ergonomic training program and manuals and developed and conduct "Train the Trainer Programs" for union members to encourage interaction and problem solving. She's also written manuals on hazardous waste and protection and confined space. I'd like to introduce Paula Coleman.

MS. COLEMAN: Thank you, Laura. Good afternoon. What I'd like to do this afternoon is just give you a brief overview of the training program that the Carpenter's Union Health and Safety Fund developed with funding from NIOSH. We were given the funding in 1992 to develop a training program and then to evaluate the effectiveness of that training in reducing work related musculoskeletal disorders among carpenters.

Because ergonomists in the program knew nothing about construction, and the carpenters knew about ergonomics, and neither group knew how to teach it, we created a focus group with representatives from labor, management, joint apprenticeship training schools and the safety and health research and assessment program at the Department of Labor and Industries in Washington State. This focus group helped the Health and Safety Fund's ergonomist and the curriculum writer to develop the program.

Despite some wrong turns and some dead ends, the focus group over these four years of the grant was able to accomplish quite a lot. We assessed the musculoskeletal risks of construction carpentry. We developed a four-hour ergonomics awareness training program for apprentices. We chose apprentices, because they're the future of the industry but also they're a captive

audience. We produced a student manual and pocket guide on ergonomics and booklets on concrete form work and drywall. And we evaluated some various tools that are being market as ergonomically designed. Finally, we conducted post-training interviews with apprentices and contractors who had participated in the awareness program.

We wanted to find out what the training impact had been and also what suggestions apprentices had for making construction carpentry easier and safer.

The original study plan that we developed for calls for three study groups. Group I would receive ergonomics awareness training. Group II would receive ergonomics awareness training and what we called without really knowing what we meant, integrated ergonomics training. And the third group would not get any ergonomics training at all. To evaluate the effectiveness, we would then compare cumulative trauma disorder claims among the three groups. This data, when analyzed, will be helpful. But as an indication of the effectiveness of this training, I believe that this scientific model is flawed.

It's not clear that the effectiveness of training in reducing CTD's can be measured by looking at workers' comp and health and welfare claims. How can four hours of training affect the development of CTD's when the conditions to which carpenters are exposed remain the same? Training apprentices to recognize risk factors does not translate into the significant work site changes that are needed to reduce work related CTD's. Unless conditions on construction sites change conditions which include tools, equipment, organization, layout, specialization, storage of materials, delivery of materials, housekeeping and bidding procedures, trained carpenters, especially apprentices, are not going to be able to adopt the risk reducing behaviors they've learned.

Though the funding was for development, implementation and training evaluation only, we first needed to understand what the risk factors were for construction carpenters. Is there risk? Is their work repetitive enough to produce CTD's? Is hammering the problem? Are CTD's even an issue when compared to falls and being struck by objects. To find out, we asked carpenters to self report their musculoskeletal symptoms. Seventy-one percent reported pain in at least one body part.

Developing the curriculum (I was the curriculum writer), I wanted to make sure that we did not have a four hour lecture on bio-mechanics and the NIOSH lifting fomula. I actually didn't want any kind of a lecture at all. We wanted students to become involved in the training. We wanted them to be active in the classroom and then active on the job site in protecting their own bodies. We wanted apprentices to recognize the risk factors of any job they were given. To recognize the signs and symptoms of CTD's and to understand the long term consequences of lack of treatment and prevention.

Mainly, we wanted participants to think about how to change their work to reduce the risk of

developing CTD's.

MS. COLEMAN: Here's a quick example of one way to teach about risk factors. This is something you're all going to do. You have to work with the person sitting next to you.

MS. COLEMAN: Okay. What you need to do. And, Laura, maybe you can do this with me. Okay. Somebody holds a pen straight out in front of you in your hand in sort of a neutral power grip. The person sitting next to you has to try and pull that pen out of your hand. Okay. Now, bend your wrist all the way down, all the way down and now try and pull that pen ---

If you want, you can reverse roles so you see what it feels like.

MS. COLEMAN: So what risk factor does that teach? Awkward posture. That's the kind of posture carpenters are in all day long. It is enormously fatiguing. Although our training also includes many physical activities, the most valuable aspect of the training has students working together in small groups to evaluate their own activities in terms of CTD risks. They develop alternative work practices which, without reducing productivity, reduce the risks to which they are exposed. Students working in small groups select one tool which they believe requires redesigning in order to reduce their risks.

These designs have produced everything from a nailer with the comfort of a golf cart to realistic easily implemented improvements which would reduce external contact stress, overhead work, repetitive large motions of the arm and shoulder, relieve trigger finger, redistribute weight and balance and allows ground level work to be done from a standing position. A few of those tool designs are over there on the wall. You'll see that the first one there is a sandblaster's helmet. And although it does have a nicotine patch in it, it also has an inflatable collar which keeps the toxins out and relieves stress upon the neck and shoulder muscles.

MS. COLEMAN: The painter sander which is the second one looks very much like the sanders being used now, but by using grip stoppers and a cable, that tool allows painters to sand ceilings with a one arm motion instead of forcefully reaching this way (indicating) with back, shoulders and both arms. One of my favorites is this painter's idea of an ergonomically enhanced tool for carpenters.

MS. COLEMAN: The truth is that many of the improvements the students have designed could be incorporated into tool production right now. It requires the commitment of tool manufacturers and major consumers. Using the focus group model, tools could be designed by engineers and users.

Tool evaluations became an unanticipated undertaking of that project. To be useful, the training had to include realistic suggestions for ways to reduce musculoskeletal stress. These suggestions needed to provide apprentices with actions that would be under their extremely limited control

and which would also serve to demonstrate new technology and equipment to contractors and owners.

Because ergonomics is a buzz word of the mid-90's with everything from \$70 martini glasses to \$400 handbags marketed as economically designed, we decided to evaluate some ergonomic construction tools for ourselves. On site, but also in the lab with heart and muscle monitors, we tested three different kinds of equipment for carrying drywall. We also tested hydraulic drywall lifts. We tried the two-wheel wheel barrow and an adjustable shovel. Unfortunately, most of these tools were inadequately designed or constructed. The point is that tools and equipment cannot be adequately designed or evaluated without the participation of the skilled users of those tools.

Our training program is taught by skilled crafts people. I believe that's the key. That's what makes it work. In 1994, OSHA funded us to take the training we had developed under the NIOSH grant nationwide. We used the funding to train trainers. We now have over 150 skilled carpenters, millwrights and piledrivers teaching ergonomics awareness to their respective apprentices and journeymen. And we've begun to train trainers from other trades, painters, sheet metal workers and asbestos insulators.

To date, about 5,000 carpenters, mainly apprentices, have taken this ergonomics awareness course. We've just completed a series of interviews with the apprentices in Seattle who have taken the training. In a minute, I'd like to close with some of their responses. In the future, we're going to increase mixed trades training so that it provides a unique opportunity to look at construction organizations and planning issues. It encourages cross-fertilization of ideas. We're improving the integration of skills and ergonomics instruction for apprentices. We'd like to see the focus group model expanded to include owners, architects and engineers - people who have the authority to change structures and worksite culture. Their participation would enable us to design and engineer-out many hazards.

This program worked, because it is immediately relevant to construction carpenters. It builds upon the knowledge and experience of skilled craftsmen who have bad backs, bad shoulders, bad arms, bad hands but who now know how to work safer and smarter. It's effective because these injured carpenters want to make sure that those just starting out in the trade do not suffer the same life-and livelihood-diminishing injuries.

I'd like to end with the apprentices' assessment of how effective this training has been for them. When we asked them if they were able to put what they had learned to use on the job, 88 percent said that they were more aware of all of their work activities and how they might change them. Eighty-five percent said they lifted differently. Fifty-three percent said they used micro-breaks at work either by varying their tasks or by taking a 10 to 20 second stretch. Thirty-six percent said it changed the way they carried materials, and eighteen percent said it helped them select better tools. Ten percent said their foremen prevented them from working safer.

We asked the apprentices how to change the awareness and behavior of co-workers, foremen, superintendents and contractors. Seventy-six percent said mandatory training for carpenters, foremen and superintendents. Finally, when we asked if they were interested in an advanced or a refresher course which would be on their own time, 89 percent said, yes, they would. Thank you.

MS. STOCK: Thank you, Paula. We're going to actually hold questions till the end in order to give all of our speakers an opportunity to speak, but we're really very committed to leaving 20 to 25 minutes at the end for a general discussion.

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Steve Gutmann, 3M

MS. STOCK: I'd like to now introduce Steven Gutmann who's from 3M. He has worked with 3M since 1981 in the Industrial Hygiene Services Group of the corporate medical department. He's been active in the area of ergonomics for 12 years and full time for the last eight years. This has included technical support and training for 3M's manufacturing, engineering, administrative and research organizations. He's a certified Industrial Hygienist. He's in comprehensive practice from the American Board of Hygiene. He's a certified professional Ergonomist. He's also the Vice Chair of the American Industrial Hygiene Ergonomics Committee and he's also an alternate to the NCCZ 365 Committee for the control of work-related CTD's upper extremities. So I'd like to welcome Steve Gutmann.

MR. GUTMANN: Good afternoon. What I'd like to do is take off on some of the comments that Tom Albin provided during the opening session today. He gave an overall structure of what we've done with the program. Now, I'd like to talk about what we've done in terms of the training aspects. And what I'd like to do is talk about an alternate view of training than perhaps what we've pursued in industry for quite some time.

I'd like to start this afternoon by discussing the problems at 3M and other companies and organizations have had with what I term the traditional approach to training. What Laura Stock referred to as some of the hit and run type of back training efforts that really concentrate primarily in giving information to hourly employees, and not necessarily backing it with anything else to find where the real issues are and resolve them. So what I'd like to do is to discuss what we've done to try and combat some of these particular problems.

But just a little bit of background about 3M, because we're what you might call a big, small company. We have about 37,000 employees here in the United States in over 100 locations in 34 states. And we have the challenge of trying to address issues in about 65 different countries internationally. So it's a very interesting challenge for us. We generally have very small facilities of only 200 to 300 people. So as far as local resources are concerned, we have a lot of people wearing different hats, and we have to be creative in terms of trying to address any kinds

of health and safety issues let alone ergonomics.

We usually tend to have light manufacturing jobs, chemical processing and offices. We make and sell about 65,000 different products. Tom Albin referred to roofing granules. Well, we also make Posted-It notes, sand paper, medical devices of one variety or another. The list goes on.

In terms of 3M's formal ergonomics program, we've had an effort in place since the late 1980's as Tom referred to. We attempted to start small establishing where the issues were to focus some of our education and training. We selected certain facilities where we wanted to test some of our programs and efforts and also to conduct project work to demonstrate effectiveness to see if our approaches really worked.

We introduced a formal ergonomics program in 1993, and this is a program that goes corporate wide. It is a general, performance oriented type of standard, and we used the meat packing guidelines, among other resources, to give us guidance in terms of setting up the program and hitting the high points.

Tom and I are based in a corporate group where we provide assistance to the different organizations, and it's really up to the facilities to implement these programs themselves. So we try to enable the facilities to put these types of programs together. And wherever possible, as I referred to earlier, we attempt to integrate the ergonomics efforts with other programs. This includes safety and health programs, quality programs and hopefully, we can avoid duplication of effort and unnecessary bureaucracy.

Now, there's a traditional approach to training. I use the term "traditional"; that's just my biased term. But really, a lot of the problems that we've had in the past have come from our tendency to throw training at certain audiences, particularly the hourly employees. And the efforts tend to hit big. It's a big flashy program. There is a big splash, and then they tend to fade away. No wonder we have some cynicism in some of our operations. The problem here, and I'll generalize very broadly, is that perhaps the training again is targeted towards the hourly employees and may not necessarily pull in other structures or other audiences that really need to hear certain types of information. I'll address that a little later.

Efforts tend to be very superficial with the "traditional" approach. "This is how you lift correctly", whereas, you may not necessarily get at some of the underlying engineering problems or layout issues. Or there may be a lack of a systems approach to some of these underlying issues such as how do you deal with cases as they come up? How do you deal with issues that the employees raise as they come up? And at times, some of these programs can be champion-driven. You have someone who is really fired up to do it and then they move on and everything fades away. This certainly was an issue with the quality movement a number of years ago, and I think by making it more pervasive throughout organizations in general, we've tended to avoid that type of problem.

A number of years ago, Liberty Mutual Insurance Company, did a study where they looked at training in terms of its impact on reduction of costs. In their particular study when training alone was done, there was really no change in the cases or the costs. However, when training was combined with, engineering controls in a more formal program, there was at least a one-third reproduction in the costs. And that's the premise I think that we have been attempting to work on.

In many organizations there has been a change of approach that has been taking place. There certainly has been what I'll term the quality revolution. Ford Motor Company talks about quality as job one, and actually, I think they've really attempted to make it a part of their organization throughout the different levels. That this must be a process and not just a program. That there's a training component, but there are also systems that are needed to address some of the underlying issues. That people have to be involved at all levels throughout the organization; the employees who know the operations far better than anybody but also a clear and consistent message from upper management.

And finally, that there are many parallels between quality and safety and health as I'm sure we've all heard over the years. That includes the use of statistical process controls and other techniques for evaluating the effectiveness of programs.

This is 3M's view of training. We've basically tailored this to our organization. This is not a panacea. This is what we have found works for us. Maybe some of this will work for you. You're going to have to tailor this to your own particular organization. But we really wanted to adapt this to our organization and culture to help establish a system for dealing with issues and to assure long term results. As Tom Albin referred to earlier, we attempted to find what worked with our organizations and then build on that success as time went on.

As a part of this effort we defined training needs at several levels. And we define training in this particular sequence that you see here starting with management and ending up with the hourly employee. Now, this is not to minimize anything that the hourly employees do or contribute at all. But I think you'll see as I go through my sequence here that there's a reason why we wanted to pursue our training in this particular order. Starting with management, then engineers, supervisors, safety and health teams or committees and finally the hourly employees themselves.

As far as management training is concerned, we've viewed it as very important for them to understand the impact of ergonomics; where we can quantify things in terms they understand, especially the impact on their bottom line, productivity, product quality, other types of issues. We also emphasize the need to look at injury and illness trends such as OSHA 200 logs, first aid logs, the need to establish a case management system that also looks at workers' compensation costs and minimizing those wherever possible. We look at productivity and quality issues and costs such as unnecessary work or re-work that may take place, process bottlenecks and why do you have those process bottlenecks?



Are you filling those bottlenecks with employees to do manual transfer of a product? Unnecessary inspection which really gets to be a process issue which is something that Deming has hit on pretty hard. High job turnover rates. Is this a job that is terribly demanding on people, and as a result you have high job turnover. This may also result in training and retraining costs. Or you might even have unusual absenteeism patterns.

We also wanted to look at the impact on other issues such as marketing demands. Marketing in our organization has sometimes come down with some interesting decisions. "Well, we want to package it this month in this particular format with these inserts", and it's completely the opposite to how you had it last month. It offers some very interesting challenges as well as dealing with some of the vendors that we have to deal with.

We also emphasize the need to have formal systems in order to handle issues such as encouraging of early reporting. There needs to be a system in place, to handle the increased reporting. Yes, perhaps their incidents rates will go up at first, but and that isn't necessarily all bad. You need a system to process those cases effectively and appropriately. You also need an effective case management system for actual medical cases that take place. Systems to identify and prioritize issues, and work at the team level to find out what are the real issues here.

Instead of trying to do everything all at once, let's try and hit some of the higher priority issues. Systems for handling ergonomic projects and resources to handle those projects, such as engineers, so that they understand what's being asked of them and they have the tools to resolve them. And finally, the inclusion of ergonomic issues and a prioritization process by management so that this is a concept that they're looking at all levels of the prioritization process.

As far as the engineering organization, this has been one of our favorites. In 3M, we've been looking at the corporate engineering group who tend to get a lot of the capital investment projects as well as location based engineers. The emphasis is on getting them to understand the impact a design may have on people. And very few of these engineers have had any kind of formal training in this area. I believe it was Stover Snook with Liberty Mutual Insurance Company, if I remember his numbers correctly, stated that of all engineers, something on the order of two to five percent had any kind of training at all in safety and health, let alone, ergonomics.

And something like 30 percent of industrial engineers may have some training in ergonomics or safety and health, and that's traditionally where the academic ergonomics programs tends to be. So we've been attempting to educate these people in topics like anthropometry or the NIOSH Lifting Guide or other information they can use as a part of their normal tool sets. And we make a distinction between the reactive projects for existing issues as well as pro-active approach, especially for projects early in the design phase that are still on paper when changes are really fairly easy to do.

Next are supervisors. We emphasize to them the importance of employees reporting issues early. That employees need to be encouraged to report things even if they consider it fairly small. Then

we can deal with it and hopefully management will have established a system to process these in a timely manner.

Working with employees, we can define and prioritize issues. Again, because they understand where the issues are and by sitting down with them, hopefully we'll be able to find out where these issues really do exist, which are the more important ones.

Working with engineers and employees on implementing solutions so we do so effectively. Ensuring proper follow up is done to make sure that it worked as we intended and perhaps didn't introduce some other types of problems. Assisting in communications with management, as well, so that we minimize mis-understandings that may take place.

Probably one of the key things in our ergonomic program, we feel, are the ergonomics teams or committees. Our teams are comprised mostly of the hourly employees, in the facilities. We sometimes will introduce a new team structure or actually add to the duties of an existing safety and health team or committee if they feel it's appropriate and we are comfortable with that as well. Sometimes during normal walk-throughs or evaluations of safety and health issues, inclusion of ergonomics issues is a relatively simple thing to do. The training that we emphasize is basic recognition and analysis skills, and the need to identify and prioritize issues for management to be able to deal with.

If management is going to spend the money to solve these things, what do you really want to have solved? How to assist with the implementation of solutions? In an earlier session, I believe, a gentleman showed some examples of the rubber workers and some manipulators. There was the discussion that some of the employees didn't appreciate some of these manipulators at first. The teams can assist a great deal in discussing with fellow workers exactly why these things are there and how they will improve the operations and also the need to conduct proper follow up. Again, employee to employee communications, I think, can be very effective and perhaps, you get better feedback that way as well.

Finally, we get down to the hourly employees. We provide these employees with basic information on ergonomics which is usually fairly brief in nature, and if they want to get additional training, we can look into that. We emphasize the importance of reporting issues early, recognition skills with signs and symptoms or risk factors that they may see in the workplace. And that people will not be penalized for doing so. Again, by training management up front, they will hopefully understand that these issues need to be dealt with and can be done so effectively.

Also, we emphasize that it's important for the success of the program for the employees to work with the teams to identify and resolve issues and also assist with follow up.

In conclusion, this is a synopsis of some of the data that Tom Albin reviewed. Between 1990 and 1996, we did have an initial upturn in the overall incidents rates for ergonomics cases. But

over time, we've seen some very encouraging results, including a 58 percent reduction in the number of loss time ergonomics cases. Roughly a 50 percent reduction, if I recall, in the number of lost work days associated with that, which to me says, yes, we have a higher number of cases being reported, we're getting at the more severe ones and making sure that those are on the down slide, and we'll deal with the other issues as we can.

We've had a 22 percent reduction in the number of OSHA recordable ergonomic cases, and in 1996, we've actually had for the first time in memory a rather sizeable decrease in the workers' compensation costs that we've paid overall in the company to the tune of about 6 to 8 million dollars. Now, even with these good results, I'm very cautiously optimistic. There have been many things happening in the corporation. For example, we're going through a new case management process. But I think it also gives us information that we can use in pushing our programs in the future.

Even with these results we feel we have a lot more work to do. We've made a good case with management and certainly their response has been very encouraging. The initial results, I think, speak for themselves. To use the term that a number of people have used, this really represents low hanging fruit. We have to realize that these are some of the easier issues that we can identify and deal with. And then we're going to have to dig down to the next level which may not be as easy to resolve or to justify. We're going to have to do a little more homework.

But looking at the low hanging fruit, hopefully we've justified that if we do our homework, if we construct these things properly, we can effectively resolve these issues. We now have a systems approach in place, we feel, to achieve further meaningful results, including identifying issues, justifying solutions and documenting effectiveness.

And that concludes my remarks. Thank you very much.

MS. STOCK: Thank you, Steve.

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Kate Stewart, Swewart and Associates

MS. STOCK: Our next speaker is Kate Stewart. She's a board certified Ergonomist. Her firm, Stewart and Associates provides consulting and training for many public and private organizations ranging from fortune 100 companies to small businesses. As a former faculty member at the University of Washington and Director of Sports Medicine at Seattle University, she has taught physiology, bio-mechanics and anatomy and has worked in injury prevention for 18 years.

She served a wide range of businesses providing ergonomic consultation, training and program development at all levels of management and for production workers. She's an instructor and consultant for the OSHA Training Institute and the National Safety Council. She teaches occupational ergonomic courses offered to safety and health professionals, production workers, compliance officers and engineers. She's also produced award winning videos, written numerous articles, created several handbooks and has been a presenter at many conferences representing a broad spectrum of industry and business. I'd like to welcome Kate Stewart.

MS. STEWART: Good afternoon. Good afternoon, post-lunch. One of the things that I'm aware is that I've been sitting all day, and you've been sitting all day, and it's post-lunch. And one of the number one rules that I try to do with training is to not let people sit too long and especially sit in the dark. So why don't you stand up where you are. Let's get a little blood in your brains.

Get your arms up over your heads. And as you have you have your hands up there, they really reach. Try not to take your neighbor's wallet. Okay. Now put your hands out in front of you and push forward until you feel your shoulder blades come apart or your suit rip, whichever happens first. Now, spread your fingers. Really open your hands. This is a teaching moment, because what we're stretching is the nine tendons that run through the Carpal Tunnel or the corporate tunnel or the carpet tunnel, whatever you've heard it called. Now, make a loose fist. Do it again. I didn't hear anyone's shirt rip, so that's good. Okay. Now, let your arms hang at your sides and see if you can feel an increase in circulation to your hands. What hands? One hand, oh, dear. Okay. Do one more of these. Hands up over your heads and reach, and as you have your hands up there, you can stretch them, too. This would be a great picture, don't you think?

MS. STEWART: Go ahead and sit back down. Another training moment that you can use as you're starting to do training is ask people to evaluate their current workstation. For example, your workstation right now is this chair, this room, this lighting, and how conducive is that to your job description right now?

MS. STEWART: Right, it's terrible. Well, what can we do about it? We have three choices with ergonomic controls. We have engineering. We have administrative, and we have work practice. Which one can we apply in here? We just did it. I mean, we did kind of a work practice administrative control by having you get up, by reducing your exposure to what we know is a pretty bad workstation.

To talk about training, I'm one of the external consultants that we all read about that charge too much money, you know. But the challenge that I face when I go into a company or an organization is that I don't have the familiarity with the internal goings on, you know, the politics, which I guess in some regard can also be a good thing. But I'm really faced with not knowing my audience in a lot of situations. I do lots of training for the OSHA Training Institute which means that I'm meeting people for the first time when they come into that training room.

So I'm faced with two challenges when developing training. One is content, and the other is training style. Now content, we all have the fundamentals of ergonomics that we look at and that we want to try to teach. The trick is trying to make it relevant to what your audience needs. So your relevance to address your audience's specific needs as well as what is the desired outcome of your training? What do you want people to know when they walk out the door at the end of your training session? Keep this real simple. I mean, it doesn't have to be complicated. I try to stick with terminology, especially with hourly workers, to develop what we call an ergonomic eye.

If you can begin to look at things a little bit differently, if you can begin to use the knowledge that you have, the extensive knowledge that you have about your job and look at that from an ergonomic perspective, then I will have succeeded as a trainer. And you can pick up and get feedback from people throughout the training to understand whether or not that's happening for you or not.

The depth at which you teach is determined by what they need. I probably wouldn't come in here and talk about the basics of ergonomics to most of you, because my hunch is that you probably have a lot of fundamental information already. So style and content in terms of relevance and depth. In terms of style, you can have the best content in the world, and if your style is boring as can be, the content's not going to go anywhere. Or if the style is patronizing, I've certainly sat in on a lot of presentations where that can happen.

Being practical, I think, is really very helpful. Check your ego at the door. People don't come to hear you, because you're not Madonna, you know. You might want to be Madonna or you might, you know, think that there's a rock concert going on, but basically, what people are coming for is information. And if you can create a safe and comfortable and learning environment for people, that's really our job as a trainer.

Use your sense of humor and your intuition. When you've checked your ego at the door, when you've left your ego outside and you aren't going to get your feelings hurt because people want to change the course of what you're teaching or how you're teaching it, and you're willing to do that in mid-stream, that's great. Get a feel from what the people that you're working with want and make appropriate changes as you're going. Does that make sense? Again, because what you're trying to do really is to create a safe and comfortable working environment.

MS. STEWART: So here's some questions to ask, because these are the basic questions I ask myself or ask a group? Who are they? I'm trying to communicate to you information without any feedback from you until the end. I don't know who you are. I don't know why you're here really. I could speculate, but I don't really have that information from you. I don't know what your individual situations are, so what is it that you really need to know? And how are you going to use what you learn at this conference? How are you going to actually apply that?

Now, in a training situation, if you have two days worth of training time, I will spend the first 45

minutes having everybody in the group talk about these questions. So it really helps to guide the direction of the course, and it also gives them a chance to open their mouth for the first time and kind of become part of the process, part of the group, which is pretty important.

How do they learn? When Paula did the exercise where you held your hand out and held on to the pencil, you learned something there, didn't you? You learned by doing, and you learned by experiencing. I'll give you an example of that. If you have a notebook or something in your lap, put it down like it's a keyboard. If you don't have one, just pretend like it's a keyboard in front of you. So you have your hands on the keyboard. Now, you're going to be a top flight data entry person. And as ergonomist, you know we get to do really fun things like count key strokes. So you're going to be a top flight data entry person which means that you're going to do 50,000 key strokes per finger per day. That's a little repetition there.

So you got your keyboard in front of you. Bend your dominant hand back. Bend your dominant wrist, extend your dominant wrist halfway and type, both hands, keep your other wrist straight so your hands look like this (indicating). Now, it's eight o'clock in the morning. You'll get a break at 10 for about 10 minutes, 50,000 key -- well, come on. Can you feel what's happening in the bent back hand? Now make your wrist straight, both wrists straight and put your hands out so that your hands are actually in front of your shoulders and type there. Now come to about here (indicating). Angle your hands at about 45 degrees, and you can feel the comfort level increase as you do that.

Now, people are going to remember that, because they felt it. Once you've felt something, it's a lot easier to take out of the room with you. So how do you learn? You learn by doing. You get people to do things as much as you possibly can. I think Susan's going to talk more about that at the end here. Why should they believe me, who am I? I'm your trainer so you should believe me. Just trust me, right?

It really helps, at least from my perspective, when I'm telling stories about myself a little bit. I've had the fortunate experience of having worked in a mill for two years. And I've been a grocery cashier. I was a house painter with a group of two other women. We called ourselves the Painter Sisters. You may have heard of us. We sold a few records. We actually attempted singing, too.

But anyway, I've done those kinds of jobs and can use examples for myself that helped to get buy-in, because I'm not just somebody sitting up here saying, "Well, I know what's best for you." That certainly doesn't work, but if you can share your own experiences that's helpful. It helps gain credibility.

But which common denominator up there is a challenge when you're going around the room and you have somebody who's just about to finish their Ph.D. dissertation in ergonomics, and you have somebody who's barely learning how to spell ergonomics. Who do you teach? Where do you aim? Where do you aim the level of the class? I don't know if this is a problem for any of

you, but I run into it all the time, there's quite a range of knowledge and experience.

So again, I think it's boiling it down to simple concepts, because even someone who's writing a dissertation can benefit from simple concepts. I try to teach toward the middle and then check in with the people who are on either end at breaks. That's a good way to find out if people are getting it or not.

Another way to figure if they're getting it is to listen to them. Be sure that there's enough interaction that they're asking you questions. I've had the really unfortunate experience of standing up there thinking that I'm just doing the greatest job, and these concepts are really sinking in, and then somebody will ask me a question that I addressed like four hours before and that they've done a group exercise on. Where did that come from? To me, I need to revamp at that point and check in with the group if I'm being clear and if that concept especially was clearly communicated. So listening to them is really important in terms of knowing whether or not they're getting it.

MS. STEWART: So here are answers. Here are some road tested ideas. And again, this is just from me to you. It's not based on anything other than my experiences of other trainers that I've worked with. Number one, know your audience. Know as much as you can about them. And you can find that out by asking them in a lot of cases.

Keep it simple. Not stupid but simple. Keeping simple concepts so that people can walk out the door with two or three firm ideas, especially when you're dealing with hourly workers to help them develop what we call their ergonomic eye.

Keep it relevant. I had the occasion recently to interview a number of different safety directors and a number of different employees from all different kinds of industry, because I'm in the process of developing this video training for an insurance company, and they want to have it really be appropriate to their clients. So I went around to all these different companies with this little questionnaire that I had developed and asked all these different questions.

The answer that was the most consistent in terms of what's going to make this stick? We're talking about back injury prevention. We're talking about back protection that this specific video topic. What can we do that's different that's going to help you to change? And every single one of them said keep it relevant to me. Make it look like my job. Make it look like something I do. And I took that to heart. You know, it's like how do you do that when you're dealing with concrete and water bottle delivery and logging and all different kinds of things. But try to find a common thread. Keep it relevant to whoever is the recipient of the information.

Keep them busy, like we did. We stretched. Do that kind of thing. Keep people involved.

Back up your facts. Don't mix stuff up. You know what I mean? Walk the talk, and use it as a teaching moment. For example, you've been sitting here for almost an hour. We did get up once,

your spine likes to be moved. The compressive forces in your low back will increase with prolonged sitting. So walk the talk and have people get up and stretch, get up and move around. Really do what you say, what you're asking other people to do. Do it in the training, and then they can also experience it.

Timing is everything. Right after lunch like this. It's probably not a good idea to turn off the lights and throw up slides, but what choice do we have. Right after lunch is a great time to do group exercises.

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Susan Moir, University of Massachusetts Lowell

MS. STOCK: Today, Susan will speak on the Construction Occupational Health Project's approaches to Ergonomics Awareness Training and the need for Popular Education methodologies in our effort to educate workers for ergonomic change. Susan.

MS. MOIR: I'm not going to talk about that. Thanks, Laura. Since I got here yesterday, I have had many conversations with people. I'm wearing this lovely presenter's button and people ask you what you're going to say, and I say, "Well, I'm going to speak on Popular Education." And people say to me, "What do you mean by Popular Education?" So I decided that's what I'd talk about, "What do we mean by Popular Education?" How many of you here either train and/or deliver training? Can I see a show of hands? That's most of you.

In about two minutes, you are either going to write for a minute or talk for a minute. Who would rather write? Say, aye. (Chorus of Ayes.)

MS. MOIR: Who would rather talk? (Chorus of Ayes.)

MS. MOIR: Okay. We're going to talk. Popular Education goes by many names. Some of these names, you may have heard, liberatory education, education for transformation, education for change, learner centered education. Nina Wallerstein and Merry Weinger in the special issue on training of the "American Journal of Industrial Medicine" from 1992, use the term "empowerment education." The goal of this type of education is critical thinking in order to make change.

Do not confuse these methods with what are generally called, participatory methods or the flipchart and marker methods to keep trainees interested and involved.

Popular Education often incorporates the use of flipcharts and markers, but it is greater than that. It is actually designed for learners to make change at work.

Do not confuse these methods with adult learning techniques which are again part of these methods. There is a great body of information out there on how adults learn, little of which has



gotten to the health and safety community, and it is important for us to know about it. Some of the panelists have referred to one principle of adult learning theory. Adults learn better by doing than by listening.

Now, what's your favorite thing here today? Sitting and listening to us talk or doing the activities that people have suggested for you? Show of hands. Who would rather sit and listen to us talk? Okay. That's four. Who would rather actually be involved in the learning by participating? That's almost everybody. You are also workers. When we train workers, we must never forget we are workers. What we like, they will like.

Popular Education methods are based on adult learning technique. They're based on participatory technique, but they are much more than that. They are techniques that are designed to cause people to actually make change, fundamental changes in the working relationship, the power dynamics in the workplace. These methods assume that learning is not just the acquisition of facts and it is not just the interesting and entertaining acquisition of facts, but it is the ability to use knowledge to change our environment. If ergonomics is the movement, Popular Education may be the medium.

Now, because the other panelists have each demonstrated Popular Education technique for you, I will get to lecture on the Theory of Popular Education. Duh -- I won't do that. I'm going to show you a technique, and you're going to get to talk. Where is my training egg timer? Everyone has one of these I'm sure, the trainer's one minute egg timer. You all have these, right? Steve you don't have one?

MR. GUTMANN: Oh, sure.

MS. MOIR: But when I'm done, you could have mine. You can buy them for twenty-five cents at the Children's Museum, any Children's Museum. Okay. Here's what we're going to do. This is a technique that's called Think, List and we're going to call it Talk. I was going to use Think, List, Write, and I thought Kate was right. You've been sitting too long, and it's after lunch. So what I'd like you to do is you're going to end up talking to one or two people closest to you for about a minute while I set up and get ready to do something else. I have only 10 minutes, and I'm giving you one of them.

MS. MOIR: Here's what I'd you to do. Just for a second, close your eyes, and I want you to picture your workstation. I want you to picture the workstation that you most commonly work at, the place where you generally do most of your work. Visualize that for a second, up and down and back and forth.

MS. MOIR: Now, mentally, make a list of the things about that workstation that might injure you. Just go through it quickly and make a quick mental list. Okay. Now, what I'd like you to do is for one minute -- my magic one minute trainer's egg timer -- I'd like you to speak to someone near you, one or two people. You can do this in groups of two or three. And I would

like you to tell each other how your workstation might cause you musculoskeletal injury.

The question is, describe to someone near you how your workstation might cause you musculoskeletal injury. Oops, you've got 45 seconds.

MS. MOIR: Okay. Time's up. What did we do? I'm going to have to hold this up, because I don't think you're going to be able to hear me.

The first thing you did from a Popular Education point of view, is you explored what's called the "generative theme". A generative theme, we talked about your workstations. We talked about injuries to your body. What is a generative theme? It gets at something that "generates" people. Something that gets people moving, thinking about the issues, wanting to learn. So that's the first thing you did by thinking about your body and your workstation.

Secondly, we began the process of analysis or critical thinking. You began to explore your workstation and how it would injure you. You began to do critical thinking.

Thirdly, you just touched the cusp of action. The first component to action is a social relationship with somebody who shares these generative themes with you. A social relationship and a collective experience is the first experience to action. Generative themes, critical thinking and action are three essential components to Popular Education.

These components of Popular Education are being used in ergonomics training by people all the country. I'm sure many of you are doing this. Basically, all over the country we're asking the same four questions.

First we ask, "What hurts?". And we're doing Risk Maps and Symptom Surveys. We're asking people what hurts in their bodies. How many of you were doing this? Raise your hands. A lot of you. We don't know each other. Have we ever met before? No, but we are asking the same question in our training. "What hurts?" This is a generative theme.

The next thing we're asking is "Why does it hurt?". We're looking at risk factors, and we're doing job analysis. And then we're saying, how can it be fixed? Those two questions, why does it hurt, and how can it be fixed?, lead to critical thinking and analysis skills.

And then we're asking, "why aren't you fixing it?". When asking that question, we're talking about power relationships at work and taking action.

People all over the country are doing ergonomics training based on these questions, in two hour units and in much longer units. For operating engineers, bus drivers, carpenters, vocational educational teachers, immigrant factory workers, nursing home workers, garment workers, office workers, hospital workers -- anybody want to add anybody? All over the country, people are doing this kind of training.

Now, what does it mean that a group of progressive women, (and it is mostly women who have developed this training), who have never met each other are doing the same training all over the country. Well, it's probably some linear relationship with feminism and the Viet Nam War.

But other than that, there is another more important reason why this is happening, a much more important reason. There is a history to this training method. These ideas came out of Brazil in the 1960's. Paulo Freire synthesized this method in Brazil drawing on adult learning theory that went on in other areas including the United States and Europe. Popular Education in Brazil was part of the liberation movement there. The method moved to Mexico. From Mexico, it came to the United States. Many of the trainers using Popular Education can trace the method back to the same four or five people from Mexico.

We all learned similar techniques. Who does Risk Maps? Have we ever met before? We have never met before, but we're all doing Risk Maps. We're all doing the same techniques and asking the same questions.

These techniques are essential to promoting change and reducing ergonomic problems at work. Ergonomics cannot be taught any other way. It cannot be taught any other way or it's not ergonomics training. Because the experts are the workers. The injuries are inside their bodies. They're not coming out of the ventilation system. The injuries are in their bodies. They know what we need to know. They have the potential for acting on ergonomics. We're providing training not only to reduce injury rates, but in order to build the base for an Ergonomics Standard. We must use these techniques, and we must not dabble in them.

And finally, I would like to say, these are methodologies. They are as scientific as epidemiology and industrial hygiene. I say to NIOSH, do you fund epidemiological studies that are conducted by people who have absorbed epidemiology as they've gone along through life? No, you don't. OSHA, do you accept sampling results from people who are using sampling methods that are 15 years, 20 years, 30 years out of date? No, you don't. Training is a science. It is a skill that must be learned. And we must do training that is soundly based in methodology, and we must do that at the ERC's and at the OSHA Training Institutes.

I'd like to say just one more thing. In this room from 5 to 7 tonight, a loose network of people who are doing this kind of training and have found each other in the last couple of months are going to come here to have an informal discussion and demonstration of some of these techniques. If you'd like to come by either to stay for the two hours or to put your name on the mailing, please come. We're going to be here from 5 to 7.

Thank you very much.

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## Question and Answer Session

MS. STOCK: Thank you, Susan. It's always great to put her at the end of a panel. Everybody riled up. Ready for questions. I'd like to ask anybody who has any questions for any of us, our panel, to use the microphone.

Q : I have a question that relates to evaluating effectiveness. And I want to describe a scenario that I see over and over again, but we've run into it quite recently. In our current cooperative agreement with NIOSH, we have a participatory team of orderlies who have implemented training programs. We can look at workers' comp data and see decreased injuries and lost work time and that kind of thing, but that team is now questioning, are we doing what we should be with the education?

How do we know that our education program is working? Are there things we could do better, and I'm curious what kind of methods you all use to quantify effectiveness of education programs for workers?

MS. STOCK: This is called the "E" word. Nobody likes to talk evaluations.

Q : Actually, I'm asking for help.

MS. STOCK: Uh-huh.

MR. GUTMANN: Oh, boy. We actually have shyed away from quantification, and we actually are much more interested -- at least this is our bias in 3M in qualitative results. What we essentially have been doing over the years with our team training, for example, has been to let it evolve. Based on the feedback from the people who were involved in the teams, based on the managers responses is that you can test the effectiveness of your training in theory.

But you have to be careful, in my estimation, to also make sure that you have a program base that is going to support that. You could have the most wonderful training in the world but if you don't have the management support or the engineering support there in place, it's going to go nowhere. So I'd be very careful about how you measure effectiveness and make sure that you also have those other pieces in place.

Q : How are you measuring effectiveness is my question?

MR. GUTMANN: How are we measuring the effectiveness? We use feedback and evaluation forms from participants during the various training exercises, engineers and the teams especially, because they're really crucial to identifying and resolving the issues. And from that, then, we're also looking at how effectively they are addressing issues in the workplace. So it's a very qualitative approach. But essentially, we feel most comfortable with that. And really, it's adapted to the individual location's needs.

Q : Could you also address in that follow up evaluations 'cause most of our literature review has really focused on evaluating like content, but not whether or not they're actually performing the things out in the workplace or the applied portion of it. Do you do follow up evaluations on effectiveness, and what kind of time frames and that type of thing?

Q : I want to say one thing before to follow up with what Steve just said. That one way to evaluate if people are doing things differently is if they've signed a two or three item commitment to check in on that and to see where they are with it in a month. You know, have some check-in times at safety meetings and whatever. I'm doing that with a company now, and that seems to be really working in terms of what some people are and some people aren't. And the ones that aren't, we can try to figure out why.

MS. STEWART: I was simply going to say that one of the things we've done in the past, and this is not with ergonomics, but with other health and safety issues, is find out -- we did interviews, surveys. Did people try and take action? Whether they were successful or not really wasn't the measure. It was whether they felt that they had been empowered enough to try and get a change made. And we -- anybody who tried, that was a success.

MS. COLEMAN: And the other thing, I was just going back up something Kate said and that is we use wrist maps as a kind of on-going assessment of the changes people are making. You know, we do it by those areas that have been improved 'cause people took action, they change on the map. And they become green instead of red, you know, however you measure it.

MR. GUTMANN: I'd like to echo that. I think evaluating what people are attempting to take action on is important and certainly that can give you some indication of whether they understood and processed the materials well. At the same time, you need to see if the organizational changes have taken place that can take that information and process and make some actual changes out there which is again another level or two at the very least. And also, see if you have a receptive organization.

How is it percolating throughout the organization? Are people beginning to bring up these ideas? Are people beginning to form new structures to deal with them effectively?

Q: Jordon Barob, American Federation of State, County and Municipal Employees. Just to also add something to that last question. We go on course at the meeting center for our staff reps and activists every year, and our main means of evaluating the effectiveness is whether we ever hear from them again. And, you know, some of them, we do and some of them, we don't. And the ones we do, we --- successful like Paula said. You know, at least they've tried to do something or they're trying to do something. But I had a question, actually for Steve Gutmann.

I thought it was very interesting that you actually do train all the levels, all your levels and departments and everything. Because we have a lot of trouble with that. We train our members, but, of course, if management isn't training, it only goes so far. The question, though, it was

interesting, I was listening to Paula talk about getting so many of these good ideas from the workers. You talked about training your engineers and then training your front line staff. Do they ever talk to each other? I mean, do the engineers actually meet with your workers and get their ideas of what's going on or do they just sit there and do it?

MR. GUTMANN: No, within our organization -- and I'll speak just to that. Essentially, the way the team structure works or the program structure works in our facilities is that -- we try and keep management out of those teams. The employees sit down and prioritize the issues, maybe do some rudimentary analysis, perhaps pull us in to help them with analysis. Once they have prioritized and identified key issues that they feel comfortable with, then they might talk to an engineer as to what's feasible in this particular circumstance. I mean, that's one scenario.

During discussions and prioritization, they may also pull in some of the engineers who are actually at the site. Also our locations tend to be fairly flat organizationally. We really try and break down those barriers as much as we can.

MS. STOCK: Other questions?

Q: Paul Snete from IBM. I have a question on the -- most of you have touched on training. Susan, I think, came the closest to what I would call education. And if you look at training in its absolute simplest form, you can train a four-legged animal to do tricks. But education on the other hand would teach somebody how to make decisions about what's right for their workstation. And I guess I would ask each of the panelists what their view is, and when does education become more effective than training?

MS. MOIR: Who invited you?

MS. MOIR: I think training's the safe word, right? I mean, that's -- we do more training than education, because training is safer than education. And training is really -- I mean, fundamentally, training is most often -- and if I may generalize. There are exceptions to this, but training is designed to change the behavior of workers. It's training for safe behavior. And it's really pretty radical for a company to support education.

MS. STEWART: I think that in order for someone to make a behavior change to actually -- to be trained, the education has to come first. I mean, once a person is educated about the why's and the how's then it's -- for me anyway, it makes more sense they will be motivated to change. I mean, I don't have to teach my Golden Retriever why she should give me her paw for a cookie. Do you know what I mean? Because she'll do that, because she's motivated to please. But for humans, I think -- I have to understand why and how before I'm motivated to make a change. And so, the educational piece comes in that part.

Q: I think I would agree with you, and that's exactly the problem that so often we're doing training first. The people that were training have no education in ergonomics. So we jump in

and we do the training, and it gets to a few others who were asking efficacy question of how effective is the training, whereas, if you do provide information that will educate them first, the training may become more effective. That was the point of the question. Thank you.

MS. STEWART: That's a good question.

MS. STOCK: I just want to make one other comment myself. It seems like a lot of this stems -- in terms of setting your objectives of training from a definition of what you think the cause of the problem is, I think that traditionally training role that Steve was saying defines the problem as if it's a result of the worker's fault or worker's behavior.

And, therefore, what you're trying to do by training has changed that behavior. I think that it particularly, in ergonomics, is ideally suited for this multi --- view that it's not the worker's fault. That it's many, many systems that need to be changed. Then you need to design a training so that you can have impact on all those systems, not just on worker behavior. That's where you need to get more into education. Yes, another question.

Q : Mine isn't really a question, but it deals more with the global issue of training. I work for chemical manufacturing facility on the south side of Chicago, and we recently acquired a training specialist who truly, truly is a training specialist. We had someone in that position before that was hired because they used to teach school but really didn't -- they taught -- this gal that we have now was brought in and was told, "We want you to develop some training." And she said to our plant manager, "Okay. What level do I train?"

We have hourly workers. We have Ph.D. engineers. We have para-professional staff. Where do I begin and where's the learning curve here, you know? Am I teaching at a third grade level? Am I teaching at a college level? We have very complicated process steps that people have to follow. The people that write the process steps are Bachelor or Master prepared, scientists, the people who have to perform the tasks, some of them have a third grade education. We have discovered that we have people -- and we went through - thank goodness for our management.

They decided that we should do what was called a "TABE" which was Test of Adult Basic Education. It was done totally confidential. Every person in our facility went through this test, including the plant manager, and we are now in the process of having feedback. Individuals are getting their results, and they're finding out. We've discovered that we have people who are dyslexic. We have people who have short-term memory at a four-year old level. Now, think about this, those of you have children.

We tell people, you know, I want you to shut this valve after you do this, this, this. When a kid is little, you say to that kid, well, you know, they just won't do what they're told. Then as a kid becomes a teenager, you say to that kid, you know, that's just a rebellious teenager. Then the person becomes an adult, and this might never have been diagnosed. It might never have been identified. And what the problem truly is the person has short-term memory problems.

I'm an occupational health nurse, and when this training gal -- occasionally, she needs somebody to bounce things off of. Can keep a secret, and she doesn't give away the farm, but she knows that I'm a person that have secrets of my own that I can't divulge. I mean my professional life. So she will come to me and she will say, "You know, what are the implications for this with Alzheimer's research?"

Maybe the folks that developed Alzheimer's never really had memory to begin with, you know. Short term. Short term, you know. Because the person with Alzheimer's loses short term memory. They don't lose long term memory, and we're identifying people with those kinds of problems. It's amazing. And I would just encourage all of you to really, truly -- if you have someone in a training function, make sure that that person is qualified to do what they're doing, not just somebody who applied or bid on the job because they worked in human resources or they had an interest in training. It really, truly is a profession. A nurse couldn't become a chemist. An industrial hygienist could not function as a nurse, and I truly believe that, now that I've met this woman, there are people who cannot function as trainers.

MS. MOIR: There's a great page from a magazine, a trade magazine, specializing in manual materials handling we use in our training some time. It was a one-page primer. I've never used that word before, but I heard it this morning, primer. On how manual material handling companies should deal with ADA, American Disabilities Act, and adapt manual materials handling work to people with disabilities in order to comply with the law. There wasn't a single thing on this page that couldn't apply to every single worker. It was a whole thing on how to adapt for people with disabilities. And, in fact, these were ergonomic adoptions that should have been available to every worker who works in manual materials handling.

So, in fact, I think, you know, people do have specialties. Everybody has strengths and weaknesses. We cannot design every job for everybody's individual strengths and weaknesses. We need to design for the worker, and to make all work a lot easier than it is.

MS. STOCK: Yes, sir.

Q : Yeah, I'm glad these last couple of questions came up. I appreciate them. In my industry, especially -- I guess the question I have is about training abuse, I guess, for a lack of a better word.

MS. MOIR: What's your industry?

Q : Sorry?

MS. MOIR: What's your industry?

Q : I guess it's really low, but in the printing industry. I'm with R. Donnelly & Sons Company. And training abuse in the terms that if there's a problem, people like to throw training



at it. Oh, this guy isn't lifting correctly. Why don't you go train him, Mike. I'll go take care of this guy. My theory --- and I don't know if this is true, but theoretically, I'm thinking, if you can hold a gun to this person's head and say lift this box correctly or, you know, handle this correctly, or do this correctly. If they can do that holding a gun to their head, is it a really a training issue or is it something else. That's kind of my question.

MR. GUTMANN: To me, in a way, that also says that perhaps you may not have some of the players on board that you need higher up in your organization. There may be circumstances where you may wish to address some of the training to the workers and make sure that your refresher training is appropriate, this, that and the other. But why is it that you're training this person or this group of people repeatedly? In terms of lifting techniques and that's all that you do. You should have a system in place so you are actually looking at what the underlying issues are.

Again, I refer to back to the Liberty Mutual study. You know, some of these problems are very difficult to resolve, but some of them are not. So I would really look at the receptiveness of trying to understand what it is that these people are dealing with on the floor.

How much of it is a person's decision to do something, but also, really more important in my mind is the underlying design, the underlying approach to the process and understanding the process as opposed to just doing the operation.

MS. STOCK: I just want to make one other comment also, 'cause I've often had the experience when I go out and do training and I come back. We talk about interventions and you see people not doing what you told them to do. They're continuing to do things wrong. And the impulse, particularly those of us who go out and do work station evaluations. Why aren't they doing what I told them to do? I'm the expert, and I know what they should be doing. And when I stop to talk to people, I almost always find out that there's a reason. It's not just that they're stubborn or they just kind of don't remember, though sometimes that might be an issue.

But often it's because the intervention is wrong. And it goes back to what a lot of people have been saying about the importance of involving workers in choosing what the solutions are. They say why aren't you using this particular chair? Why aren't you sitting up in this position? Why aren't you using that document holder that I gave you? There's an often a concrete work related reason that whoever designed the control didn't take into account. It's just another reason to analyze further and involve workers in figuring out what the solution should be.

Q : I have one question --- since nobody else is on line. And it kind of relates to this occupational nurse was mentioning which is the issue of knowing your audience which a number of people have said. But we at LOHP have been doing a lot of work about designing training materials that are appropriate for low literacy populations and trying to recognize it when you go in and do training. You have to see not only that adults have different learning styles but also that people have different levels of literacy, not to mention different languages.

And I'm curious in the training programs that you've described whether you have anything to offer about how you would address that issue, or techniques you use to uncover that, or how you modify your training to allow for people who, in fact, can't read or have limited reading skills?

MS. STEWART: One of the things that I like to do is use video for some -- it depends on -- I mean, if I'm dealing with a group of employees who need to have -- and understanding of fundamentals of ergonomics, what ergonomics is. And again, to help develop their ergonomic eye. There are a couple of real short little videos out there or little vignettes that are quite good that communicate the issue, and then you can talk about it. So I think, not limiting it just to reading and using a lot of examples, getting people to teach anthropometry.

You get a tall person and a short person up in front of the room and you ask people to identify what the differences are that they see, you know. Somebody will say, oh, he's a lot fatter than she is. You know, that kind of thing. You know, using more practical examples.

Q : I would say that certainly in ergonomics training, we find that we --- most of the information comes from the students. You know, they bring their tools. They describe what's wrong. They figure out what needs to be change. You know, ergonomics is easy because it's so physical. That way, you can teach through illustrations. You can teach through drawings. I find that ergonomics is probably the easiest ---

MS. STOCK: I want to say one more thing. We designed an analysis, work site analysis package that is all illustrations, and there's a, you know, green light, yellow light, red light kind of thing. And each one of them has a picture. If you're looking at back flexion, for example, you know the green light is straight up to 15 degrees, that kind of thing. And people can circle whichever one it is that is appropriate to them. And it was reviewed by literacy and adult literacy expert to satisfy someone with a seventh grade education. And it's primarily graphics.

MR. GUTMANN: Let me throw a little extra twist in here just to have a little fun. All right. We referred to literacy and those types of issues. Now, the issue that we face many times is not only that, although we have certain reading requirements that people have to fulfill in order to be hired, but we deal with a tremendously diverse population. For example, in the State of California, we're dealing with Vietnamese. We're dealing with Hispanic employees. We're dealing with any number of different languages.

They're excellent workers, but in order to communicate any kind of safety and health information, let alone ergonomics, is a real challenge for us, especially because a lot of it is under state mandate or federal mandate to train in their language. If I'm not mistaken, I think that there's some attempt in the company to actually get them some remedial English training and to also have those who perhaps had better English skills to help in communicating to others some of the basic information they need and also to deal with some of the cultural issues that we come across. But it's very difficult and not always easy to deal with.

MS. MOIR: Let me add something to that. I was consulting last week with an adult educator who works with a health care unit in Boston. And she works with largely immigrant populations, and the politics of the workplace and the power relationships -- if I can generalize again, often much better understood by immigrant populations than they are by American workers. We live under the myth of the classless society and the quality at work. People come from places where they fully understand what it means to not be able to exercise power to change their workstation.

But I deal with what I would contend is one of the most challenging populations to teach ergonomics to and that's undergraduate students in engineering.

MS. MOIR: These are the folks who are really dead from the neck up, because they learn in extremely rigid ways. They cannot participate. They cannot talk unless they know they have the right answer. They can't go from sector to sector, because their conception of these problems is so narrowly defined. So I think -- literacy cuts across a lot of different sectors and a lot of different levels of education.

MS. STOCK: Okay. One last question.

Q: I'm Rosalind Edson. I'm an Industrial Hygienist with the Public Health Service. And I wanted to get the panelist's feedback as to computer-based training. I know a lot of employers who feel that computer-based training will solve all your training needs. And I very much disagree with that, especially in the area of ergonomics where I think you learn by doing.

MS. MOIR: From an ergonomics point of view, sitting workers at a workstation with computer-based training is putting them in a hazardous situation. It's really dead. It's lazy. It's expensive. It's inaccessible. I don't like it.

MR. GUTMANN: I respectfully offer perhaps an alternate explanation.

MS. MOIR: Good. Let' have a debate.

MR GUTMANN: No, no, no. Not necessary. Actually, for the most part, we've been looking at computer-based education, and there's certainly the issues of hardware. How do you get enough units to really train people and this, that and the other. But we've made a decision that the primary education that we provide to employees is going to be person-based. That is someone standing up in front of the class. And what we're looking at right now, we haven't made any final decision, is for the one's, two's people who have not attended, perhaps someone posted into a new area, you're not able to pull them into a class in a timely manner, then you might sit them down in front of a computer-based training to at least give them some basics and then get them into the class that they should have been in the first place. So we see it as an ancillary tool. And we're approaching this, at least in our organization, very cautiously.

MS. MOIR: I agree totally. One of the programs that the Center to Protect Workers' Right is

funding is a researcher in Florida who's developing a computer-based training. And I've differed with him on this computer-based training on hazardous materials. It's in many languages and it's voice activated. I've disagreed with him and his use of this as a primary training methodology, but in the way we used to teach children to use encyclopedias, if these can be available in the workplace so the worker doesn't have to spend weeks exposed to a chemical before they can an MSDS, if they can go to a computer and reference what they need to know, or if they need some supplement to training, I think that it can be effective. I'm not opposed to the Internet, and this can operate in that way. I just think it's lazy as a primary training methodology.

MS. STOCK: Okay. I think we're out of time. But thank you very much for your participation. And thanks to the panelist.

(Whereupon, the Training session was concluded.)



## Product Design

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Welcome by Brian Peacock, General Motors

DR. PEACOCK: Welcome to this afternoon session. This is going to be on product design. We were to have had three different speakers, but unfortunately, Jerry Duncan from John Deere couldn't be here. So Bill Marras has agreed to step in. Most of what we're going to be talking about this afternoon is design for manufacturing.

We're very privileged to have with us Bill Marras and Rob Radwin who will tell us something of the university perspective on design.

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Brian Peacock, General Motors

DR. PEACOCK: This may seem to be a bit of a surprise to you, but I feel that the health and safety industry has tried to redefine my profession. I learned about ergonomics back in the 60's, and I thought it was a little broader than industry has tried to define it. Because, of course, people have minds and souls as well as bodies, I think we must not lose sight of that fact. You cannot just look at a back or a wrist. It doesn't make sense. You got to look at their minds and motivations as well.

Now, over recent years, maybe over the last 50 years, ergonomics has had various highlights that have attracted a lot of attention. Scientific management was one. Around the time of the Second World War, there were issues of complex military and transportation systems, and that activity has continued. Process safety has attracted a lot of attention recently. Someone this morning said ergonomics never killed anybody, but maybe they didn't go to Chinoble. My suspicion is that that was an ergonomics problem.

Consumer product evaluation has given a lot of impetus to ergonomics. Ralph Nader drew attention to that in the 60's. Recently, over the last 10 years, computer interface design has been a major source of interest, particularly in cognitive ergonomics. But most of you are familiar with cumulative disorders and the activities of OSHA and NIOSH, maybe over the last 10 years, in drawing attention to the physical aspects of ergonomics. That is why most of you are here, but I'm trying to point out that this is just one thing in the line of major events that have attracted attention to ergonomics.

I am going to address various aspects of ergonomics: Why we do ergonomics, when do we do it,

what are the opportunities in the design process. Then I'm going to talk a little about what we do, who does it and how we do it. Finally, I'm going to draw attention to some of the perhaps more political issues of how much and how many and accommodation decisions; who do we design for?

I view ergonomics as having this kind of categorization. There are physical, informational and macro aspects of ergonomics. We can pay attention to consumer products and services where the eventual customer has a choice to buy a product or not buy a product. The other part of ergonomics has to do with industrial and service occupations where the eventual customer, usually the line worker, doesn't have too much choice with regard to the design of his equipment and environment.

When we talk about consumer products and services, we consider comfort and convenience. In the informational aspects, we talk about performance and human error. In the macro aspects, we apply ergonomics to the business of marketing and we also apply it to the issue of products liability. In industrial and service occupations, physical ergonomics has mainly to do with health enhancement or musculoskeletal disorders. In the informational ergonomics, we deal with safety and product quality because these are mainly cognitive problems.

At the macro level, we deal with how do we motivate people to do inherently boring or unstimulating jobs? Also at the macro level, we use ergonomics to deal with cost avoidance and cost reduction.

In the physical area, we tend to use comfort surveys or illness and injury methods. In the informational ergonomics, we talk about transaction times. How long does it take to choose the right program on your radio in the car or just your air conditioner? At the macro level, we deal with sales. Does ergonomics sell more cars? In the industrial and service occupations, we deal with injury and illness rates. In the informational area, we talk about quality audits and accident rates. And at the macro level, we deal with attendance, turnover, and the cost of ergonomics as compared to the cost of not doing ergonomics.

At General Motors, in the physical area, we deal with occupant packaging, whether you can reach the pedals, or not, or whether you can see where you're going and seat comfort. In the information area, we deal with stop lights, heads up displays, control design, those kind of things. We also deal a lot with warnings. The textbook "Automotive Ergonomics" deals with this subject area. It was published by Taylor and Francis in 1993.

However, most of us here are interested in reactive and proactive ergonomics programs which deal with physical ergonomics in the workplace. I think there are many opportunities, and I'm going to spend more time on that subject. There are many opportunities of the application, particularly of cognitive ergonomics in the areas of process safety and product quality with particular regard to warranty costs.

Again, opportunities of the macro level with the safety and health environment of the firm and the definition of what is a fair day's work and what is job enrichment? How do we stimulate people in inherently unstimulating jobs?

Very briefly, this is a description of the reactive General Motors or joint UAW-GM-OSHA Program on manufacturing ergonomics. It's very similar to many of the programs that you are familiar with. It deals with ergonomics committees and monitors, practical ergonomics training. We deal with a risk factor checklist which came out of the University of Michigan in the mid-80's. We use symptoms questionnaires. We use job analysis and hazard abatement. Finally, we deal with medical management and record and reporting.

Many of you who are very familiar with those kind of programs. This was a massive program over six years.

In parallel with this program has been the development of the General Motors pro-active manufacturing ergonomics process. In 1990, I was asked to develop a manufacturing ergonomics lab which involved the development of the physical facilities and staff. There was also divisional ergonomics staff development. Most of what we do is transfer ergonomics technology from the literature into useful ergonomics tools and techniques.

We do laboratory and field project work. We do analysis tool and guideline development, you saw some of those kind of checklists this morning. A lot of what we do is ergonomics process development. We believe training is the strongest thing we do, because eventually, ergonomists don't do ergonomics. Engineers do. It's got to be into the engineering process. We also work with computer aided ergonomics.

This is the beginning of my discussion of the process of ergonomics. The first opportunity, of course, is to design the hardware and the software. That is, if you can design a car to put itself together, then you've solved the problem. And so, for example, it would be nice to have a battery that weighed two pounds. But sometimes you can't design the hardware to solve the problem. So then you've got to deal with a processing intervention, so you might be designing an assist.

If you can't design the assist, then you've got to deal with a production solution which usually means how many people does it take to put a battery in a car? Finally, if you can't solve it at the production level, you've got to deal with the personnel system design which is population and individual assignment, training and surveillance.

This is a classical description of how you all learned in Ergonomics 101 about how you design systems and processes. This doesn't work. Ergonomists don't own the process, engineers do. It is our job to infiltrate the engineering process or the company's process in design.

At the product design level, we like to influence the design of components and where things are in the vehicle. Fasteners are also very important, and Rob is going to talk to some extent about



this issue.

At the process level, we talk about assists, tools, containers, and the design of workstations. At the production level -- this is close to when we're going to have the manufacturing system up and running, we talk about line balance and physical balance using the kind of checklist that you saw this morning. And then finally, we talk about team structure, rotations, the placement of appropriate people on appropriate jobs.

For example, an engineer might ask me, "How heavy should this box be?" And I will say, "It all depends on what you're going to do with it." But he doesn't want to know what you're going to do with it. He wants to know what should be the weight of this box or how high should this thing be. He does not want to hear, "It all depends".

In General Motors, we've set up a semi-quantitative scale where we produce a set of number on a zero, one, two, three scale. But we give hard numbers to our engineers. A number that is associated with a zero is unlikely to cause any problem. It might be two pounds or something like that. A number that's associated with a "one" has a possible interaction with other factors. Number two has probable interaction with other factors. And a "three" should only be exceeded with good cause. We never say never.

This is our mapping statement philosophy. Along the bottom we give either simple or complex engineering quantities. We must give engineers numbers, and we link that to our rating system.

Some GM examples. For example, we have a thing called a risk factor checklist, a wall work sheet, production analysis tool that we use. These are all quantitative analysis tools, but the engineers want to know 75 newtons for push force or 45 pounds or, "everything has to be in this box" which is a defined reached curves. The policies that are offered by management is that there should be no three's on the job. That is a policy decision. It is not an engineering decision.

We support all of this activity by training. For example, in General Motors, I think more than 10,000 people have been trained, at least the one hour level. At the one day level, more than 5,000 people have been trained. At the one week level, over 1,000 have been trained. Finally, at the one month level, more than 40 have been trained, and we have got at least 10 people who have had much more than the one year level of professional training.

This has more to do with the policy issues of our manufacturing process. It's the "how much" decision. I'm going to discuss issues of production with protection, which population are we aiming at, such as people who work in electric motive division of General Motors here in LaGrange.

If we went to a protectionist type philosophy where the job demands were much less than the population capabilities, everybody would be able to do every job, and that would be totally non-competitive. It is not possible. However, if we go to selectionism, if we're in the NFL, then

there are very few can do that job. But in the long run, in industry, this is a very short-sighted view of the world. So our decisions about where do we draw the line in the sand is somewhere between protectionism and selectionism, which is, of course, production with protection. Now, the other problem is which population are we talking about? We have certain surrogates. We have anthropometric data from certain populations. We have strength data. Bill, you've produced industrial strength data. The average age of General Motors assembly workers is in the upper 40's. Are we talking about handicapped workers? Are we talking about professional athletes? We have to be more specific about the population that we're describing, otherwise, our numbers don't make sense.

These are just some examples of the kind of questions that are related to those decisions. How much head room should there be in the rear seat of a sports car? Do we accommodate the 95 percent head room or leg room? How heavy should a box be? Should we restrict the weight of suitcases to 10 pounds?

What does "some assembly required" mean? How much are you willing to spend for a vehicle safety feature? These are all factors that affect the policy decisions that we as ergonomists have to advise on.

Most of you have seen Barbara Silverstein's paper on incidents which is the upper part of this picture. The problems with incidents, that is, the high force, high exposure problems create great incidents. Low force and high exposure which is the CTD problem. And, of course, accidents may occur with high force and low exposure.

One of the problems that we face in incident counts is that they are very sensitive to recording policies and thresholds. We feel that it is more important to look at severity measures such as lost days and dollars and particularly be sensitive to the effects of other factors.

Unfortunately, ergonomists are sort of political football in the middle of all of this activity. We talk about voice of the customers. We have employers and workers, and we talk about participation. Really, "voice of the customer" and "participation" are equivalent things. We have the government (OSHA and NIOSH) trying to help us. We have the lawyers and the medics trying to help us and we also have academia. Consultants are certainly trying to help us as also are the trade associations. The unions are in on the act, and the consumer advocates are not far behind.

In the end, we are just in the middle of all of this mess trying to take advice from everybody. And what we're trying to do is get some ergonomics balance. Thank you very much.

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Robert Radwin, University of Wisconsin

DR. PEACOCK: Rob Radwin is a Professor at the University of Wisconsin, Madison. He is on the faculty of the Department of Industrial Engineering and he is the Director of the Biomedical Engineering Program. He conducts research and teaches in the areas of ergonomics and human factors engineering. He got his Ph.D. from the University of Michigan in industrial engineering and was a post-doctor of research fellow at the Center for Ergonomics. He is the recipient of the Presidential Young Investigator Award from the National Science Foundation.

He actively studies the recognition, causes and control of CTD's in manual work. His research is concerned with developing measurement and analytic methods for assessing exposure for physical stress in the workplace. He also has two university industrial consortia, one of them related to hand tools and the other with ergonomics analysis and design. In recent years, he's contributed a tremendous amount to the Human Factors Society and the ergonomics profession in general.

DR. RADWIN: Thank you, Brian. This is a little different than any technical presentation I've given because I'm going to talk about how industry can use universities in the design of products. Jim McGlothlin asked me to say a little about the process of design and the involvement of universities. I've heard it said many times before that if you ask a university researcher a question, they'll go back to their lab, do an experiment then come back and tell you they need more data. And then they'll ask you more questions rather than answer your original question. I'm hoping to dispel some of those myths with this talk today.

I'm at the College of Engineering at the University of Wisconsin in Madison. In engineering, we're engaged in a great deal of design, and we train engineers who go off to industry and do design. In U.S. engineering colleges today, statistics show that about 3.3 billion dollars are used per year in funded research. This is data by the National Science Foundation, and of that 3.3 billion dollars, only 60 percent of that research is supported by the U.S. Government. That includes agencies like the National Institutes for Health, The National Science Foundation, The National Institute for Occupational Safety and Health and other government agencies.

Of the remaining 40 percent, according to Science Magazine '95, it is reported that 16 percent of the research is funded by and for industry. That sums up to something over a half billion dollars per year in research that's being used by industry and being conducted for industry. Industry\ university partnerships are increasing more and more, and I believe this is going to become the common model.

First, let me say something about working with universities and then I'll give some examples of designing new products with universities. I must say that there are very fine universities engaged in ergonomics today. There are a number of people here at this conference who are scheduled speakers or attending the conference from universities and who are doing a great deal of ergonomics research and working in the area of design. There are also many companies here who do, in fact, work with universities in the design process.

One good reason to work with universities is because some of the best people in the field of ergonomics are at the universities. They are at the forefront of knowledge in ergonomics, and this new knowledge can go directly into the design of new products offered by manufacturers. Universities are very good at doing novel things, and are very good at generating new knowledge. The benefits of working with universities in the design process, then, is to explore new areas of product design, to generate new knowledge, and to investigate novel problems.

Another reason to use universities is that university research involves bright, energetic students to work on problems for industry. And many of them will end up working in your industry as an employee, and they will become intimately familiar with your company and your products. Another benefit that many companies find in working with universities is that universities do peer reviewed objective research, and that peer reviewed research is recognized for its integrity. This is valuable for marketing for other reasons that justify product designs.

Finally, universities have some of the most advanced laboratories and resources. Industry cannot usually invest in these types of resources because of the expense and the inability to maintain these types of laboratories. In general, a university laboratory is very different than the kinds of laboratories you find in industry. At least that's my experience. So let me describe some examples of some of the kinds of things I'm talking about.

The first example is a study that we did with a manufacturer of construction vehicles. In this study, we were interested in understanding how to design controllers and steering wheels that are used for operating large construction vehicles. These tools are products, but they also serve as the workplace for many construction workers. In this case the vehicle cab is the workplace. And so, ergonomic design of products, as Brian pointed out, often involves industrial products.

The concern in this case was the understanding of designing cabs with the minimization of factors that reduced the risk of musculoskeletal disorders. Our lab developed equipment and procedures that most industrial laboratories do not have, and this involves the ability to synchronize very complex events with signals that are recorded from goniometers that measure angles on the wrist and joints, and from EMG electrodes or sensors for measuring force in the hands. We can encode that data directly into video tape for analysis of very complex activities like performing construction tasks with a large vehicle.

These are some of the sensors that we've been working with on in our lab for measuring the forces in the hands. We developed equipment and software for using multimedia computer

technology to extract biomechanical data encoded on the tape for job analysis, but I won't go into all the details of how this methodology works.

What it allows us to do is to observe complex behavior or complex activities like working in a factory or working in the cab of a construction vehicle, and extract bio-mechanical data. In doing this, we are able to quantify force and motion. In the case of the cab, the motions and the forces are exerted when driving a wheel loader.

We studied a number of different types of control systems and vehicles in order to understand how the operation of these vehicles relate to repetition, force and posture. These are the factors that we are concerned with when we want to design equipment to prevent musculoskeletal disorders. We placed goniometers on various joints, the hand and the wrist, the forearm and the shoulder; and we used EMG electrodes because we were concerned with muscle contraction in this study.

We were able to advise the manufacturer about the design conditions that minimize physical stress factors, depending on the kind of job the operator performs. This was research but the outcome was design recommendations and parameters for specific control systems.

We used the same technology for the design of a workplace in a much different environment. It was a hardware manufacturing plant. Here, we were helping locate hanging hooks for painting various shape products as well as learning how this job could be designed to minimize repetition and awkward postures.

Another example is the design of power hand tools. We've worked with a number of hand tool manufacturers. One manufacturer told us they wanted to design a better tool, and they wanted to understand if certain features had ergonomic benefits in order to minimize exertions in the hands. One thing they were interested in was the trigger shape. This trigger was a single finger trigger, and this trigger was a multiple finger trigger.

When they searched the literature, nothing indicated the advantages and disadvantages of these triggers in terms of the force exerted by each finger. Another thing they wanted to do in their design was to make the handle of the power tool adjustable. This was a very unique idea, but they had no way of really knowing if there was an advantage in doing this. Intuitively, it made sense, but there was no data to support it.

So we designed a study, and our study looked at these factors from a very generic scientific standpoint. But in doing this study, we were able to provide very specific design parameters and factors for the design of these new products. In this case, we took a tool that was an in-line nut runner. Since we wanted to design a pistol grip nut runner, we had the company modify the tool so that it had the torque and power parameters of a pistol grip tool and we attached a handle to in-line tool.

Because we were working with the manufacturer, they were able to provide us with such an in-line power tool. We attached handles to this tool that had strange gauge force sensors that allowed us to measure the forces in the fingers and the palm. I won't go into all the details of how we did this, but we had a working prototype of a new tool that didn't exist for testing using actual operators.

We also worked with the industrial designers. They had certain constraints about the size of the handle. In our experiment, the industrial designers built plastic caps for our sensors that were shaped into the design that they were anticipating. All the parameters for our experiment were directly related to the product that was being designed, but we actually looked at some very new scientific questions.

This is a picture of the prototype that we used. It doesn't look very pretty, but it gave us the data we needed. Working with the target customer industry, we went to an auto assembly plant, found subjects for our experiment who used tools that were very similar to our product prototype. In doing this, we were able to provide some very specific parameters about the eventual design of this product. This company won an IDEA design award in "Business Week" for the final design of the product.

I'll show you some other examples. This was an investigation into some very specific factors for the design of the key switch in a computer keyboard. In this experiment, we studied the force displacement parameters of the spring element in the key. We were able to provide very specific design parameters to help minimize the forces in keying. This was sponsored by the Office of Ergonomics Research Committee which is a consortium of a number of computer companies and affiliated industries.

Another study involved a company that was also designing a computer-related product. This was for people with disabilities as a substitute for the computer mouse. The company wanted to design a device that could be worn on the head using infrared technology that would allow a person with cerebral palsy or another movement disability to use their head to locate the cursor on the computer screen of a graphical user interface.

They had the knowledge of how to design and build this, but they didn't have an understanding of what specific parameters they needed. The gain parameters, the motion of the head versus the motion on the screen, would have to be optimized for their design. We conducted experiments using prototypes of this product in order to design the software that drives this product. Again, this is an example of working with the company in designing a new product.

Another mechanism that's worked for us with industry is the use of university-industry consortia. This is a partnership between the university and company. It brings together the engineers and designers in the company with university researchers. Often products that are manufactured or being designed are worked into on-going research projects. Sometimes new research projects are created around that design, but the objective is to transfer technology, and to share expertise

between the university researchers and the industry designers and engineers.

A benefit is that the companies can influence the research that universities perform in specific ways that help them benefit from specific ergonomic information. This is a list of some of the benefits of these consortia, and each of these consortia are different. The consortium we have at the University of Wisconsin deals with the design and use of industrial tools, hand tools and power tools.

We work with more than 12 manufacturers of hand tools to help them understand the latest information on ergonomics and also work with them in designing new and better tools for the prevention of work-related musculoskeletal disorders.

Let me say a few things about working with the university. Many people believe that university researchers are up in some ivory tower working outside of the real world. Well, this is changing, and many university researchers do in fact work in the real world with industry. I hope I've shown you some examples, and that they have a great appreciation for the problems and the needs of industry. As government funding sources shrink, there's a much greater interest in the university to work and to partner with industry. One thing to keep in mind is that students benefit from the experience. But because it is a learning experience, industry needs to understand that sometimes the time limitations of getting a Masters degree or a Ph.D. are longer than their time constraints.

There are ways to deal with some of these constraints. University laboratories aren't job shops. Many people come to universities to do very specific things, and there are ways of working with universities to do that. One way is to have milestones established to produce very specific outcomes on the way to accomplishing novel research. I'll show you some examples of how we deal with that situation.

Consider that when working with universities, the time frame is longer and milestones and specific deliverables should be established at certain stages in the research. Establishing these at the onset of the project, makes it possible for industry to get some quick and dirty information. Then the university can proceed with not just a quick investigation but go on to produce new knowledge and to understand in-depth some of the factors and considerations that are being studied.

One other thing to keep in mind is the "publish or perish syndrome." Universities exist for the generation of new knowledge, and the way that new knowledge in science progresses is through the publication of information. Working with universities on the specific time lines for publications is important. There's a value to publishing the research that's done with universities because it validates the design features, and it provides recognition for the scientific validity of the design factors and parameters. It also indicates that, in fact, the product really has something new.

In summary, I'll list some of these. They'll be available in the proceedings. One key is to expand very specific problems into general scientific areas of inquiry. And in doing so, plan milestones so that universities can produce the deliverables that are needed by industry, while at the same time doing research, identifying at the onset what information is proprietary and establishing time periods for publication.

Anticipate failures as well as success. The reason I say that is because universities work on new problems and things that have never been studied before. Sometimes the outcome is different than what one might anticipate. Consider those failures as new knowledge gained to best use that information in the production of new products. Thank you.

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Bill Marras, Ohio State University

DR. PEACOCK: Bill Marras, many of you know. He is the NCR Professor of Ergonomics in the Department of Industrial Welding and Systems Engineering at the Ohio State University where he is the Director of the Biodynamics Lab. He also holds joint appointments in the Departments of Physical Medicine and Biomedical Engineering. He received his Ph.D. in Bioengineering and Ergonomics from Wayne State University in Detroit. His research centers around industrial biomechanics. He has published 80 reference journal articles and 12 book chapters and holds two patents, one of which is his lumbar motion monitor, and many of you are familiar with the LLM.

His work has attracted national as well as international recognition and recently won the prestigious Swedish Volvo Award for low back pain research as well as Austria's Vienna Award for physical medicine.

DR. MARRAS: Thank you, Brian, good afternoon to all of you. Today, I'm going to talk about some of the tools that are used to help quantify product design. What I found in my experience in product design is it's more than simply common sense. People are saying things like, ergonomics is all common sense, anybody could do it. Well, I would challenge that assertion. What I found is often by quantifying design, product design, you find that you get some really unexpected results. My contention is that you could not really come up with an optimal design until you do quantitative analysis.

What I'm going to talk about in particular here today is the design of something that's very common in industry which is case design. In particular, I'm going to talk about some issues in food distribution warehouses which are very common around the country. If you look at the injury rates, they're phenomenal. Warehouses are very dangerous places for the back, and at least most of them, you see typically over 30 percent of the injuries related to the back. It is common



to see in the neighborhood of 60 to 65 percent of injuries related to the back.

Now, in order to control these costs in the food distribution area, the Food Marketing Institute out of Washington, D.C. came to us a couple of years back and asked us to do some quantitative analyses of some suggestions that they were ready to make to the industry. They wanted to limit the size and the weights of the cases that came into the food distribution warehouse and in turn are shipped out to individual stores.

As you can imagine, this is a very expensive proposition. They would require that, cases for example, be no larger than a given amount of weight and limited size. They also had some ideas about handles. All that could cost the manufacturers millions of dollars, they realized that was an expensive proposition. If they were going to make these types of recommendations and set standards, they'd better be right. These situations lend high cost to the decisions where you want to do quantitative analyses.

They contracted our laboratory to do this type of research, and I'd simply like to share some of our experiences with you. Our objective was to provide a quantitative assessment for the Food Marketing Institute and to look specifically at the risk of low back disorders. When they originally came to us, they said, "Well, we're considering a little drop in the case weight and we want to know whether 40 pounds is the correct weight or whether it should be 50, or 60, or whatever. We want to see the difference. We want to see a bang for our buck, because this is a very expensive decision".

They said, "We're also thinking about limiting the size", and they were pretty much basing these ideas just on what they'd read in the literature, what other companies were doing. They really weren't doing any quantitative analyses. When they approached us, we said, "Well, this is all well and good. We could do that, but have you ever considered looking at some other issues? For example, do you want to put handles in there?" The NOSH Lifting Guide, the 1991 revised equation has an effect for handles in there. So we suggested they might want to look at that.

We also realized that it's not just the way you lift the boxes, but it depends where you're lifting that box coming from and going to. So we were able to talk them into looking at that also.

Here are the cases we looked at. We wanted to be able to change the weight, and only the weight; and then change the handle conditions, only the handles. What we found was about the ninety-fifth percentile box in a warehouse and about the twenty-fifth percentile box in a warehouse. This happened to be a box of water containers in a box of salt. The nice thing about these is you could take some of the water out, take some of the salt out, maintain everything else the same and just alter the weight. Then we had a set of boxes that had handles and ones that did not have handles, and you can see we sealed them up pretty good so they wouldn't leak all over the place.

Where do you lift from the pallet? As you probably realize in most distribution centers and

warehouses, basically, the task is to take boxes out of a slot and dump them onto a pallet jack. Essentially, you walk around with the shopping list and pick five boxes of this, 12 boxes of those and go back to the pallet jack and load them up. And so, when you do this you're constantly breaking down the pallet. You might start up here in the top regions and end up down there. We wanted to look at the risk as a function of that.

Our subjects were experienced warehouse workers, and I'd encourage people considering this type of work to use experienced people. There's a world of difference between a university student and somebody who is actually out there doing this all day long. You could see our experience averaged five years, and it went up to 23 years for at least one of our subjects.

The experimental task was simply to do what these people did every day. They simply came to our laboratory. We had set this up like a warehouse. We went to a warehouse, measured everything, measured the distances between the pallets, measured the heights of these. We also put slots in there that looked exactly like the slots in a warehouse, and we paced the person. We found out that in this particular warehouse we were emulating, they lifted 125 boxes a minute. So we'd have the person walk up here, stand on a tape mark, walk over to the slot, pick up a box, twist, turn, move it over to where the pallet jack would be, and that's where we ended the analysis.

While they were doing that, we were monitoring lots of things about the person. I'll show a little bit about this in a moment. Basically, we were considering everything on-line on the computer as well as videotaping everything the person was doing. This allowed us to really break the exertion apart.

As Brian was also saying in his introductory remarks, ergonomics is more than just worrying about biomechanics. You've really got to look at the total package, and that's one of the things we've recognized for a while. And so, this is the way I view the world of back pain. Biomechanics will get you so far, you could talk about the loading of the spine, things like that. But we also know there's some type of a social interaction involved here. Why do some people report higher rates and other people do not report high rates. We think there's some interaction between the biomechanics and that.

In order to explore that area, we've developed some technology based on historical trends. What do people like in the warehouse or in industry in general? What do they not like? When do people tend to report injuries versus not report injuries? And so, this is based on purely six years of observation of injury rates in industry, and we used our lumbar motion monitor technology with which some of you may be familiar. I'll talk more about that in a minute.

On the other side, we did have to pay attention to the biomechanics of the situation. We had to look at the loading of the body and the personal tolerances. In order to do that, we wanted to look at some bio-mechanical models that we had developed. I'll also talk about that in a minute.

First, in terms of the risk model, the historical perspective, that's basically what this is about. Our tool is based on historical observation in high and low risk jobs in industry for low back disorder. We looked at over 400 jobs in industry, divided them up into high risk jobs of injury over 12 instances per 100 workers doing the job per year, and then those jobs where there was a lot of material handling but didn't have any injuries. Given these parameters we collected in the workplace, we developed a model that helped us discriminate between the high risk jobs and the low risk jobs.

Here's the LLM. It's an exo skeleton of the spine, it straps onto the person. As they move around, it simply sends signals to the computer which tells us what the motion patterns are like.

This is the model. Basically, we found that five factors you get from the workplace such as lift rates and moments as well as some things you get from the LLM such as twisting velocity, lateral velocity, and sagittal angle --- will determine what the odds ratios of what your risk or the probability of being in that high risk group is. The idea of this is when you're designing the jobs, get this vertical red arrow as far to the left as possible. If you're up here, you're almost guaranteed to have a back injury with that design of the job. If you're here, you're almost guaranteed not to have a back injury from the work.

Our other measure was a bio-mechanical model that we've developed over the last dozen years, and bio-mechanical models basically estimate the amount of load that occurs in the spine. Here's a vertebral body. There's a vertebral body. Here's a disc. What we're really measuring is a crush strength where the crush force is acting on the spine. It's the same way a lot of people do it, but ours is really a dynamic model.

Here's a representation of the model. We assume that there's a plate in the thorax, a plate in the pelvis, spine in between. If we know what's happening with all these muscles or vectors that are holding these two plates together, we could work backwards and compute the load on the spine, basically that's what we did. How do you measure the muscle activities? You do it with the electromyography, some of the slides that Rob had shown a little while ago.

Let me show what this model actually looks like and show you some examples. Here's the exertion we're interest in. We're interested in this fella just lifting and lowering as you see right here. First, I'm just going to show you the basic model, and then I'll show you some specific examples of the things we're interested in. Just to show you how we could pick this model apart, we have hundreds of analyses at our disposal with something like this.

The first thing we may be interested in is how is the person moving it? We just pick up a couple variables. We'll look at angle and velocity, and there it was, the blue line. Up here is the velocity. The black line is the angle, you see there. As we move through time, the red line corresponds exactly where the video is. So we could see exactly how he's moving at any point in time. By the way, this the bio-mechanical model I'm talking about right now.

We could also look at the future such as how hard are all the muscles working? He's the EMG of the 10 trunk muscles we're monitoring, so we can have an idea of how those vary as a function of the work the person's doing. We could also look at how those co-activate. And what we mean by that is let's try and get an appreciation for how these all turn on at the same time. By looking at a cross-section of the trunk, here's the spine, here are the various muscles. We get a time history of how active those muscles are, so we could appreciate whether they're working at the same time or whether they're not and the different colors correspond to how intense the muscle's working at different points in time.

We could also get an appreciation for what this means in terms of the loads on the spine. As you probably realize, the distance from each one of these muscle actions from the spine creates a bit of a moment or a bit of a leverage system. So a little bit of activity in these muscles has much more influence on the loading of the spine compared to a little activity here. See, you have to pay attention to the distance it is from the spine, and that's what this figure does. As we move through space, it tells us what the instantaneous moment is associated with each muscle. As you could see, we could pick up lots of things here.

Let me end by looking at trunk load here which is the bottom line. We want to know the compressive and sheer forces on the spine, and that's shown here. The yellow is the amount of compressive force where you start to get into problems of micro-fractures which we believe is where you start to have a risk of injury. That would be analogous to the action limit in the NIOSH Lifting Guide. And down is increasing compressive force with the black line here.

So let me just put all these in a window right now, and I'll show you how we typically evaluate a workplace. Typically what we look at are the feature of the box and let the person lift. We could say ah ha. There's a point where he has maximum compression. At that point, he was all right. At this point, he started to get into problems again. At that point, he's all right, and we could see what muscles were working, how fast he's moving, how much load is being supplied to the muscles.

As you probably notice here, lifting straight up and down like this is not what you see in industry. Typically, what you see is the type of environment we showed a little while ago. Let me show you a video of one of those.

Let's look at somebody who's lifting a box out of a slot, and let me pull up the file on that with the data we're interested in and run the model. What we're going to do is look at this fellow as he's pulling a box out of a slot that weighs 40 pounds and simply lifts up like this. Let me just cut to the trunk loading issue here and figure out how much force is on the spine as you're doing this. And so, there we have an analysis of what this job entailed.

He was all right at the beginning of the lift here, and it wasn't until this point right here that he started to load the spine to a point where he could run into problems. That's his maximum moment. So those are the types of issues we're interested in. We've also done some studies of

using hoist.

Talk about product design, this will show us with and without using a hoist to do a similar task, and the first thing we'll look at here is the video. This is the activity we're going to be interested in. The person's going to use the hoist and carry it over here. This is an alternative to lifting by hand. We could run the model with that, and we could take a look at what kinds of trunk load we get with that. The person is lifting this thing by hand. You could see, now we're down into the red area here, through a good portion of this lift, it starts right about here. And so, this area here is where you have at least 50 percent of people who have micro-fractures on their spine when they're getting into that point. It occurs right when he starts the lift. We could do a similar analysis as he's using a hoist which is what I just showed you a minute ago.

You should see what this used to be when we had slow computers. I showed you the video of that which is the one we just saw. Trunk load, spinal force. If you remember on the last one we saw, all kinds of activity in the red zone.

Now, we're not even getting into the yellow throughout the lift. So this is the person lifting with a mechanical lifting aid. You can quantify the danger that's imposed on the person as he's working.

Let me show you some of the results of this study. Let me show what we've found in terms of case weight. Basically, what we found is a difference with weight in terms of our risk measures. What we do for industries, we give them a measure like this. We give them a barometer or a thermometer, something they can relate to. Green means you're good. Red means you have a serious problem. Yellow means you have to be concerned about this. So we give them continuum. And so, no matter what measure I use, whether it's our LLM risk model or our compression index, we're going to be able to relate it back to something we could relate to.

Looking in terms of compression, we see increased risks as we increase the weight. But also, look at the range we get in these arrow bars. Something that's 40 pounds could be just as risky as something that's 60 pounds. You could see the same things happen in compression. These are standard deviation bars now. This is where you start to get vertebral micro-fractures. This is where you get a lot of people with them. And still, even the light box has dangerous areas. If you go out three standard deviations, you could see it could be well over the maximum limit.

If we just go to pallet region now, what we see now is we break this down, one box now, one weight of a box, and we just look at whether they're lifting from the top layer, the middle layer, or the bottom layer of the pallet. You could see all the risk is in the bottom layer of the pallet.

Top layer, that's fine. Middle layer is fine. As a matter of fact, if we go to the heaviest box there, to the 60 pound box, that's 50. If we go to the next one, you could see that very little of the risk, even with a 60 pound box actually occurs when you have the load high enough. And even the middle level is acceptable. It's not until you reach down to the very bottom of that thing that you

really start to have serious compression loads, that could cause a problem. It makes no sense to say, "Well let's leave everything at 40 pounds", because even 40 pounds could be dangerous in the wrong position.

What we saw is that size made a difference but only at the top layer. Who cares about the top layer? That's safe and so, we concluded that it wasn't worth worrying about the size of the box. And now, if we could go to the handles.

This shows what happens with and without handles. You could see handles in a box makes the box look like it's about 10 pounds less. In other words, a 50 pound box with handles looks like a 40 pound box without handles in terms of the compressive load, and you see that relationship all the way up. Here we see the effect of both box weight, where it is on the pallet and factors such as whether or not it has handles. We're able to quantify that and give them the type of information they need. For example, a 40 pound box lifted from the bottom layer with handles puts 3.3 percent of the exertions at risk. Where a 60 pound box lifted from the same layer puts 15.7 percent of the risk in the risk category. Without handles, it jumps up about a third. And so, I don't have time to talk about this in detail, but you could see the benefit here, and we could specifically tell you what the risk is for every single activity that you're doing and tell you where you need to make the changes.

The idea here is how much exposure is too much exposure, and that's what we're able to determine.

What we found in that region was real important. Weight and handle was real important when you considered their interaction with region. So there's more than one way to skin a cat. What that means is you don't always have to reduce the weight on the products that are a problem. What you could do is raise those up to the level that can help.

Lastly, I'd like to show that these same type of measures, can be used in other environments. For example, here's some studies we did in the check stand environment. Look at the effects of check stands. Look at the effects of scanner, similar to what Rob was showing. We're able to tell you exactly what percentage of the motions put a person at risk with different designs of the scanners.

We've done similar things with product design such as spray paint guns. We've done some work with companies that develops those. You can see us analyzing a person spray painting both in terms of muscle activities as well as motion patterns.

Currently, we're doing some studies on keyboards, as is everyone. And we're interested in what are the effects of having these keyboards in all the different orientations, and we've developed monitors such as finger monitors based on fibre optics. That helps us evaluate exactly how people move. So a lot of work is going on in our laboratory these days. I thank you for your attention.

DR. PEACOCK: Thank you very much, Bill.

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### Question and Answer Session

DR. PEACOCK: Well, that is probably a record. One ex-university professor and two university professors finished 15 minutes ahead of time. There will be 15 minutes for questions for anybody who has questions. We said some very different things and some contradictory things I think this afternoon. And so, one would hope that there might be some questions.

Q : I have two questions and they're for Bill Marras. I enjoyed your presentation and the multimedia associated with it. The first question is the problems that I've seen in the warehouse industry have a lot to do with timing issues and time standards. And I was wondering whether or not you had addressed that portion of the research?

DR. MARRAS: We have considered that a constant in this. I know what you're talking about. A lot of times these people are really pushed by performance standards. We observed that warehouses work people at 125 boxes per hour. We did not look at this as a variable in this initial study.

Q : Do you have any ideas on how you would perform that research?

DR. MARRAS: Same thing except pace people at different times and see how the muscle recruitment patterns change and what that does to the different loadings of the spine.

Q : The second question that I have is the use of EMG analysis in general. You appear very well versed in the use of EMG analysis in research, but in looking at this, you make it seem very simple with all of your gadgets and your programs. But, indeed, I would not recommend the use of EMG research unless it's performed by someone such as yourself in a university site. Rob Radwin has excellent materials and equipment as well, but I've seen a great number of consultants, I shouldn't say a great number, but a number of consultants use EMG analysis in a way that provides results, but not results that might have the integrity that you would want them to.

DR. MARRAS: That's an excellent observation, and I completely endorse your observation. If there's one measure that's probably misused more than anything, even in the literature, is probably EMG. And I would not encourage people to go out and just apply EMG's randomly. As you probably know, you have to do a lot of calibration. You have to do maximum strength efforts, make sure the people don't fatigue and make all kinds of adjustments to make some sense

out of it. So that's an excellent point.

DR. RADWIN: That's also another example of how universities might be utilized for accessing advanced technologies that are not usually routine/available in industry or by some consultants.

Q: Larry Bullock, Proctor and Gamble. I'm struggling with how to set lifting guidelines for our company. In other words, basically, I've been telling people, go use the NIOSH lifting equation and all your problems will be solved. People want me to set up some sort of company-wide number that you shall not lift more than this many pounds. Do you have any advice to give to companies that are struggling with how to set weight limits that are simple yet meaningful?

MR. PEACOCK: I will address this question and discuss the first question that was asked of Bill about frequency. The problem that we face and which I suspect is the same as you is that the person who makes the decision about the size or the weight of the box is a product engineer. The person who designs a pallet or a lifting device is a manufacturing engineer. The person who designs how many times a minute somebody should lift it is an industrial engineer. So three different people need communication from this ergonomist.

One other part of that story is that the person who designs the weight of the box did so five years ago. Whereas, the industrial engineer has a shorter lead time to effect the frequency issue. If you don't have a job to look at, that is, if you are looking five years ahead, you don't know how often the thing is going to be lifted or under what conditions it's going to be lifted.

The process that we use in General Motors is to make certain assumptions about conditions and frequencies and draw a line in the sand on weight. Once you've got a line on weight, we then will draw a line in the sand as to whether to have an assist. Finally, we draw a line in the sand about frequency. We have to draw these different lines in the sand that apply to different engineering functions. Bill or Robert, would you like to comment?

DR. MARRAS: Yeah, my response would be it goes back to something Brian said earlier which is, it depends on what you do. And I know that's not what you want to hear, but that's the truth. Ergonomics is situation specific. You don't just go out and buy ergonomic tools and think you've done ergonomics, because what's called an ergonomic tool in a bad situation is bad ergonomics.

It's the right tool in the right place at the right time. So if you're going to force me to give you one answer, I'd say don't use your hands and everything's fine. But then you won't get the task done.

Q: Question for you, Brian. My name is Ed Fredericks. I'm an industrial hygienist with Michigan OSHA. The corporate-wide settlement between GM, UAW and OSHA is winding down, and I know from our experience, we see plants that have done very well and then plants that have not done so well. Are you a part of or are you aware of any type of report card kind of thing that GM, UAW or OSHA will be producing as the agreement wears down?



MR. PEACOCK: No, I cannot address that question. I am not part of that joint activity. I exist in the engineering function which deals mainly with pro-active design, and you're referring to a joint UAW-GM-OSHA reactive program. At the moment, the discussion of its continuance or the report card is up in the air. So I'm afraid I can't answer that question.

Q: Okay. And one for Bill. I know that we need quantitative analysis in litigation and in workers' comp and things, but what you just portrayed up there I would say would be intuitively evident to those who go into workplaces and look at workers working and talk to workers who are doing the work.

DR. MARRAS: There are situations where the cost is high in terms of injury rates or dollar costs, or whatever, where it makes a lot of sense to do a quantitative analysis because you don't want to be wrong. And that's where you use these types of assessment tools.

Q: Thank you.

Q: Hi, I'm Mike Fleming with Sara Lee, and my question is for anyone on the panel who'd like to jump on it. Lift truck manufacturers for the last several years have addressed ergonomics issues. The specific piece of equipment I'm thinking about is a narrow aisle equipment. The Crowns, the Heisters, the Yales have done a lot of work with ergonomics and human factors inside the operator compartment. The particular affect I'm speaking to is the single function control. Heister, within the last year, has almost been forced to go do this because of pressures from customers.

Have any of you had any experience in helping to quantify or evaluate or are you aware of any comprehensive studies that have been done that are in the literature that I could go to help find these answers?

DR. RADWIN: I think you hit the nail on the head. There is a great deal of literature on manual control design. Ergonomics, as Brian pointed out and Bill too, is much greater than just the prevention of work related musculoskeletal disorders. It involves the enhancement of operator performance and many other factors involved with safety and the use of controllers on forklifts or construction vehicles for example. We've worked with construction vehicle manufacturers on these kinds of controllers. Some of the methodologies that I showed you earlier describe how you might quantify and study repetitive motion force, the postures associated with the use of different controllers. There's very little published on these kinds of controllers specifically with regard to physical stress as opposed to manual performance and the ability for the operator to accurately and quickly use the vehicle.

Q: Chuck Taylor, Association of American Railroads. When we talked to our equipment and tool designers in our industry, quite often when we discuss with them why they don't give us a more environmentally and friendly product line, typically, the response we get is well, it's because it costs so much more than the current product line, and our customers aren't willing to

pay for that cost.

Well, setting aside the issue of whether or not the customers ought to pay that premium, based on considerations of total life cycle costs, has it been your experience that, indeed, if you're going to take that extra effort with regard to a more ergonomically designed product, that it is going to substantially increase the cost of that product?

MR. PEACOCK: I think I can answer that question. We're continually faced with that problem. We recommend a design change, and then the people who have been designing that equipment in the past say, no, it'll cost too much or who will pay for it? It's always an issue. It might be handles or controllers, or it may be weight or welding machine design. We try to draw some reasonable lines in the sand that we give to the suppliers, and then we argue it out around the table.

One of our big activities is, in fact, communication with suppliers for equipment and tool design, and it's often a very difficult battle. But cost is always an argument, and there are a lot of people at this conference are discussing the costing of ergonomics.

DR. MARRAS: In my experience, the cost is only high if you try and retrofit. If you consider the design initially when you're first talking about building the tool or whatever it is, usually it's not much more than, and if anything, there's no cost at all most of the time just by doing it right in the first place. But just like in manufacturing processes and everything, if you discover you've got a problem too late and you go back and try to retrofit it, that's where the high cost comes in.

And, you know, I've had some well-known tool manufacturers talk to me about a lot of these issues, and what they tell me is that the cost is really minimal for changing the tool. But they feel it's a marketing point, and so, they'll charge you 15 percent more just to change the color to yellow and label it ergonomics. So I'm not sure it's a real cost.

Q: I'm Monica Steele from Abbott Laboratories, and this is for anyone. Similar to the gentleman asking about a one number, I've been asked to give one number. But fortunately, I'm giving this to design engineers. We manufacture diagnostic equipment, some of which are the size of small Volkswagens, and I'm trying to minimize the risk of having a 120 pound power supply being handled from six inches off the floor by a service engineer in the field. So I can handle manufacturability, but service ability is my worst case.

I won't give them just one number obviously. I've tried giving them regional numbers, you know, knuckle, waist and shoulder numbers, but that's not satisfactory to them mostly because the numbers are so low for low regions. I'm wondering if there is one tool that you would give a mechanical design engineer, be it one of the NIOSH models or a bio-mechanical model. Which it might it be that you would have the most confidence in? Not only the results, but given the fact that these engineers may not be trained in ergonomics and may not use it properly.

In other words, which tool is most likely for them to not make a drastic error and to come out with some reasonable results? Or do you think I ought to stand firm on some numbers that I've done the analysis?

DR. MARRAS: Well, I guess the question is how important is it to be a 100 percent right? Is the ball park good enough?

Q: I think in order to improve the situation we have today, a ball park is a wonderful first step, yes.

DR. MARRAS: What I would recommend is just base it on the very simple concept of moments. If it's so far away and you can handle so much weight. If it's so high, you couldn't handle so much weight. If it's so low, you can handle so much weight. And that's probably the simplest and easiest thing to do. Keep it simple.

Q: So given certain moments they can easily calculate the moment, where would I find, you know, the guidelines as far as what numbers?

DR. MARRAS: Okay. There are a lot of sources for that. For example, if you look at the first phase of the OSHA Standard, those are some ball park things. The part that enters you into the more advanced NIOSH analyses. That's probably the simplest way you could do it.

Q: Okay.

DR. MARRAS: There are a lot of lifting calculators out there, computer programs. There's all kinds of ways to get those numbers.

Q: Deal with the moments only. Okay. Thank you.

MR. PEACOCK: One answer to that question is that we're forever asking questions of that nature, and the approach that we use is a consensus of experts to come up with the number.

I think I've got to draw this to a close. But before I draw it to a close, I've got to thank Jim McGlothlin from NIOSH in putting this session together and got us all to come to talk. Again, thank you very much, Jim. And thank you all for coming.

Whereupon, the Product Design session was concluded.

## Utilities

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Ira Janowitz, University of California

MR. JANOWITZ: I'm an Ergonomics Consultant with the University of California Ergonomics Program in Richmond, California. I've had the pleasure of working with several utilities over the last several years; and I appreciate the work of utility in the utility industry every time I drink a glass of water, flip on a switch, an electric switch, or flush the toilet. And especially, many people in the Northwest United States right now are finding a new appreciation for their utilities as some of them are left without power, without water and without heat.

Utilities combine the hazards of many different industries. We had a panel on construction ergonomics this morning, and it occurred to me during that that utilities combine the hazards of construction, warehousing, laboratory, office work, and to some extent, manufacturing work. The ergonomics risk factors include high force, awkward postures, vibration and the other risk factors that we're all familiar with.

I'd like for us to begin our panel discussion by discussing program elements of successful ergonomics programs and move on to specific interventions in electric, gas and waste water treatment. Our panel members which I'll be introducing in a little bit more detail as we go along include Randy Nicholls immediately to my left who's with Montana Power Company; Fran Devlin to his left, who's with the San Francisco Division of Pacific Gas and Electric; Pam Deutsch on my far left who's with Puget Sound Power and Light.

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Pam Deutsch, Puget Sound Power and Light

MR. JANOWITZ: Let me begin by introducing Pam. She's a Senior Industrial Hygienist for Puget Sound Power and Light, and has been with the company for almost five years. Prior to her current position, she was an Industrial Hygiene Compliance Inspector for the State of Washington. Prior to that, she was an Ergonomics Consultant with HAZCON, a private consulting firm. Pam received her Masters of Science degree from the University of Washington in 1990. Prior to that, a Bachelor of Arts degree from Earlham College in Richmond, Indiana in 1983. Without further ado, Pam Deutsch.

MS. DEUTSCH: Good afternoon. As Ira mentioned, things have been happening in the Northwest, and I'm just glad that I'm even able to attend the conference today. I appreciate being given the opportunity to talk about efforts that our company has taken in the last year in expanding our ergonomics program from our office environments out to our operations or field employees.

In the last couple of weeks in Washington State a state of emergency has been declared in seven out of the nine counties that we serve. The counties have either been under water, under mud or under fallen trees, and I've actually been working an 18 hours on, 6 hours off shift, the 18 hours being on during the night. So it's a little strange to be awake at this time of the day.

This is what happened to us in the last 48 hours. This is our Snoqualmie Falls hydroelectric project. It looked like this one day, and within 48 hours later, we had flooding. We had an arctic express followed by a pineapple express during the course of a week. The temperature increased about 30 degrees.

Puget Power is the largest private utility in Washington State, and it's the descendent of more than 150 little companies that first started providing electric power in 1866. We're about to get bigger in this world of energy industry deregulation. Any utilities are considering merging or have already merged with another utility. We're about to merge with Washington Natural Gas. After the merger, we're going to have about 3,000 employees and over 2 million customers.

We live and work in a beautiful part of the country, as you can see from these slides. This is one of the reasons that we're willing to put up with a little bad weather every once in a while.

Our facilities are located in nine counties in Washington, and we're part-owners of a coal-fired plant in Montana. Our operating headquarters have what are called Line crews, Project Center crews, New Business crews and Wire crews working out of them. Our Line Worker crews do all of the maintenance work on our system. So doing tasks that would include things like climbing poles, using hot sticks, climbing up an H-frame structure, working out of a bucket truck and working with tools.

Our Project Center crew does all of the new transmission line construction, and the tasks that they're involved in include digging structures for footing placement of poles and lifting construction material. Our New Business crews do all of the new distribution work. So this is mostly underground work. Doing tasks that include digging trenches and installing underground cable.

And then we have something that's relatively unusual for a utility. We have a wire crew that does all of our substation work, and that's all they do. They do a lot of loading and unloading equipment as they construct and maintain a substation. So as you can see from the slides that I've showed, our field employees are exposed to many awkward postures, a lot of forward bending work and excessive force. They're constantly being asked to lift things that folks shouldn't be

asked to lift, repetitiveness of tasks, temperature extremes, awkward postures combined with excessive force, and fatigue.

This is the safety and health organizational chart for the company. And you can see we have a number of vice presidents along with our human resources director serving on the Executive Safety Review Committee that the safety department reports directly into. Joint labor and management safety committees are mandatory in Washington State, and we have more than 50 of those functioning around the company for each individual area in the company.

What we've found in the last year, year and a half is that almost half of our workers' compensation claims were related to ergonomics issues. This would include both over-exertion and some slips and trips. The claims were found to be about 15 percent of them from an office environment, and 85 percent of them were coming from our field employees. Fifty-two percent of the claims were related to back injuries, 14 percent were related to shoulder injuries, and 13 percent were related to hand-wrist injuries. The ergonomics claims accounted for 61 percent of our workers' compensation costs which are over \$500,000 a year in direct costs.

Back in 1991, Puget Power hired an outside consultant to train several in-house employees on the principles of ergonomics and how to conduct workplace assessments. This was done just for the office environment, and it was in response to the growing number of carpal tunnel syndrome claims. The assessments were conducted when an employee requested it and training was given simultaneous to the assessment.

Training was provided to all of our customer service representatives. These are folks who spend their entire shift on the telephone and computer. The company purchased numerous ergonomics training videos which could be viewed during a safety meeting, but again, these did not relate to our field employees. And so, the field employees found the videos rather useless.

The company began a pilot back injury prevention program involving back belts in 1994 to see if back belts could decrease our injury rate. The program was never completed, and we asked them to discontinue the use of back belts until there was scientific evidence that they work. In 1996, we received approval from our Executive Safety Review Committee to begin providing ergonomics training to the field employees. Each one of our operating headquarters has a "Safety Day," which is an entire day that's devoted to safety training for the employees at that facility.

We hired outside consultants to assist us with the training. One of the consultants was a physical therapist, one was an ergonomist, and one was an engineer. We ended up calling the module back injury prevention, because we were told by our safety coordinators that we'd have a hard time selling it if we called it ergonomics. The challenge we were told we had to overcome was that our field employees saw ergonomics as being for the "office girls".

So at each one of the Safety Days, we spend about half an hour inside going through a slide presentation, discussing what the ergonomics risk factors are, and alternatives to how they might

do their work, recognizing that, of course, there's an awful lot that can't be changed about what they have to do. We then head out to the field and spend a half an hour with the employees going through some of their routine tasks and using the principles they've just heard about such as technique for shoveling. Alternatives that they could consider as they're shoveling, because our folks do so much shoveling.

The technique for lifting compressed gas cylinders. We've actually had a number of back injuries from folks having to lift these things up and then placing them up at about a four foot high level.

Taking ladders on and off of rigs have caused a number of injuries to folks simply because there was enough force coming with the ladder that forced them off of the back of the rig, or simply just a cumulative trauma back injury. So we covered alternative techniques for this task.

Technique for lifting a box of insulators. Again, just covering alternatives for how they might normally do things. This gentleman is about six foot six, and I'm not going to even guess his weight. When we asked him the first time to pick up the box, he simply did a heavy weight lifters clean and jerk lift. We talked with him about some alternatives of how he could actually do that lift in the future.

We spent a lot of time with them talking about how to get in and out of the rigs. And one of the things we discovered was that our rigs are not designed consistently. The rigs first come into our fleet facility, and then fleet tailors it according to what the facility that purchased it asked them to do. So some of them have added on handles to the left or right of the door. You can see this gentleman's about to put his hand on it and use it for getting into the rig.

Some of the trucks don't have that additional handle. The rigs have different configurations of steps for getting in and out of them. We realize some people were literally having to vault themselves into the rigs. And some of them had that additional step that was real useful.

We had them go through the process of getting in and out of the bucket. That's one of the worse contortion processes that I see folks having to do. Again, no consistency in our bucket design. Some of them had little side doors that folks would have to bend down and over and get into. Some of them were made out of cloth material like this particular one. The other thing that we spent a lot of time talking about was lifting our vault lids. We've had lots of back injuries with lifting vault lids and so we wanted to give them some alternative ways to think about doing that task.

We're in the process of developing an ergonomics program, and we're basing it on the guidelines booklet that was developed by the State of Washington. We're creating an ergonomics task force that will have representation from all the appropriate areas in the company.

We're going to continue to train our Safety Coordinators on the principles of ergonomics in order to use their eyes and ears out in the field.

We're going to be training the Safety Committees on the principles of ergonomics and how they can actually work to solve situations they identify.

We will be training our tools committees, because each one of the areas in the company has a tool committee specifically tasked with looking at the tools that their folks work with. We'd like to be able to utilize them for coming up with solutions with issues that we or they identify.

One of the tools that we've been able to identify for redesign in the last couple of years was the heavy, hand-held, cumbersome computer unit the meter readers were using to do their meter reading. We found that there were companies actually were manufacturing smaller units, so less force was required for holding the unit. We also purchased holsters so after they're done with reading, they can holster the unit and not have to hang onto it through the course of the day.

One of the issues that we identified during the course of the Safety Days was that we had folks working with vibrating tools, including jack hammers; and nobody had ever talked about ways to protect their hands and wrists in the process of using those tools. We are going through the process of looking at some anti-vibration gloves to determine if something like that might help us prevent those kind of injuries.

We also identified the need for a different tool for lifting the compressed gas cylinders. That was one where the worker having to lift back and then put it up at a four foot high level. We identified that there is a tool, something they can clamp around each side and then they can actually lift up the cylinder with handles. But when they're getting into the space where they need to place the cylinder, there's not enough clearance to use that tool. So nobody uses it. So we need to design another tool that would work for that task.

We also identified the need to redesign the vault lid lifter tool that we have. And I'm sorry, I don't have a picture of this tool. It's basically a three foot long metal rod with a little hook on the end and then two little hook handles so that these folks are only able to use two fingers to lift a vault lid. Sometimes the force involved in the vault lids themselves can weigh up to 120 pounds. And then the impaction of being packed into the ground, the force that these folks are having to use, is pretty phenomenal.

So we're hoping to design a couple of different heights of the tool, because right now it's a one size fits all, and we'd like to create a different handle that could actually have a different grasp to permit better body mechanics.

We've also been working with our facilities staff on furniture and equipment design and purchase. And we're going to be training them on the principles of ergonomics. We'll also be training our work practices and standards group in order to utilize their expertise in creating solutions to work practice problems.

We are also considering a company-wide stretching program. Several areas in the company



historically have had stretching programs which have fallen by the wayside for one reason or another. Either there was no management support or employees no longer felt motivated to actually lead the stretching exercises.

The company that we're merging with, Washington Natural Gas, has exercise facilities at each of their main headquarters. And so, there's discussion now about what happens when we become a merged company, the possibility of expanding that exercise program into more of our facilities so that more people have access to it.

I can't really talk about what the success has been other than antidotally from taking our Safety Days and incorporating an ergonomics training module. Antidotally, it's been very well received. Field employees don't seem to feel like ergonomics is just for "office girls" anymore, which is a major hurdle to have gotten over. We're actually getting calls from our field employees asking for individual ergonomic assessments where we can go out there and work with them on particular issues. We've had a number of line men approach us and say, you know, I've got carpal tunnel syndrome or I've had release surgery.

And so, this is pretty new, because for those of you who don't know, utilities line men see themselves as somewhere above God, and then there's God, and then there's the rest of us normal human beings. Line men do not typically talk about any problems or issues they might be having. So it's a pretty major breakthrough for us to have them volunteering information about ergonomics injuries. One of the things that I've seen in this last year unfortunately, but probably not related to implementing field ergonomics training, is a huge increase in our recordable reportable and time lost injuries.

Our feeling is that this relates more to our merger activities and the folks that are feeling disengaged and distracted. We're hoping that after that process ends, we'll actually start seeing a decrease in our lost time injuries, and hopefully a substantial decrease in our back injuries. So, thank you.

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Fran Devlin, Pacific Gas and Electric (PG&E)

MR. JANOWITZ: I'm going to ask that we hold questions until after the speakers are finished, because some of the subsequent speakers might address an issue that you had in mind. Our next speaker is Fran Devlin. Fran is a Nurse Practitioner whose been working on a contractual basis with the San Francisco Division of Pacific Gas and Electric since 1989. Fran is a Nurse with two Masters degrees, worked for United Airlines Medical Department from '86 to '89 and has a wealth of experience. And without further ado, Fran, you're on.

MS. DEVLIN: Hi, everybody. Many of the issues that I'm going to actually be addressing or talking about has been covered this morning, lots and lots of overlap. And I thank Pam because

she covered some really good stuff that I really won't have to go over. But first of all, I'll tell you about the company.

PG&E has been around a long time, just like Puget Sound. We are both gas and electric. That's the way it's been. PG&E, too, is expanding as of this month. No longer is it a company. It's now PG&E Corporation, so a whole big change in the structure because they're looking towards other and new areas of endeavor. We have 18 divisions within PG&E, a pretty big place. That's about two-thirds of the state that they cover. We have about 20,000 on last count. Our numbers kind of go up and down depending on what's going on.

And the two primary unions are IBEW, (International Brotherhood of Electric Workers) and ESC (Engineers and Scientists of California).

Now, we're going to talk about San Francisco, because that's where I work, and that's where a lot of this stuff has been going on. The rest of the company is doing lots of good things, too, in ergonomics. And actually, Ira is one of the consultant advisors to the company as a whole. But I'll stick with San Francisco right now. We have approximately, again, last count as of last week, 675 employees. We have physical and non-physical work force. Physical are the line men, underground electric workers, gas service reps, gas construction, and gas maintenance operation. We also have mechanics who fix the equipment. We have the non-physical who would be our customer service reps. They would be on the phone doing a variety of tasks at the computer. We have our estimators engineers who use this wonderful gizmo called the "CAD Board," Computer Assisted Drawing. So they spend time at their computer working on that as well as going in the field.

Mean age, 42. Range is approximately 19 to 66 years of age, but I was informed by the employee that was trying to help me staple some of these things together that he's 67. So I apologize, but we go from 19 to 67, 80 percent male.

I started from the point of cumulative trauma, and then I used ergonomics as a preventive approach. CT is wear and tear, repetitive strain, if you will, pressure on the muscles, tendons, joints, and it leads to problems over time. And OSHA considers it an illness when reporting, and they keep bringing that up all the time. 'Cause that helps with tracking if you put it in the right place. Unfortunately, it doesn't get there. It usually ends up being a strain or a sprain. So it's hard, then, to know, like, what you're really dealing with.

If you're calling it a sprain or a strain, then to me, you deal it with differently. If somebody tripped and fell, that's different than wire cutting multiple times a day. Prevention, again, involves the ergonomic approach, because it's related to work processes and tools, the way jobs get done.

When I came to the San Francisco Division and PG&E as a whole, just like Puget Sound, had a really, sound safety program in place for the company as a whole. If an incident occurs,

management, safety representatives talk about how could this accident be avoided. It had to be an acute type injury. There was no such thing as CTD.

But meantime we continue to see all these injuries and illnesses. These problems kept occurring. So PG&E decided that maybe they ought to have an in-house person look see. When I came to PG&E who was coming through my door as a health care professional were the employees with wear and tear injuries, Carpal Tunnel, elbow problems, tendinitis, back problems, shoulders, etc.

What I noticed in 1990 that at least 27 percent of the reportables were related to cumulative trauma, just like they said this morning, responsible for the most amount of lost time. Lots more in the physical work force than the office workers. Had problems with the office workers, but the physicals were worse, especially at our gas construction --- I think we had about five cases of Carpal Tunnel in 1990 at gas construction. Leads to the loss of productivity and it's costly as they mentioned this morning.

Not only is it costly in term of workers' comp claims, how much money gets paid out, but costly to the individual themselves that can't do their work and to the co-workers who have maybe -- instead of having three do the job, you have one person. Or if you have only two to begin, now you only have one left, and/or they're using their other arm because one hurts, so they switch to the other. So it's more pressure on the other side of their body.

Further data collection included, going out and looking around to see how people are working, and then talking to the workers, of course. Because they have the clues in their pocket. They know if you converse with them. And if they don't, sometimes it helps just to point things out, see where they think the problem is coming from and which tool maybe they think is the source.

With me being in the position of being on site, I'm calling the shots in terms of what the problem is. As I am prevention oriented, I don't just sit there and say, well, here, take a few pills, call me in the morning. I want to see where it's coming from. I want to go find out. So besides making the diagnosis, the education is more on a one to one work modification.

We are fortunate that we can modify the work so people can still come to work but don't have to do the same activity. Monitor to see if we're making any improvements. Ergonomic consultation, if necessary. And I often use lots of -- well, I send a lot of people to physical therapist to work with for their specific problem. But before I send them back again, I want to make sure everything is in place, that we don't start from ground zero again.

On this, I chose just a few years because I can't go through all the trends that I've been following, but I would like to stress how important it is to follow trends. And again, the speakers have said this before, just to see where you're going, where all your problems are. And when I looked -- of course, all of our injuries or illnesses, everything was kind of lumped up. And what I'm showing you now in the cumulative trauma "pile".

Gas construction had 11 back problems 1993, and I'm just going to jump through a few, and customer service, their predominant problem was hand problems from being on the telephone, reaching, lifting, whatever, just with their hands, leaning improperly, leaning on their elbows.

In 1995, a little bit of movement here. Things kind of jumped back and forth, too. You'll go from one part of the body to the next depending, and maybe you can find the work process as the culprit. Maybe there's something else out there, too, that that's a problem.

In 1993, too, we were going through downsizing, and that's a very difficult time. With downsizing, though, I saw more of an increase in acute problems, not so much on the wear and tear. 'Cause people weren't really thinking, not focused, were nervous, they didn't know if they were going to have a job tomorrow, and less people to work with.

Here, things are starting to mellow out in 1995. Some improvements as you jump around. Hasn't all gone away, and it probably won't. And then it's also when people report. They all don't always report at once, they might wait a while.

1996, we have a change to our names. It's now Gas Maintenance and Operations. We kind of change depending on the nature of the work. And again, they're doing maintenance work. They're doing some, a little bit of construction in terms of gas lines to the person's house. And back problems started to go down. And are we using tons of back belts? No. But I'll get into a few other things with our customer service.

What happened was the mouse came along at PG&E for our computer operators. The mouse was just placed on top of the desk. Well, the keyboard might be below it, so employees were reaching. And our other group we call capital investment, that's our engineers, the CAD board is just not in a good place causing the employee to reach and stretch.

But meantime, our physical people started to improving, but we were putting a lot more effort here, too, with our programs. Before I get to this, I will also say that what Pam mentioned is our electric linemen aren't complainers. They usually wait until they really have a problem before they'll come in the door and chat with me about it. I have developed a fairly good relationship with them, so they might whisper it in my ear, but they don't make it a recordable. So I never get swayed by the data in terms of OSHA reportables, because I still know some of them have problems with their shoulders from working with cross-arms.

We have within our group, within San Francisco, in all the divisions a safety committee, and that is key, I think, to be able to get anything done. And employees and supervisors are represented. If it's really heavy on employee empowerment. They meet on a monthly basis and have a member attend system-wide meetings. It's a very key group, and that's part of the reason why I'm here, because they thought this would be a wonderful idea, too. They are key to implementation of a program.

With gas maintenance operation, because we were having problems, we began looking at what could we do, or could they do to improve it? And before, they would do all the digging in San Francisco, dig up the concrete, go through the cobblestone. They didn't bring in equipment to do it because it was difficult in the city. Well, now they're using a saw cutter contractor. Now, I don't know what happens to the saw cutter, but at least, the saw cutter shows up, cuts the pavement for them, so we reduce the risk of exposure.

We did try reduced vibration pavement breakers as well anti-vibration gloves. Unfortunately not every glove fits every person. And sometimes they have to work harder. But we went through a whole bunch of trials, came up with one that seems to be working fairly well. But again, one doesn't always fit everybody's, so you have to look at other vendors. I'll show you some pictures of some of the rest of the stuff as I go through.

We had three person crew. Then we went to two person crew. Now, we're back to three person crew.

And the Stretch-N-Work: We have a stretching program. Does everybody do it? I'm not going to stand here and say they do, because they haven't totally bought into it, at least in the San Francisco Division. They know it's important. They do get training on CT prevention and recognition. So they are aware of the signs and symptoms. So at least they'll come forth if they are having a problem.

Okay. What he has is an impact bar. Is anybody familiar with this thing? They look for leaks, but they go through basically any kind of crack they can find in the pavement. And that has a nice little small radius on, and you can see his hand around there. This is the newer one. What happened was with the older model, this one, elbow problems. Because when I had asked them, well, what do you think is causing your elbow problem? Oh, it's that impact bar, "cause that's the killer". So they would go through these small holes and then bam, bam. And you have to really take your whole body and go down with it which not everybody does. Also, come in various sizes but not the same size in each truck. So you might have the little person working with the big one.

This is a device that holds their ....

MR. JANOWITZ: Whacker.

MS. DEVLIN: Before it was behind in the truck so they'd have to crawl over everything and pull this thing out. And I think it weighs about, what 100?

MR. JANOWITZ: 150.

MS. DEVLIN: 150 pounds. So they don't have to do that anymore. It just swings out and they can bring it down. It's level with them, so there's no more climbing over everything.

This is where -- we don't have this on all the trucks. This was -- this idea was formulated by one of our employees who came with the idea of when they do have to use their pavement breaking devices, to have a cabinet that's easily accessible. So again, they're not digging, going through their truck to get to their stuff. This one is actually controlled by a little button. It's on a lift, so you push it, it comes down, and it goes out. So again, it's equal to the waist.

The only drawback they tell me is they can't double park with this. Somehow, it gets in their way. So we haven't quite gotten through this whole thing yet, but it was fitted on one of the trucks. Unfortunately, we still don't have a 100 percent buy-in.

Pam mentioned this, too. Like the trucks, this guy was trying to jump in all the time. He went on his own and had those installed in his truck because he didn't want to use the steering wheel to lift himself in.

Instead of bringing in sometimes the back hoes, you can bring in this to do the digging. And it's smaller for those who work in the city. In the country, it probably doesn't make that big of a difference, but in San Francisco, it does. And so, using this instead of digging is a better idea. And there's another thing that fits on there called the "pecker," and you can put the holes in the ground that way. Just these little simple things.

And this person is taking their little stretch break here that I put them in.

We had a class, too. This is a person who is an ergonomist and a physical therapist who went through a back training class. Also, we were watching them work to see how they lifted, how they put things into their truck.

Electric construction. Some of the things that have occurred there was that -- and one of the other speakers will speak to this, the crimping device. But cutters, instead of having the usual cutters like this, we have a battery powered one. I think I'll show some pictures of the man hole lift. That's easier.

Again, the theme is the training, the awareness training of the importance of using proper tools if they're available. Sometimes they're not, they don't exist. If anybody could come up with a wonderful idea, then giving him credit for that and then signs and symptoms. If your hand is feeling numb, please tell us about it. Please tell me about your shoulder.

On the right there is the Fargo wrench versus the traditional standard wrench. You don't have this jerking movement. And then there's the regular hacksaw and then there's the power cutter. And, though, this might weigh a little bit more, they find it easier on bigger jobs just to use the power saw which makes sense.

What he's demonstrating is a traditional way of doing cable. This is electric underground and then the hydraulic operated cutting device. Unfortunately, this thing is kind of a heavy thing you

lug around, so it hasn't had wide acceptance. It works, but it's just not that accessible.

And this is the last -- this is the one person lift, but you have to have the right kind of cover to lift it, and not every cover is the same in San Francisco. He prefers, he told me, the two person lift, because it's easier to maneuver. But he's able to do that with one and not much effort. There he is. And this is a two person lift. I was telling the members of the panel earlier that they were putting on this new cover. It didn't have the holes in it. Our division has a welding shop, and they had them put the holes in there so they could put their hooks in there. So in the future, they'll be able to get this thing on and off.

Our other workers, Gas Field Service, our gas service reps. A lot of problems, and that's -- the numbers are going up, but these would be more of our older employees -- called H-4's, --40 to 50 years of age. And what they did earlier on was start using knee pads, simple little pads, because they had knee problems from kneeling on the floor. Also, they use a tool pouch rather than heavy metal boxes. They also have lighter tools and use hand pumps for pilot lights to avoid having to place their back in an awkward position.

We tried the Stretch-N-Work with them. It hasn't been working that wonderfully well for this group in San Francisco, but the gas service representatives are doing it in another division. Again, training to prevent problems, and encouragement to report problems when they occur.

Office Field: All of our office people do get an evaluation, and they started doing this, maybe, in 1990, but even more so now. I think what I see in terms of antidotal notes, if you will, is people are calling and asking for ergonomic evaluations, and the bosses are asking for them, too. Employees will also rotate to another area then it's real important that we keep re-evaluating so they don't go into the six foot four office space and they're only five foot three.

Sometimes the pointing devices are problematic so if an individual has specific complaints that maybe related to the pointing device, I do office visits and I sit there and watch them work for a while, make corrections, and write out my report.

Seating: Important for the office workers as well as for our crews, and we've done a lot more in that area, too, with out back hoe operators giving them better seating. So the seat takes the absorption of the vibration from the ground versus their backs. Unfortunately, the physical have gotten forgot in the past, but now we're pushing for improved sitting in the physical.

This is just, you know, typical of people when they're working and the kind of positions. And her mouse is way up there. We've seen that. Maybe some of us are guilty.

This person's working with the CAD board, and they prefer, because right now the CAD program is on that pallet there. It's going to go on windows next year, and some companies really have it on the computer. They don't even have to use the digitizing board. But we have that for another year or so, so we kind of have to make do.

And this person liked having their arms supported that way.

Another person, what we did was come up with this device that we found. And this works for them. You got to move a little bit with this, but at least they're not stretching. But again, it's all going to be automated onto the Windows program.

MR. JANOWITZ: Excuse me, I just want to make the point that these workstations were set up to put the keyboard, as the primary input device, in front of the operator even though the keyboard's used 10 percent of the time, and the CAD board is used about 80 percent of the time, and then the mouse, 10 percent. So that the fact that these workstations were originally set up as cookie cutter workstations with the keyboard in front caused, I think, the major part of the problem.

And this is just the person actually who installs some of these devices. He's got one in there, but I took a picture of this because he's working smart. He's got his bucket, and he's got his little wheely. So instead of carrying this thing up and down the elevator, up and down the stairs, he just wheels it around. A simple thing like this can save his back and his arms.

Basically, we'll continue with an ergonomic approach, if you will, to CTD prevention. We have to keep including the employees. We need to -- oh, this what the employees had to say.

What they had to say, and I'm going to skip to the second one here. One of their goals, and I underlined it, was to continue to educate employees in the area of CTD prevention. So they, themselves, feel it's important. It's not management saying this. This was not me in the room prompting them, but they came up with this, and they're also big on exercise. And we actually do have an exercise facility at our place, but not everybody uses it.

We have purchased some new tools. Some of them are user friendly. Some of them we still have to work with. We have a reduction of lost time days. Our rates are about the same, maybe 27, maybe 33 percent are cumulative trauma. But we don't have that much lost time. They're not as severe as they once were in the past. So that's good. A lot of these, we cut short at the pass by just making things available to people, the right tools.

Again, early reporting and work process changes again instead of digging everything. Plan the job ahead of time, the design of the job is important, too. In San Francisco there are curb meters. I don't know if other people have them. It looks good. The house -- the owners are really happy with curb meters, but they're hard on the employees. So we're really looking at that, because they really have to work hard to adjust those meters once they're in the ground. So that's been brought up as an issue to try to talk customers out of curb meters if they can.

And these are two of our happy healthy employees, a little stretch there, but very happy with the job they have accomplished. And that's all. Thank you.



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Randy Nicholls, Montana Power Company

MR. JANOWITZ: Thanks, Fran. Our next speaker is Randy Nicholls. He's an Industrial Hygienist with Montana Power Company. He's a certified Industrial Hygienist with over 18 years of experience in the safety and health business. Randy.

MR. NICHOLLS: Thank you. I put up my address, and phone number and E-mail address in case you want to get in touch with me after the presentation. A couple of observations. The more you see the presentations, the more you realize your program starts to look a lot like other peoples' programs, and we experience much the same problems.

I've got essentially three objectives in my presentation. First, to give you an overview of our total program, some of the specific highlights and what we think are unique features to our program and some of the results and lessons that we've learned.

We started in 1991, and this was actually before I even worked for the utility side of the company. We partnered with Montana State University right at the beginning of the program and developed a three point strategy.

First, develop internal expertise to be able to deal with ergonomic issues. Secondly, and I think just about everybody has brought this up, you have to develop an employee awareness to ergonomic related issues. And thirdly, we felt there was a need for some research and development to find solutions to problems in the utility sector. By the way, we're a combination gas and electric utility.

To develop the internal expertise, we had our company field safety directors and our facilities dept. that deal with office furniture attend a day and half workshop that was put on by the university back in '92. This slide is just kind of a chronology. In 1995, the company hired its first industrial hygienist. Actually, the program had kind of stalled, and I think we've picked it up and got it going back in a good direction.

In the utility business, traditionally, safety and health people have been brought up through the ranks and a lot of them through the craft ranks. We've started to move away from that a little bit. We're requiring all of our safety directors to attain an Associates of Science degree in safety and health.

We are fortunate in Montana that we do have a four year degree program offered within the university system. They can even obtain a Masters in industrial hygiene as well. So we feel that it's critical to get some credibility and some expertise, not only experience-wise, but educational-wise for the people to lead the internal effort.

Probably in February or March this year, we plan another workshop. This is going to be an eight hour, more of an advanced workshop for this same group. And we plan to focus more on field applications and assessment tools so that we can, in the future, start doing more actual field observation assessments.

On the employee awareness side, we had awareness training back in '93. It was a two-hour session. Our message here was instructing employees how ergonomic principles can apply to their daily work, and then the empowerment word was thrown out at that time to say, yes, the company wants you to look at your job, and we are empowering you to make modifications within your realm of influence. So that was the first effort there. We keep that in front of the employee.

We, like many other utilities, have an annual -- we call them Employee Safety and Health Seminars, and we include an ergonomic component to that presentation. Typically, this is in the form of retraining on lifting, updates on our research activities, new tools, et cetera.

This, risk versus load profile chart has been a component of our lifting training over the years, and we really have made some headway in this regard. People do now understand that when you start lifting things over 70 pounds, you are starting to go into a higher risk category here. And we think that has been effective based on the reduction in lower back injuries in the company.

The third element of our strategy is the research and development. The first study that we conducted is what we call the Crimping Tool Study. Fran has already shown you a crimping tool. I'm sure you're all aware of what that involves. Here's a picture of a lineman using a manual crimping tool to connect conductors. We took that tool into the lab at MSU and did four studies. Then we brought that information back to the crafts.

This is really kind of hard to see. This is a chart comparing the force over here in pounds, and this is time down here of two different types of connectors, same size wire. You can't quite see the graph, but it basically goes like that. Same size wire, two different connectors, a 508 versus a 502, and you can see the force is considerably more, almost double for the 508 versus the 502.

And people say, well, why do you even use the 508 or why do they make two different types? Well, there's some cross-over there that in many applications, the 502 can be substituted for the 508 and make an effective connection. The point here was we brought this back to the work force and said, look, there are some things out there that you can do to influence the amount of stress you're putting on yourself.

We also examined the inner jaw and outer jaw of this crimping tool. As you know, most of these tools can be fitted with two different size dies at once, supposedly to help productivity because you don't have to change dies. We found through this study that the force requirement on the outer jaw, again, the graph line is pretty thin, is considerably more. Basically, the conclusion of this was don't use the outer jaw. Change dies. Only use the inner jaw.

So MSU went ahead and developed what was called the stress index, and we kind of carried this theme, as you'll see, through a lot of our ergonomic related research. The red, yellow, green zone -- green being the least stressful, red being the very stressful. What this equates to is at our stress index of 1.0, that is equal to the maximum strength of 20 percent of the male population. Right here is 50 percent strength, max strength of 50 percent of the male population.

So MSU put together a matrix which rated various combinations, squeeze on combinations, and you can see here in this column, they were into the red zone with those types of connection combinations. And again, the message was brought back to the line worker that, look, you can influence this. Fortunately, technology had been cruising along quite nicely and a battery powered crimping tool was developed.

This is a battery powered crimping tool. Fran showed the hydraulic version, which is quite cumbersome. In fact, if you've looked at crimping tools of this type two years ago, look at them again. Within two years, they've shrunk considerably in size. They've made a lot of improvements in battery powered crimping tools. We don't expect ever to get completely rid of manual crimping, however, we just finished a program up in '96 to get battery operated crimping tools in all of our operating divisions. These were purchased with money that was saved from workers' compensation.

I'll go into that in a little more detail, but we returned about \$120,000 back to the operating units that we saved in 1995 on workers' comp cost, and we earmarked that money for these types of purchases. In fact, we developed a hit list that they pretty much had to stay within. The hit list was developed from a field survey done in 1995. As I said, I'll elaborate on that a little bit more here in a minute.

Okay. The next effort was our ground rod driver study. We analyzed accident data over a five year period and were very confident that this is a low number. We felt there were more accidents attributed to the use of these manual ground rod drivers, but we couldn't make the connection through the accident reports. But a fairly high severity was involved in these types of accidents, 71 lost days, 119 restricted duty days cost of about \$21,000.

For those of you unfamiliar with these devices, they're similar to what Fran showed for driving the lead detection probes. These things have work written all over them. The alternative --- a percussion tool that has an adapter, to drive the ten foot, half inch diameter ground rod. We talked about acceptance. Initially there was quite a bit of resistance to using this tool by the work force.

But fortunately, when we distributed the workers' comp money many of these devices were purchased. Also, there was kind of a domino effect. One of our operating divisions had already gone to electric ground rod drivers, and then word of mouth did the rest on the acceptance side. So now, we've pretty much eliminated manual ground rod drivers in our company. And we've eliminated accidents and injuries from manual ground rod driving. So this is another, what we

feel, is a success story.

This is what we call the body map survey. And this is what we hope will be a pretty good assessment tool. Essentially, what happens here is you distribute a form that has the body map on it, and you survey the worker population. It's a self-report tool, and they basically rate their discomfort level by body part. For each body part, they rate the frequency of discomfort on a numeric scale, and they rate the severity of discomfort on a numeric scale. Then that data is input into a software program that we helped fund and develop through MSU.

Here's our color coded, easy to understand, scheme. The initial research effort on this was to determine if this tool could predict who would go to the doctor for MSD treatment. The result was that with an 81.5 percent accuracy, it could predict who would end up going for medical treatment for an MSD. That was the initial effort, and that was actually before I became associated with this product. We did a body map survey in 1993 across the company. We did a follow up in '95. We're in the process now of developing a comparative output from this program.

I don't have slides of the output, because we're still developing it. But essentially what it will do is it will tell you by body part, by department or job classification, however you want to query the thing, who has gone more to the green or who has gone more to the red. On an initial survey basis, we're confident it will show you if you have hot spots and may direct your intervention efforts. We hope to develop this product and put it on the market by the end of '97. So we think this could be another valuable tool in the ergonomics bag of tools.

Other activities: We've got a computer ergonomics program. Consists primarily of workstation evaluations. We have just recently put some alarm clock software onto various computers. We're finding that's a pretty effective item. These are computer programs that pop up an exercise graphic after so many mouse strokes or keyboard strokes. And that in conjunction with a properly designed workstation, is providing some success in that area.

Stretching programs: We have those. We have a fairly good participation rate, but they're not mandatory across the company.

You need an avenue for employee input, to bring issues, ergonomic and otherwise, to management. To accomplish this, we have a safety committee system throughout the company. In fact, Montana's a little unique in that regard, I think. They passed a state law that requires companies to have joint labor management safety committees.

Now, as I said, in 1995, we did do a field study, and we wanted to make sure that we were looking at the right job classifications. So we did a quick analysis.

In fact, in our company, the line worker category over the five year period of '90 to '95, experienced the highest level of MSD's. When turned into an incident rate, linemen are not the

highest, but they're second. We excluded the mechanics, because they were in the steam plants, and they were not part of this study. We included the gas trades, because we were in the field anyway.

Okay. Just quickly, I'll run through some of the practical things. We came up with a device similar to a conduit bender. It's a wire bender for bending conductors in the boxes and transformers. It adds a mechanical advantage, rather than just doing it strictly by hand. Again, these are on the market, but this was something that was identified.

Instead of kneeling at a pad mount transformer, this is a tool box stool. This individual made his own, but you can purchase them at K-Mart stores and Wal-Mart stores.

Gas service trucks: We're now attempting to get all of our little platforms back there height adjustable. We felt that would help posture.

Rehandling of material. We're trying to get rid of this scenario and get dedicated cable trailers so we aren't rehandling material.

We have the same meter reader issue.

Quickly, future projects. We've got a pole climbing study is about to start. We want to expand into generation facilities, do more field assessments. We've set up a pole in the lab, Human Factors Lab in MSU, and we're doing some things there starting in '97.

Results: We've reduced lower back injuries 57 percent. However, extremity injuries have increased. We think that's a reporting thing, awareness thing. We're still implementing many items and anticipate that the results will come more over the next few years.

And finally, to wrap it up, problem fixes equal dollars. Be prepared to spend the money before you identify the problem. Otherwise, it's a bomber. It's a morale buster. In our case, tying ergonomics to continuous improvement type of thinking was key to getting it accepted both on the management side and the labor side. In other words, this is improving the company. It's improving working conditions. It's a win/win deal.

Changes are measured better in years. A long and winding road was mentioned this morning, and I think it's going to wind a little further. This stuff takes time.

Keep the program visible but don't overdo it. We were actually told that our work force was tired of hearing that their mean age was 41 years old, and they were falling apart from the work they've done for the last 20 years. It's true. So we had to kind of cool it on certain aspects of that.

I would like to thank Dr. Robert Marley (sic) from MSU. He's our research partner in this effort, and by the way, the body map survey has been published in "International Journal of

Ergonomics." If you're interested in the specifics of that, we can provide you with the locations where those studies have been published.

Thank you very much.

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Ira Janowitz, University of California, San Francisco/Berkeley, Ergonomics

MR. JANOWITZ: Thanks very much. I would like to spend about five minutes going over some material from other utilities. But taking a cue from Tom Cook this morning, why don't you all stand up and stretch real quick, because we don't want to be hypocrites and put you in a static position for the whole afternoon.

We will have time for questions, but as I say, let me take five minutes. You know, we have overlooked water and sewer treatment, sewage treatment and some other utility issues. So I want to show some slides from those real quickly.

I'll introduce us by saying that most of these slides are from the Union Sanitary District which serves the Fremont, California area. But that they are analogies to other utilities as well, such as water treatment. And the material we're working on with regard to looking at valves is actually taken from work I did in an oil refinery with a joint labor management project at the Tasco Refinery at Concord, California.

This is advertisement for a microscope. And it's interesting that the pitch of this ad is how this microscope supposedly has superior ergonomics. Now, I'm not going to make any comment about any particular manufacturer, but I am going to say that I never thought I'd live to see the day when microscopes, and for that matter, forklift trucks were advertised on the basis of the ergonomics of the device.

Now, this is a lab that has a shared microscope, and people of sizes ranging from 5 foot tall to 5 foot 10 have to use the same microscope. She's 5 foot 10, and so we put the microscope on a monitor lift. And now, she can be comfortable. And the 5 foot tall woman using the same microscope can be comfortable, because it's on an easily adjustable monitor lift.

Another task they have to perform is mixing and shaking mixtures in these funny shaped containers. And this is a little home-made device they worked out so they didn't have to group the vessels so tightly. They could just shake it up this way, and eventually, this was replaced by a piece of equipment that does the same sort of thing. So there were problems with upper extremity pain as a result of statically holding this container and containers like this for long periods of time, and those have been eliminated.

In the treatment plant, we had problems with valves located frequently at seven foot heights and

lots of awkward postures to reach them. And so, we replaced them. Near the top, I think you can probably just about make out a rocker arm that has a loop of chain hanging from it. And we've, of course, improved his posture here. We also had large knife valves, and it actually takes 15 to 20 minutes of turning this chain fall for the valve to be opened or closed, because the mechanical advantage is so great.

So the force is low, but the repetition is very high, 15 minutes of repetitive pulling. We built a platform like this, and now people can stand on the platform and just use a hand wheel. Since the force is low, there's no problem doing this by hand.

We had also awkward postures as a result of other valves in the plant cranking repeatedly. There's no reason why this has to be operated by a crank. In fact, this can be replaced by a hand wheel as well, because the force was low in this case.

We also looked at truck design and the way things were stored on the trucks and found lots of awkward postures. For instance, there are large jobs where they're taking 50 safety cones on and off the truck. And so, we put a hinge at the base of the cone stack and allowed the cones to be taken off from the side instead.

This is a photograph of the same device that Fran talked about. And the point I'm making here is that one division of PG&E had a worker who developed this lift for the pneumatic tamper, but some other divisions didn't know about it. So we need to proliferate good ideas. We put it on the front page of the PG&E newsletter and sent it all around the corporation so people elsewhere could find out about this success story.

In making connections in sewer collection systems, these kind of hose clamps are in common use. And to make connections with this simple hand-held nut driver actually might take 200, 300 or 400 turns of the nut driver to make one connection at one junction. And so, we replaced that with an electrically driven nut driver. And, you know, there were concerns about sparks here, but, you're sending down a sniffer to check for methane and other gases that could burn. You're not sending a person down into the trench unless that's checked for ahead of time. So this turned out to be a good way to go, and it reduced the repetitive motion considerably.

Any utility is going to have a fleet of trucks, and truck maintenance was another issue that we looked at. In this case, we suspended the impact wrench on here that he's using to take wheels on and off from a cable. And when he's finished using it, he can just roll it away. So this was a big success.

The bottom line is if you can have ergonomic dog dishes, then we should certainly have better working conditions for our employees. And we should tap their intelligence as the speakers here have said today and get their ideas. This is a joint management labor meeting, a problem-solving meeting that we held at the sewage treatment plant to come up with good ideas.

There were six issues that we identified as high priority, and in five of the six cases, the employees and managers came up with the best strategy. Only in one of the six cases did I have a better idea. So that, I think, puts it into perspective: you're going to get the best ideas from the people doing the work. And with that attitude, I think we can have some success in ergonomics.

Why don't we close the formal part now, and if we can have the lights turned up where we can have some questions from the audience, there are microphones here, in the aisle, in the center, and you can direct your questions to any of us. Yes.

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### Question and Answer Session

Why don't we close the formal part now, and if we can have the lights turned up where we can have some questions from the audience, there are microphones here, in the aisle, in the center, and you can direct your questions to any of us. Yes.

Q : I guess this question is directed to anyone on the panel. Coming from a utility, how are you addressing rotator cuff problems, use of hot sticks, for example. Are you having any concerns or problems in that area and, if so, how do you address that?

MR. JANOWITZ: Okay. I'm going to make a brief introductory answer and then turn it over to anybody on the panel who wants to respond. If you do a bio-mechanical analysis of the work of line people, for instance, using hot sticks, installing cross arms and insulators, you see that various tasks exceed, in some cases 50 percent, and in some cases 75 percent of the male population's ability to exert that amount of force in that position. And if you look at the female population, you see that many of these tasks exceed the strength capacity of 95 or 99 percent of the female population.

So we're dealing with tasks that clearly are likely to cause injury and place a high load on the rotator cuff and other structures at the shoulder. So with that in mind, I'm going to see if any of our panelists have a response to that in dealing with shoulder problems among line workers. Did I summarize your question that way?

Q : Yes.

MS. DEVLIN: In San Francisco, they use rubber gloving so they're not using the hot sticks anymore. They use rubber gloves directly on the lines.

Q : They don't use hot sticks at all?

MS. DEVLIN: No, not in San Francisco, they don't. They still have some shoulder problems. I



think it's from the cross arms. They don't complain about them of course, but I've had a few talk to me about it. But they've stopped using hot sticks. They used to do it, but now they're into the rubber gloving.

MR. JANOWITZ: Okay. Pam.

MS. DEUTSCH: For us, we use a variety of length of hot sticks, and the complaints that we get the most on are the 12 foot long hot sticks. And all we've been able to come up with so far is just talking with them about good body mechanics, some alternatives, micro-brakes. It's not just the rotator cuff, they're usually using these 12 foot sticks bending over, twisting, turning --- everything combined.

Q : Right, right.

MS. DEUTSCH: And that's all we've been able to come up with so far.

Q : Okay. Thanks.

MR. JANOWITZ: Just one or two more comments. One is, wherever possible, suspending the hot stick from a rope that supports it at the middle of the hot stick, which is possible on steel towers, for example. And also, training people to the point where they can get the job done faster. Both in the case of underground work, looking at time in the trench, as well as time on the tower for overhead lines, that's another variable that can be looked at to help assess the success or failure of a given ergonomic strategy. Decreasing the time in the trench will yield a whole lot of benefits to the worker's safety. And if you're decreasing the time performing a task up on a pole or tower, obviously, the same is true. We found that the time the worker was exposed to an awkward posture with the hot stick was decreased with increased training. Yes.

Q : Part of my question I think already has been answered, because all of you have successful programs. But speaking from the regulatory side from OSHA and dealing with trying to come up with regulation, outreach enforcement, all of the things that will work for a variety of industries. And one of the items or issues we hear, especially from the utilities industry is we are different and we are special, because we are primarily mobile work sites, non-fixed work sites.

And what I didn't hear addressed today at any of your presentations was how you implemented the program elements of ergonomics, your ergonomic programs. I'm hearing more the really good solutions you've had, but how did you get from the start up to that solution? And the second thing is how have you been dealing with multi-employer work site issues when it comes to ergonomics, specifically when it comes to your program? And the third issue is how are you dealing with training with non-fixed workstations?

MR. JANOWITZ: Any comments on that?

MS. DEUTSCH: Yeah, actually it was something that I was talking about with Scott Schneider right before the session, for the most part, utilities are the opposite of construction. Construction really is a non-fixed work site constantly changing work force, work locations. Utilities do have a set service territory. They do have operating headquarters, main headquarters. And even though the work force moves around, every morning they're reporting to the same work location.

For our company, we have one group, the project center, that does the transmission line construction. And they work all over the service territory, and they do not have a facility. So they're the one challenging group that it's sort of hard to track down exactly where they are. We were able to get them for training. They reported in with another group to one of our other service centers and grabbed them for training at that point.

In terms of utilities being sort of different, you're going to hear that on every issues. Utilities are always going to claim that we're different, we're special. Sometimes they are different. They are special. One of the things that we've talked about a lot in Washington is the fall protection standard being applied to utility workers will actually create some or ergonomics hazards for the line men trying to comply with one standard and putting themselves at risk for something else.

The way we've been able to sort of initiate our program out in the field was getting buy-off obviously from the executives and then getting buy-off from management out in the field and then a very positive response from employees who participated in the Safety Days to tell stories and talk about the fact that they had back injuries, rotator cuff injuries, Carpal Tunnel Syndrome, and being able to immediately toss out fixes that they've known about for a long time but have never had a mechanism for being able to say, you know, this could be changed, and this could be changed. So coming up with some real quick successes where they've been able to see the results.

MR. JANOWITZ: I have a couple more quick comments. One is that I think it's actually easier to implement ergonomics changes in the utility industry than in construction, and I'd be interested in any comments from Scott and others in the audience about that. The other thing is that there have actually been a lot of positive changes even before we all got involved, or at least before I got involved in ergonomics and utilities, that are very useful but go unrecognized. And if you talk to line men, they'll say, oh, you can't change this job. It's the way it is. It's tough. It's rough. And this is how it has to be.

But if you ask them, well, did you use that kind of hot stick five years ago or ten years ago? "Well, no, we used to use this big old heavy thing, you know." And that wrench there, did you use that wrench 10 -- "... Well, no, that wrench is much better than the old one, we used to have -- let me show you what we used to have to do." And you'll find out, yes, they've really made a lot of progress. There have been constant changes. It's in a state of evolution as is everything else, and a lot more can be done. Scott.

Q: Yeah, I have to agree. I mean, the more we talk about these difficult to control ergonomics

problems like those of fire fighters -- I mean, there's a whole host of occupations that have really difficult problems, but there've been enormous changes over the years. And when you talk about what was done five years ago, ten years ago, there really has been a big difference. We saw that today. We had our presentation in our session on the roofing industry and how that's changed. It's enormously different. Although there are still a lot of problems left to deal with.

And I agree, you know, with what Pam was saying. And basically, utility workers are a lot like construction workers, but the advantage is that you have a stable work force that you're working with over 20 years or 30 year basis. It's not changing, with every job. So there are some advantages in utilities that you don't have in construction, although we've made a lot of strides in construction as well.

I did have a quick question. One of the things we're looking at in construction more and more is using, people are using scissor lifts to get up to where the work is, to do ceiling work. I don't know that much about the utility industry, but how much do people use, like, skyjacks or things to get up to where the work is so they don't have to work overhead like that?

MR. JANOWITZ: Well, I'd like to hear what the panel has to say. The way I would rephrase that question is that there is a lot of use of bucket trucks as opposed to climbing a wooden pole. Okay. And the next question is, which is better from an ergonomics standpoint? Some people say the bucket truck's easier because they can hang their tools from it, and if they're taking off a cross arm, they can lay it on the bucket, for instance.

Other people say they can get much closer to their work when they're on the pole, climbing the pole. And therefore the extended reaches are decreased when they're on the pole versus the bucket. Having rephrased it that way, it sounds like Randy has something to add here.

MR. NICHOLLS: Well, our experience, given the rural nature of our operating territory, is that we're always going to have to climb poles. But I will say that, again, the truck technologies are getting better. They can reach higher. They're improving all the time, so we're constantly trying to find applications for bucket trucks. I mean, generally, we feel that it's a little less strenuous working from the bucket truck than climbing the pole.

MS. DEVLIN: I'll add one thing. We have a group called "Trouble Men." I don't know if you have trouble men, but this group deals with specific electric problems that need to be solved and fixed. And they had ladders on their trucks, no more. Now they now have their own bucket trucks that they take around with them, and they use them. They really haven't had much complaining. Sometimes it's hard. They can't always use them, because they may have to go through somebody's property to get in the backyard. But they do like their bucket trucks that they can take to their jobs.

MR. JANOWITZ: And you can see that buckets can be redesigned in the future to be adapted to utility work; there's no reason they all have to be square in cross-section. They could perhaps be

triangular so you can get into closer, tighter places, Because we already know that the bigger the bucket, the worse the situation is from a horizontal reach point of view. Bucket trucks could be designed with "holsters" to hold your tools with various attachments that would assist in taking the cross arm off, for instance, things like that. Yes.

Q : Hi, Randy was kind enough to give us an address and a phone number, and I was wondering if Fran and Pam would mind us bothering them in the future? I know, I'd like you as a resource.

MR. JANOWITZ: Thank you for reminding me. The other three of us have written our names and addresses and phone numbers on a slip of paper here. And I'd be happy to read it off or to just keep it up in front if some of you want. It looks like you want me to read it off. Okay.

MS. DEVLIN: I have a handout up here, too.

MR. JANOWITZ: Oh, great.

MS. DEVLIN: I had to do some minor changes, because it didn't get stapled correctly. But it's up here if you would like that.

MR. JANOWITZ: Okay. Let me see if there are any other questions, and if there's time, then I'll read this off.

MS. DEUTSCH: Well actually, I was just going to quickly comment on Scott's question. It depends on the state, so Fran was mentioning that her folks rubber glove. In Washington State, you do not rubber glove. So it depends on the activity that our folks are doing. Half of the activities probably, they still would prefer to climb the pole. Most line men will talk about the fact that when we used to climb poles, we didn't have back injuries. Now, we're in these bucket trucks, we're up in the bucket, we're in these awkward postures, and now we're having some problems with back injuries. So it just sort of depends on what they're doing.

MR. JANOWITZ: By the way, the anthropometry of the usual bucket designs is such that if you're not at least five eight or taller, you'll be at a serious disadvantage in terms of bending of the spine. So that needs to be improved. Yes.

Q : I had a question about, like, the vibrating tools, and you mentioned gloves in some cases. I was wondering about what kind of benefits, and what kind of comments and acceptance you've gotten with that? And some people in their presentation mentioned reduced vibration pavement breakers and things like that. And I wanted to know, just in general, what cost would gloves be? Are these pavement breakers reducing vibration, some of those things?

MR. JANOWITZ: Why don't I begin with a comment and then turn it over to the panel. There are a number of pavement breakers that have suspension systems in the handles, or rubber

bushings between the handles and the body.

We're going to be doing a comparison of 90 pound hammers; we really want to look at the total picture with a view toward worker acceptance as well as the vibration exposure to the worker.

And Fran made the point of substituting things like concrete saws and other means to reduce the use of hand-held pavement breakers, and the use pavement breaker attached to a back hoe so you don't have to use pavement breakers as much. With those introductory remarks, I'll turn it over to Fran.

MS. DEVLIN: The gloves. I'll do my best to respond to that, because one of my pet projects was looking for the right glove and especially important for those of you who work in cold climates. Gloves are hard to fit, one size doesn't fit all, durability is important especially when you're doing a lot of breaking. It's easy to rip and tear.

And then there was controversy, well, you should have your fingers completely covered, because this is a cold exposure and then the vibration travels tip of finger and down. But sometimes people don't like to wear full finger gloves, so we bounced around. Many of them were falling apart. We finally found one vendor where the gloves did pretty well hold up. Actually, the president of that company came by to talk to the workers about it. We have a glove questionnaire. I think what I didn't mention in my talk -- sometimes we don't follow through very well with questions like how well is this working?

But with the gloves, we did do that. So we found one that seems to be pretty good. Supposedly, it does reduce the vibration if you're going to be exposed. Is it for everybody? No. Because you still can't always get the greatest fit. So you just don't push it.

We don't force back belts on people, no. We look really at the posture and try to avoid the problem to begin with so they don't have to do all these other things. So again, the same with the gloves.

MR. JANOWITZ: Yes, Sure.

Q: Just for curiosity, I know in my state at least they're pushing for the underground versus the over for electrical services. Are you seeing any different problems now that there have been more underground installations? And if so, which direction are you heading?

MR. NICHOLLS: Well, from an ergonomics perspective, strictly, we found some other problems with underground. Yeah, a lot more shovel work. A lot, you know, lifting, working on pad mount transformers, that type of thing. Underground can be pretty intensive as well, but we just try to address it through work practices. We did identify a potential problem with some older trenching units.

With the older style, the operator has to look back to watch the trenching unit. Where the new ones, the seats swivel and you can turn around or you could use mirrors. But that's one thing. We're trying to get rid of those types of units, because we felt that constant vibration plus the rotated neck could be a problem. That's one example I can think of.

Q: The question I guess I got when I was looking at some maintenance tasks in a trench is that the space was designed for a person to be able to be in there but not to be able to work. I mean, in other words, if you had to reach forward, there was no way to put your leg back and that type of thing. Are any of those things coming into the design of the actual systems when they're put in anymore?

MR. JANOWITZ: Right. So you've got anthropometry issues. In other words, it's designed as if the worker were in a fixed position, not with a dynamic anthropometry approach.

MR. NICHOLLS: Do you mean like in a vault or something like this?

Q : Like a vault ---

MS. DEVLIN: A junction box or something.

MR. NICHOLLS: I don't know that we've addressed that. I think the NESC course has working clearance requirements that -- if you're within code, hopefully you'll have some room there, but I don't know. Like you said, I don't know if that would fit everybody, but we haven't addressed that specifically.

MS. DEUTSCH: We've had some discussion with our practices standards group to try to get them to think about some alternative ways of doing that. Because you're exactly right. These folks are staying there. There's absolutely no room. They're supposed to dig. They're supposed to do all of their work completely confined, and a awful lot of knee injuries, back injuries. We haven't come up with any ideas quite yet, but I'm hoping that there are some options.

MR. JANOWITZ: Okay. There are always options. I'm going to read off three phone numbers to keep it short. And the rest of the people's addresses or E-mail addresses are up here.

Pam Deutsch, from Puget Power. Her work phone is area code 206-462-3566. That's 206-462-3566, and her E-mail address is DEUTSCH, PJ@PUGET.COM.

Fran Devlin, her telephone number is area code 415-695-3383.

And my name is Ira Janowitz. My telephone number is area code 510-256-0628. My E-mail address is ILJANOWITZ@AOL.COM.

Okay. Thank you very much, all of you. Bye-bye.

(Whereupon, the Utilities session was concluded.)

## Report Back General Session #1

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William S. Marras, Ohio State University

DR. MARRAS: Welcome to the session. I'm Bill Marras from the Ohio State University, and we have a great collection of moderators from some of today's sessions who are going to be giving us a little oversight throughout the day.

Before we start, I'd like to mention that tomorrow we start promptly at 8:30, so please be here ready to go. We have a great schedule tomorrow, it looks like.

I'd like to briefly introduce our speakers today, and I'm just going to tell you who they are and where they're from, and they can tell you a little bit about their background when they give their summaries.

We have representation from several areas.

First, we have representation from manufacturing; we had Brad Joseph from Ford; Jim McCauley from Perdue. From Maritime we have Dan Cimmino, from Newport News Shipbuilding. From Health Care we have Guy Fragala from the University of Massachusetts. From Apparel and Textile we have Eric Frumin from UNITE, and from Construction we have Scott Schneider from the Center to Protect Workers Rights.

The agenda for today is, since we had several breakout sessions and not everyone had an opportunity to attend all of them, obviously, we're going to try and transfer some information here by letting everyone be exposed to exactly what was happening in each session, or at least the highlights of each session.

So I'm going to ask each of the moderators from the sessions I just mentioned to start with about a five-minute overview. First, start with a little introduction of who they are in case people aren't familiar, what their bend on ergonomics is, and then I'd ask for a five-minute summary as to what happened in their session.

After that, then we're going to open it up to questions.



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Scott Schneider from CONSTRUCTION

DR. MARRAS: So let's start with Scott Schneider. Scott.

MR. SCHNEIDER: Thanks, Bill.

We had a workshop on Construction this morning, and we had five speakers, so I guess I get one-minute on each.

We started off with a presentation by Stew Burkhammer who is with Bechtel, and he discussed the back injury and prevention program, which really has about four components.

One of them is training of workers about how to lift properly, and they also have a stretching program, and they get retrained quarterly. They also do stretching every morning on the job for five minutes. Everybody does it.

They also allow them to do it at lunch time on a voluntary basis. They do provide back belts for workers to use and train them on how to use it.

They also do a lot of pre-planning of jobs and analysis of the jobs before they do the work to see how they could make the jobs easier.

As a result of this program over the last couple of years, lost workday injury rates have significantly dropped. We did have a lot of discussion of the back belt issue, and Stew said that he felt that back belts are only a small piece of the puzzle, that really you need all of these components to make it work properly.

Then we had a presentation by Tony Barsotti, who is with Technology and Development Corporation, which is a contracting company in the Pacific Northwest that builds computer chip manufacturing facilities. They developed a soft tissue injury prevention program, which includes training of workers, initial training.

They do a stretching program every morning on the job.

They do a lot of incident investigations of accidents that occur on the job.

They also have an intervention program where they've been working with an ergonomist on the site, one or two days a week to look at particular hazardous tasks, try to figure out ways to

intervene. They've been looking at plumbers and electricians and also drywall handling.

They also did an evaluation of their program and, in particular, of the stretching program; did a survey to see what people thought of it, whether they felt better at the end of the day, et cetera.

Third: Then we began a panel of people to talk about specific trades. We had Bill Buckley from the Roofers Local in Minneapolis, who gave us sort of a quick snapshot, a history, of the roofing trade and what's happened over the last hundred years, where there's been an incredible increase and mechanization of the work, where now they're using power cutters, and many years ago they used to use axes.

There's been a lot of changes in the material handling on the job, use of motorized carts, use of boom trucks, et cetera, to move equipment around, which has resulted in a dramatic reduction in the amount of injuries on the job, although that still is a big problem that needs to be worked on.

Secondly, we had Paddy Dennehy who is with the Carpenters Ergonomics Training Program in Washington, D.C. They started a training program a couple years ago to train all their members on ergonomics. They've trained about 5,000 people so far in a four-hour program.

They're also doing some ergonomic intervention studies, looking at form work and drywall work from the Pacific Northwest. They talked about his experiences with some of the interventions that they've tried, about how some of them have been pretty helpful, but other ones were sort of touted and really didn't pan out the way they thought they would, or weren't as useful as they originally thought they might be.

Our last speaker was Tom Cook with the University of Iowa, who's been working with an operating engineer's contractor in Iowa. They have done a symptom survey of a couple hundred -- about 400 operating engineers in Iowa and tried to use the results to pinpoint where the areas are that operating engineers have the most problems.

Where they're particularly high were in the neck and also foot and ankle problems, although they also have low back problems like most construction workers.

But they've been working closely with one contractor in Iowa who buys a lot of equipment. What he does is when he buys a piece of equipment he'll spend \$30,000 retrofitting it to make it easier to work on and the guys love it.

They add grab bars and nonskid surfaces to make it easier to get in and out of.

They prevent slips.

He adds joysticks and has a replacement program to make it easier to use.

He has a window replacement program to make it easier to see. If there's any cracks or damage to the windows, they're replaced immediately.

Also, he's done a lot of changes to retrofit the equipment to make it easier to service, to get it easier to find the lubrication points.

The results have been increased productivity, increased employee satisfaction and a decrease in lost work time injuries.

Let me just conclude by mentioning we did have some discussion at the end, and one of the major topics was someone suggested that they find an increase in the number of injuries just before a layoff or just when a job is about to end.

In the discussions what came up was that may be related to a couple of things.

One of them is in the symptom survey they did in Iowa they found that 40 percent of the people complained that one of their major problems was having to work while they were hurt.

And so I think a lot of people are actually working while they're hurt because they need the paycheck and then not reporting the injuries until it's imminent that they're going to be laid off, perhaps.

And then, secondly, there may be an increase in productivity. As people are pushing to get the job done on time, that increase in productivity may also be related to a rise in reported injuries toward the end of the job.

That's all I had to say. Thanks.

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Eric Frumin from APPAREL/TEXTILE

DR. MARRAS: Can we hear from Eric Frumin, please.

MR. FRUMIN: Hi. My name is Eric Frumin, and I'm the health and safety director for UNITE. UNITE is a result of a recent merger between two long-standing unions in the apparel and textile industry. They are the International Ladies Garment Workers Union and the Amalgamated Clothing and Textile Workers Union.

We merged last year, a year and a half ago. We're now a union that has an acronym called UNITE, The Union of Needletrades, Industrial and Textile Employees.

We heard three cases studies this morning. One from the Reg Wing Shoe Company in Red

Wing, Minnesota. Gail Sater presented.

The second was from a company called Sequins, International, which is a relatively small apparel industry employer in Queens, in New York City, and was jointly presented with a UNITE staff member, Laurie Kellogg. Third a presentation from a UNITE staff rep, Roosevelt Broadnax, concerning a joint ergonomics program at the Fieldcrest/Cannon towel manufacturing complex in Columbus, Georgia.

First, we looked at the overall conditions in the industry, and not surprisingly what we see are the kinds of numbers with which we're familiar for a number of manufacturing industries since OSHA started enforcing record keeping rules in the late '80s. What we see, of course, is a dramatic increase. Since '92, the numbers have leveled off for the apparel industry overall.

Now, this masked quite a great differential in reported rates within the apparel industry, with, on the one hand, higher rates on the men's side, particularly men's pants and uniforms and workwear, or men's underwear; and then very low rates on the women's wear side. It's not clear why that is.

It's a very important question: is it better recording and reporting because they are large employers or are their risks actually higher in these industries? Underwear, men's pants, they are very high ergonomic risks, serious risks in those sectors. It may well be that the risks are higher but it's not certain.

In terms of other overall conditions that were important we heard reports of widespread management resistance to taking action. There is also a widespread pattern of small employers, particularly in the women's apparel sector.

Widespread acceptance of worker injury is a fact of life. In general, widespread ignorance of ergonomics.

How did things get started? How did management particularly get focused on doing things in these three case studies?

Well, first, there were case reports that prompted some of it. The union, UNITE, has a union-run clinic in New York City which was a source for the case reports that started the project at Sequins, International. This is particularly important for small unionized employers who do not have the benefit of any kind of a medical service of their own; the union can help alert them to this.

At Red Wing, clearly, the workers' comp costs were rising dramatically at the same period of time that you saw on the chart a minute ago, and that prompted an initiative there. It's a cost-savings measure.

At Fieldcrest Cannon we saw a cycle of management resistance, union agitation, and more management resistance. The union had raised the brown lung/cotton dust issue in the early '80s. They eventually got Fieldcrest Cannon to cooperate. That led to a joint committee.

That led to modernization. Guess what?

That led to higher work loads, more ergonomic risks.

That led to the union's raising the issue with management, management resisting, and eventually the development of a joint program at Fieldcrest Cannon with the dramatic reduction in the rates of injury which we'll show you later.

We also heard about a unique fund which the union runs with multi-employer contributions called Council on American Fashion, that provides matching funds to small employers on a 50 percent matching basis to purchase ergonomic equipment. That's mainly concentrated for employers in the women's wear industry in the northeast.

Worker training was important in getting employers involved and reviewing the actual scope of the problem. Once workers were given an opportunity to speak to their issues things that had long been buried became revealed.

We heard a report from one of our moderators, Pat Hirschberg from OshKosh, that the way she got management interested was to invite them to an all-day meeting and put them in the same old rickety wooden chairs that the operators sit in all day, not letting them bring a cushion, and after a few hours they were ready to agree to anything.

Worker involvement was a very important feature of all three case studies. It was deemed uniformly to be essential to any effective ergonomics committee or any ergonomics process, essential to any effective job analysis, and certainly to any job modification, whether we're dealing with some of the quick fixes that were described or with some of the more complicated development of prototypes or new work systems.

Job analysis itself proceeded in all three case studies in some similar ways. In one case, the union came in and videoed the jobs, which didn't go down that easily, but when combined with management education, led to an awareness that jobs needed to be changed.

In other cases, in response to workers' comp costs, consultants and physical therapists were brought in. A return- to-work program helped identify opportunities to analyze jobs better.

Job modification, of course, is a big part of what we're all about. The biggest piece of it on the apparel side, in the two case studies on the apparel side, was moving out of piecework and into hourly work, perhaps with bonuses or not, but getting rid of the piecework system. The handwriting is on the wall. Hopefully, it's an epitaph for the piecework system in the apparel industry. It is destructive to workers' health, it's destructive to high quality work, and to a few

other things like flexible production.

It was encouraging to hear that elimination of piecework was a key feature of the successful case studies.

Job rotation, of course, is critical, and that too was accomplished in part by eliminating piecework.

A shift to modular work organization was essential.

Then, of course, there were some fairly simply job modifications, like tilting sewing machines so people didn't have to lean over; providing adjustable tables, adjustable footrests, adjustable treadles. These are common modifications that are not unique to sewing operations but they're important.

The money from this program, this joint fund, of course, was helpful to job modification, as was worker feedback on the prototypes.

To present the results, we looked at some of the actual numbers. This is from the Sequins International case study. Just looking at the question of adjustable chairs, before they even got into the workstation and this particular spooling machine, these were results compiled by the Mt. Sinai Center for Occupational Health in New York, which staffs our clinics and which looked at these symptom surveys. You can see a dramatic change in the symptoms, just from the provision of adjustable chairs.

Again, the chairs that you're familiar with in office settings are hardly prevalent at all for production workers in the apparel industry. The fight over adjustable chairs represents part of the culture change that management has to go through.

The next results are from the Fieldcrest/Cannon case study. This is a case study not involving apparel but textile manufacturing -- yarn manufacturing and weaving.

Here are the results from the four-year period, looking at all other strains and sprains, besides back injuries, and we see a pretty dramatic drop over that period, both in the number of cases and in the lost work time.

This is all back injuries, involving strains and sprains, in addition to the "other strains and sprains" in the previous slide.

Again, a fairly dramatic drop. Not quite as even. Finally, for injuries overall including lacerations, amputations, and whatever else, you see a dramatic drop. Of course, the economic savings are quite important.

In regard to the workers' comp costs, the Sequins International case study reported a drop in workers' comp costs from about \$100,000 over one 12-month period to a \$5,000 cost for the period 1995 to date, and a complete elimination of trauma disorders.

We heard reports of increased productivity; and increased trust between workers and management. We heard reports of much improved worker education in general, including it's English as a second language; and job skills training for maintenance workers on new multi-hundred thousand dollar looms in a textile mill where the availability of new training techniques, because of an ergonomics program, allowed the employer to better train workers in general.

Finally, what we saw was a new, renewed interest in quality promotion and quality management and the identification of a critical link between the work that we do on ergonomics and the work that we do to try to manage quality and improve it. We heard about the recognition that these are inseparable and that you can't really address quality unless you're dealing with the workers' conditions.

If we had a little more time I could tell you the answers to the interesting question that came up at the end, which is, how did you convince management to go along with that.

Finally, I have left some information from the union in the back of the room, in the very last row. I would encourage you to take a look at that. For any reporters that didn't pick up our press kit, please come see me.

Lastly, in the Chicago Seven room, which is an interesting phrase, at 5:00 we're going to show a 15-minute video on the Sequins International case study.

Again, to OSHA and NIOSH, thanks a lot for having us.

DR. MARRAS: Thank you, Eric.

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Jim McCauley from MANUFACTURING 2

DR. MARRAS: Next we're going to hear from Jim McCauley.

MR. McCAULEY: Thank you.

This afternoon we had three presenters, including myself. The first was Jo Spiceland. She is a young lady that has five years experience now in the furniture manufacturing business, wearing several different hats, a company of just a couple hundred people.

Then we went to Dr. Rab Cross, who is a medical doctor, who has gone back and been certified as an ergonomist and is now consulting in the New England States. He gave a good presentation on some of the people he's consulted with and some of the things that they've done to remedy ergonomic problems.

Then I'm with Perdue Farms, that chicken company that disassembles the chickens that you heard about this morning. I talked about our friends from North Carolina that came into our place and gave us some citations and what we went through then to get into a written, defined ergonomic program.

I'm not going to go through all of that. I'm just going to hit some bullets that was kind of the theme of what was being said this afternoon. One of the main themes that came out of it was that ergonomics, CTS, lower musculoskeletal strains, et cetera, is an ongoing problem, and we have to recognize that with or without a standard.

We need to address it, and it's nothing to go hide your head in the sand and pretend like it doesn't exist, only because Washington hasn't come through with something.

If it's good for the people, then it's good, and we should be doing it.

Another thing that we discussed was that at some point every state has a different definition as to what's recordable, whether it's CTS as an illness, an injury; whether it's compensable, et cetera, and whether it was a preexisting condition, and the arguments can go on and on.

The consensus is that there's no need for this extracurricular discussion as to whether it's compensable, recordable, whatever it is. By law, it is compensable in most states. Even in those states that we do business in that it is not compensable, it is recordable. We still handle it as a compensable injury and we pay it ourselves, just like under a state plan.

We don't spend a lot of time arguing about compensability. I think that was the gist of the conversations today of discussing whether it is or isn't. You're just wasting time.

One of the other things that came out was the fact that one program -- and I use the word program -- does not fit all. I don't see, and I think that was the gist of what was being said, that you can have an ergo standard that prescribes what you do in every given situation because it can't be that long or we'd never get a chance to read it. It's got to be performance oriented and it's got to be something that has a little bit of flexibility to it.

In my discussion, I discussed how the State of North Carolina allowed us that flexibility in applying the ergo agreement that we had with them. I also was able to show the great success, and I mean great success, that we have had, because we were able to tailor it to our particular needs.



Medical intervention. To not have early, and I used the word, "early," medical intervention is foolish, to put it politely. We have found, and I think from the other panelists, if you get the people in there early and can have conservative treatment for them it will save a lot of lost time, a lot of surgeries, a lot of permanent or partial disabilities on behalf of your associates or employees later.

Risk analysis. I think that everybody that talked today actually went and looked at their jobs, assessed their jobs, so that they could tell whether they were high-risk jobs or not so high-risk.

We talked about other things, such as job rotation, such as ramp-in, job conditioning, if you might; how that works in some industries and, in particular, how it works in my industry. It's going to have to be an ongoing process. It's not going to be a program. We all know that a program has a beginning and it has an ending, and in most industries, I can speak for mine, that the art of manufacturing changes from year to year, so whatever you're doing this year may not be apropos or applicable next year, so you're going to have to have something that's ongoing all the time so that you can protect your associates out there in your plants or offices.

I think that was pretty well illustrated today, too, that this was not just a plant manufacturing type of problem. It is also an office type problem, too, where repetitive motion is engaged in.

The last thing that we discussed was that it's not going to be one of these things that you add water to it and you have instant success. Look to some of the things that are being shown here just now and also today, and you can normally expect that it's going to take you 12 to 24 months to really see good, long-lasting, progressive improvement type of changes in your environment.

Some less because you might be smaller; some more because it's going to take a while to incorporate it throughout your whole operation.

One of themes was that you can bite off more than you can chew, so you're better off taking little bites at a time, make sure it works, and then go on to the next appetizer and work on it.

I think, basically, that was the thrust of our presentations.

DR. MARRAS: Thank you.

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Brad Joseph from MANUFACTURING 1

DR. MARRAS: Next we have a report by Brad Joseph of Ford.

DR. JOSEPH: I'm going to show a little bit, as Larry Fine called them, of pearls of wisdom that

we learned from our group. We were pretty lucky, actually, when we setup our group. I think it happened by chance.

Maybe it was something higher than us that realized what was going on, but we were actually able to pull three people, one from a plant, who had a focus on a plant program; one was from a division and one was from the corporate perspective, and I think that was kind of neat because it allowed us to view programs from these different perspectives.

We were able to actually put some things together and talk about these things from different perspectives, and I'm curious how those things are going to pan out tomorrow morning when the session deals with small industry because I have a feeling that they'll be very similar, especially the plant level.

The first speaker was Sandy Le Sage. She works for Hay and Forage, basically a farm equipment manufacturer. I probably just destroyed that name, but close. As a farm equipment manufacturer, obviously, making large equipment and probably some smaller, but a lot of large equipment.

She had a videotape that did a couple of things. One was explain the program quite well and the other was explained some case studies, A picture is worth a thousand words. It showed how their program worked through interviews.

The program had four phases or types of training, and one of the recurring themes in our group was the management commitment process. Part one of the training needed to get management commitment. Let them know what it is, let them know what they're in for, and let them know how long it's going to take for an ergonomic training course and program to be implemented.

The second part of their process was dealing with the actual job improvement -- we call it job improvement cycle at Ford, but they call it something else, and basically how they identify jobs, using questionnaires and problems. They actually had a unique twist on it where they talked about some of the issues, some of the employees, some of their home activities, because they said people spend a lot of time at home, too, and some risk occurs at home.

Not that they're trying to show that is the reason for it, but that is one of the potential reasons for this problem to be aggravated at work.

They talked about job analysis, and one of the unique things about job analysis was doing it with the worker in the room to talk about their jobs. They had some one-on-one activity. They talked about how they put work orders and equipment changes together, and then they talked about the outcomes of these changes. Finally, the video demonstrated through case studies the positive outcomes of the process.

Generally, there is some interesting trends, a decrease in cumulative trauma disorder, and so on,

like we all expected; but she also talked about some of the other positive aspects of the program like increase in productivity and quality.

The second speaker was Larry Kreh from PPG, and I was told it's a coatings organization. Actually, he was probably the first speaker. But it's a coatings organization. Coatings are more expensive than paint, so he told me to call it coating.

They charge \$100 for a coating, they charge \$10 for the paint. So you pick. I guess Ford uses coatings.

At any rate, he talked quite a bit about his divisional process. He's the manager of ergonomics and loss prevention for that particular division.

He talked about the overall PPG organization and then focused in on his particular area of the program. It was interesting because PPG does a lot of batch processing, and in the auto industry we don't do a lot of batch processing, so it was a different twist in how you do ergonomics in that kind of industry.

He showed us some interesting case studies of large batch processes being mixed and how employees had to move these loads and lug these things around in the earlier days, and now how some of the tooling is reducing the loads. Not total automation like we all expected but some tooling is being used to help these employees move things around.

He also mentioned a three-day training course. He primarily uses outside consultants, and there's some training going on internally. That training course is focused not only on the internal people but on customers, customers like Ford. We could actually go to his training course, which I thought was a best practice.

Prioritization effort. They prioritize on a number of things, including OSHA recordables.

Finally, integration. One of the key things he wanted to talk about was integration and engineering services. He, and I, felt that was one of the key things that made the program successful.

Interesting thing about Larry, he came from engineering. A lot of our people in ergonomics come from health and safety and then go to engineering. He actually started in engineering and went to health and safety, so he was able to bring those important contacts important things with him.

He talked about some of the initial challenges, and one of them that was just mentioned was the issue of process versus program - what should ergonomics be?

I was the third speaker, and I'll just briefly mention what I did. I basically went through a

corporate level process and I discussed or defined what I thought was a best practices from a Ford Motor Company perspective, and I talked a little bit about how the best practice is something that needs to be replicated in all the plants, at least some of the core parts of the best practices.

Some of the main issues that I talked about was we have a core program in place. UAW-Ford does not want to turn it upside down on its ear and start all over again, so our focus has been on small, incremental improvements. Incremental improvements have to add value, and they should be replicated where possible.

We discussed the reactive versus our proactive process, showed some case studies, and we talked about a new best practice called Ergonomic Handbook, that's been distributed to the hourly employees and the supervisors, and some of the empowerment that this particular process is giving them through education. I guess in the last session we heard about education versus training. The proper word to use now is education.

The last thing I mentioned was a thing called a risk priority number, which deals with the issue of prioritization of jobs for intervention. I know there was a concurrent session going on during this that talked about risk assessment and job analysis.

They mostly talked about the deep dive job analysis rather than job identification methods--but I am talking about the identification process, and we're looking at ways of doing this better in our process.

As a summary, just a couple things:

Management commitment was vital.

Employee involvement was vital.

Process not a program.

Most of these things have positive results but they're not quick. They're not going to happen tomorrow morning.

Many questions from the audience on those processes, and a lot of the questions on how did you do it? Or get there? We brought the issue back to the person who asked and we told them, "Here's how we did it, how did you?"

A lot of questions on work organizations and exercise programs.

Drive the process down from corporate to the division to the plant.

Certain core processes, core disciplines are required everywhere, and again incremental changes are the way to proceed.

That's kind of our lessons learned from our particular group, our best practices.

Thank you.

DR. MARRAS: Thank you, Brad.

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Dan Cimmino from MARITIME

DR. MARRAS: Next we'll hear from Dan Cimmino from Maritime

MR. CIMMINO: Thank you.

I would first like to take the opportunity to thank NIOSH and OSHA for the invitation to come and speak here, and I'd also like to congratulate them on what's so far been an outstanding program, and I personally hope to see more of them in the future.

I would also like to thank my cochair, Chico McGill, from the International Brotherhood of Electrical Workers, Local 733, at Ingle Shipbuilding; and Karl Siegfried, corporate ergonomist at Bath Iron Workers in Bath, Maine. Both gave outstanding and informative presentations which are evident by the number of questions and comments following their presentations.

All of our presentations focused on implementing ergonomics in the maritime industry. The maritime industry is a different industry, very difficult to implement ergonomics in that it's not an assembly line environment. Probably like a lot of others, similar to the aircraft industry.

Ergonomics is difficult enough to implement in any environment, but the shipbuilding industry presents many additional challenges. Many times the products that you're building were designed decades ago. Production cycles are measured in months and years rather than seconds and minutes.

If you want to capture on videotape what an employee does in some industries, maybe you could use four minutes of videotape and get several complete cycles. If you wanted to capture on videotape what a ship builder does, you better bring a lot of tape and follow him around for a few days because there's a lot of different things that they do.

Because the designs are so old, there's very limited opportunity for process changes because, as you know, the design of a product many times dictates much of the manufacturing process, so there's not a lot you can do, as far as changing the process, but there are a lot of very effective things that you could do to control the problems.

Two things kept on coming up over and over. One of them was education and one of them is employee involvement, and I'll touch briefly on both of those.

Education is absolutely critical for all the organization and different members of the organization should receive education at different levels. Management education was critical, and there's several reasons for that.

When you need job modifications, more than likely you'll need management approval to make the changes, and if they speak the same language, if they know what you're talking about, they're much more receptive to the changes.

Also, when you look at ergonomic injuries a lot of times management doesn't understand what the problem is. They're not all ergonomists. They're not all safety professionals, they're manufacturing professionals. Unless they see somebody bleeding or part of their body missing, a lot of times they don't understand that a person is hurt, but understanding the philosophy behind a cumulative trauma disorder or what causes a cumulative trauma disorder, very important in helping him understand what causes it and what's their part in preventing them from occurring.

The other thing that kept coming up was employee involvement, and that's absolutely critical. It's more than employee involvement in that you involve them and inform them what's going on. You make them part of the actual process. We have what's called health and safety task teams, where we have hourly level employees as part of the process.

It's pretty significant when they understand that they're part of the process.

I teach a lot of training classes and I'll give before and after examples, just generic examples of ergonomic fixes, and then I'll ask them to bring up some examples of a similar problem in their area, and most of the time someone will raise their hand and say, oh, there's no way that you'll be able to fix that problem. I have a simple answer to that. You're right. I'm not going to fix it, you're going to fix it, because you're here for a reason; you're here because we need your help, and if we didn't need your help we wouldn't be sitting in this room.

At that time they understand that they own part of the problem. They're less likely to complain, more likely to suggest good ideas. More times than not, that very same individual will come up with an outstanding idea to fix a problem.

The other thing, and one of the comments made, had to do with empowerment. Without employee empowerment, employee involvement is kind of useless. If you really want to

dishearten people and take the wind out of a group of people, assign them to a team to study a problem, let them take a look at it and then ignore their results and suggestions. If you really want to demoralize a group of people, I suggest you do that.

However, if you really want to empower them and get them rolling implementing their suggestions is really a good way to get them rolling, and when you seem some success going, that will breed more success.

As Chico McGill pointed out in his presentations, a lot of other industries have explored the benefits of ergonomics in joint labor management programs, but the shipbuilding industry is kind of late to catch on to that, but that's starting to change, and it's evident to ergonomic programs underway through the national shipbuilding research program, and taking advantage of programs like that and continuing to work together, labor and management, is a way to, as I said before, breed more success and really benefit everybody.

Karl Ziegfried outlined his program. He gave a lot of good practical examples of interventions in the shipbuilding industry. I had the privilege of visiting Karl at Bath and seeing firsthand his interventions and I can attest that they are both common and very, very effective.

Changes are very widespread. His program uses a team concept where he has an ergonomic core team which will identify problem areas, and the first order of business when he reaches the problem areas is education of both the hourly and salaried employees in that area.

They then brainstorm solutions.

They'll make prototype workstations to try to eliminate the ergonomic risk.

As soon as they fine-tuned it, it's then implemented throughout the department, and it has been a very effective process for them.

As I said before, Newport News Shipbuilding is very focused on education, through a lot of different avenues, through classes and health and safety task team, through night school, voluntary night school for employees, through take-home courses in health and safety and through newsletters.

In our clinic, when somebody comes in with a back injury, they don't leave the clinic until they've seen a video on back injury prevention.

The same goes for the wrist, the same goes for the shoulder. It's reactive, but it is effective.

We have a lot of health and safety task teams; over 40 health and safety task teams, all educated in ergonomics, as well as in industrial hygiene, lockout/tagout, all different subjects.

The workplace modifications are focused on fixing the problems after finding them. We have what I'd like to call low-tech ergonomics, as far as job analysis.

In my opinion, job analysis has four goals, and if you accomplish those our goals, you're analysis is in-depth enough, and what you want to do is define the problem; highlight the area where the problem is; justify a workplace modification; and be able to prioritize it.

If you can accomplish those goals, it's sophisticated enough an evaluation. The changes usually made are very simple but very effective.

In conclusion, when properly applied through education, teamwork, and empowerment, ergonomics can very significantly reduce injuries and illnesses while increasing productivity and product quality.

Thank you.

DR. MARRAS: Thank you, Dan.

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Guy Fragala from HEALTH CARE

DR. MARRAS: Our final report will be from Guy Fragala, reporting on the Health Care meeting.

DR. FRAGALA: I'd like to begin by saying the health care industry was really pleased to be included in this program because, oftentimes, we're thought of as the group that needs to care for the people who become sick and injured, and many forget about the risks involved in health care work.

If you look at the injury rates, the incidence rates for the health care industry is among the highest of all industries. We looked at case studies from acute care hospitals, from long-term care, and also at a worker training program, and one of the interesting things was that everyone focused on the real big part of the problem, which is lifting and handling patients.

We felt that was the big problem that needed to be dealt with in the health care industry because these loads are living, dynamic loads, and they're very, very heavy, and the tasks are difficult.

We talked about both administrative controls and engineering controls. The administrative controls were the use of lifting or transport teams where certain individuals did the lifting or transporting in a particular facility, and the case study that was presented demonstrates some successes.



The engineering controls are very primitive at this point in time. We have lifting aid devices in health care, but we're only at the very early stages in design. We've had devices for many years. Only recently have they begun to be improved, so we're seeing a lot of improvements right now and there are more devices becoming available.

Something else that was kind of interesting was that someone commented that the experience in health care was so bad with regard to workers' comp that some insurance carriers didn't even want to carry some of the long-term care facilities.

We talked about other variables that needed to be addressed, such as the resistance to change in nursing practice, because we're dealing with living loads, so a lot of people are resistant to engineering controls, so we have a lot of resistance to overcome.

Something else that's interesting is that nurses for many years expected that a back injury or a back pain was part of their trade. They expected to have this condition, so that's something else that needs to be overcome.

We identified many of the high-risk activities, and they were lifting and transporting patients and residents from beds to chairs, chairs to toilets, bathing tasks.

Something else that's interesting in health care is that we also need to consider the dignity of the resident or patient. When you're using lifting aid devices, the dignity issue is a big issue, and also the safety of the patient or resident.

We felt that if ergonomics is applied properly, not only will we improve things for the worker, but we can improve things for the resident and patients in our industries. We also noted that traditional programs which are focused on just teaching people how to lift have really not been successful, and we need to really focus on changing the job tasks in health care.

We did show that we can demonstrate successes. The case studies that were presented show that injury rates did drop when we applied both the administrative and the engineering controls.

We looked at some studies where engineering controls were put in place, and injury rates did drop.

We also noted that in the health care industry it's very important, as with other industries, for labor and management to work together, and we really need to involve the workers, those people who are involved in lifting and handling residents in the whole process.

My cochair for the session was Jamie Cohen, from the Service Employees International Union. We got done very late, and I lost Jamie on the way over here so, Jamie, if you're out there when we have the comment period, if there are any other items that I've missed that you'd like to add, please do so.

So, in summary, the health care industry we feel is a high-risk industry, and we're in the very early stages in applying ergonomics, but the studies that have been done thus far have shown that we can really reduce injury rates if we change the way this work is done.

Thank you.

DR. MARRAS: Thank you. I'd like to thank all of the moderators.

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### Question and Answer Session

DR. MARRAS: I'd like to, at this point, open up the floor to questions on any of these issues or any new issues and feel free to synthesize between areas, too, because I think we have some very common issues and problems that need to be addressed here.

What I ask is when you step up to the microphone to ask a question is that you first state your name and tell us where you're coming from, for the record, and we'll be glad to answer.

Sue.

Q: I'd like to ask Eric how you get management commitment.

MR. FRUMIN: That was the main question that the audience in our workshop had. Here are some of the answers.

First of all, the obvious: The workers' comp dollars were unsupportable for these businesses and it didn't take much to get them to see that. The horse was already out of the barn at that point.

In another situation, the value of worker involvement expanded to outside the ergonomics area. I forget which of the management saw the wisdom of that, but the fact that there was some overlap there was apparently useful.

In the case of Sequins, International, again, a small employer of less than 200 workers' in the urban environment, the availability of a multi-employer, labor-management negotiated fund to provide matching funding for investments was critical, as well as the union's support and doing

the training.

I think we have seen other examples in other industries of multi-employer, single union, or multi-union funds or joint efforts where unions can provide training. The construction industry is another example.

These are things that if they are organized correctly and are promoted properly, they can be very helpful.

One person was able to convince the employer that OSHA was coming with or without a standard some day, and it was better to fix the problem before they get there. So if anyone has any qualms about pointing out the importance of OSHA as a force of this issue, it's worth pointing it out forever.

Also, the union status as a partner, being both capable of providing training and willing to take some responsibility to help out, was an important factor in one case.

Last of all, I believe it was Gail Sater from Red Wing who pointed out, that when she was able to develop some cost allocation models, that would really take the costs out of the so-called corporate accounts and put them back in the plants, and even trace it back to the individual's supervisors and affect their bonuses, then it began to get a lot more of a response, and I know this has come up as an issue in other companies.

How workers' comp costs are allocated - away from central corporate processing and back to the facilities - is a difficult issue. It's often complicated by the bizarre accounting procedures in the workers' comp system. But if you can find a way to do it, it can have a big effect in ensuring that the supervision at the front line and other people at the facilities need to be held accountable for failing to pursue ergonomic interventions.

DR. JOSEPH: I'd like to add one quick thing to that. I know the question was focused, but I think it's such an important issue that we need to look at a lot of the tricks of the trade, and you mentioned a number of them.

One of the things that we found, there was one particular manager in this case, one of these real world examples, that we talked about ergonomics, and he said, yeah, yeah, yeah, and this person wasn't particularly a bad person, he just had a lot of other things on his mind. He had competing values or issues to deal with.

One thing that we did one day in our focus group or a forum, actually, was showed him the cost per unit of workers' comp, and basically it was an interpretation issue. He saw this big number and said, big numbers at Ford are not a big deal a lot of times, because we spend a lot of money on a lot of things. But then when he saw the cost per unit and he saw he was charging his engineers with taking a penny off of a car, and all of sudden you had \$30 opportunity for a

vehicle, he stopped what he was doing and he said, what did you say?

And the next thing we know we're talking, and the next thing we know we hired ergonomists for the division, and they put somebody in product, and things happened. Sometimes it's just a matter of interpretation of the data for them because they are looking at certain things certain ways, and you need to do that for them.

MR. SCHNEIDER: I would just add one more thing.

In our industry, in one of the case examples, one of the things that drove us was the interest on the owner's part, because the owner is paying the bill and the construction industry, ultimately, who is going to build this project. So having an enlightened owner really made a big difference in the opportunities that were available to do interventions on that particular site.

But in construction, like in other industries, the comp costs really are driving a lot of this. I mean, like the average carpentry contractor, it varies tremendously from state to state, but they're paying about \$25 in comp premiums per \$100 of payroll. It's astounding when you think about it.

In some cases in the ironworking trade, structural steelworkers are paying over \$100 in comp costs per \$100 of payroll, so it's a lot of money.

DR. MARRAS: Any other questions?

Q: I'm Shannon Isles from Iowa State University. I'm a student. You were talking about back belts. You had quite a discussion. I read a couple studies that said there's more injuries due to the back belts being worn because people feel that they should be able to lift more and they're trying to do more than they can.

I was wondering what was said about that if you could let me know?

MR. SCHNEIDER: I'll tell you, there are so many people in this audience that are more qualified than I am to answer this question, including Bill Marras and Marie Sweeney, and a whole lot of other people here.

I don't think there have been a lot of studies looking at back belts causing injuries, although there's certainly a lot of people that talk about that, and there have been a number of studies in the literature that discuss whether back belts can or could possibly have a preventive effect.

Right now, my read on the literature is there's not a lot of evidence to show that. There was one recent study that was published by Kraus on Home Depot, but that study, like a lot of studies, has some significant problems with it. I think we could spend probably the next six hours discussing this, and I hope Bill and others will chime in.

MR. McCAULEY: Let me chime in.

We still use back belts. Not so much to prevent injuries but probably a sugar-coated pill because it reminds them that they should be using the proper lifting technique, and we make them go through the medical office to get their belts so that they're measured properly.

They're told how to wear it, because you look at a lot of people and they are wearing it more like a halter than as a back support, and so we make sure that they're properly educated.

We make sure we tell them, too, that it doesn't make them Atlas. I think your point was well made, that everybody sees a weight lifter on television, then they have to have that big leather belt on. We've even gotten away from the leather belt into the more comfortable back brace, if you might.

MR. CIMMINO: I'd like to throw a comment in there. To get a little different perspective on this, I'll start by loosely quoting Jerry Seinfeld when he talked about the invention of the helmet. What Jerry called the helmet was a monument to human stupidity.

The reason for that is people invented helmets for a reason, and the reason was because they were doing things, and people ended up cracking their heads open. Rather than stop doing the things that were causing their heads to crack open they invented a device to put on their head to stop them from cracking it open.

I think you could apply the same logic loosely to that of back belts, in that, rather than trying to figure out something to strap on to a person's body, to prevent them from hurting their backs, why don't we take a look at what they're doing and trying to make a change to their job and reduce the risk that way?

DR. MARRAS: David.

Q: My name is David Alexander. I'm with Auburn Engineers.

Frankly, looking at a group of a half a dozen manufacturing oriented representatives, the temptation is just too great. I've got to ask about costs.

What I'm interested in, and I'd like each person to respond, if you would, please: Are the costs so high now that simple cost reduction can drive the ergonomic efforts? In other words, is it a cost issue, in addition to a health and safety issue?

The second question is, once workers' comp is under control, are cost opportunities available to sustain the ergonomics initiatives or will they end at that point?

MR. FRUMIN: Dave, thank you. In general, Dave, thank you for your leadership in this field.

You've raised a critically important question. If costs are the sole driver or the primary driver, we see bizarre results, like the Virginia legislature disallowing compensability for carpal tunnel syndrome. This is bizarre.

So if that's how costs are to be controlled, and costs are the main driver, then we're going backwards faster than we can believe.

In some cases, costs are quite high, but costs are very much dependent upon awareness and compensability issue, depending on the states. In some cases they will not be an effective driver to get things started.

But once they're identified and allocated properly, yes, you have to make a business case for it, and that's the language of business. It's a free enterprise system. We're stuck with it, and so we might as well take advantage of it where we have the numbers.

On the other hand, again -- what we found in two of three cases was that while cost being a driver, the ergonomics program itself was a segue for management into some very innovative management changes. To me, the opportunity to tie quality management to job design is going to be a critically important motivator, particularly for firms which are under increasing stress and pressure on both the cost side and on quality and flexible production.

That's why I thought the product design workshop was interesting, because a lot of the key issues that we deal with in looking at quality also come up in product design. I was glad to hear some of the insights that Bill and the other people provided there: the issues of whether it's the process or the equipment or the parts that you're working with. The same things that you're dealing with in quality management, you're also dealing with in ergonomics.

DR. MARRAS: Yes, ma'am.

Q: Hi, I'm Laurie Rectanus with the General Accounting Office. One of the things Tom Albin had said this morning, and we heard through several of the presentations was this idea of prioritizing the jobs or processes that you need to fix or trying to establish a threshold of the risk or the hazard.

From everyone's presentation, it seems like everyone has a -- or at least it sounds like people have a separate ergonomics program in addition to their health and safety program, and I was curious to get some sense from those of you who have programs, I guess, how did you determine whether the extent to which you needed to take action in response to the magnitude of the problem and why did you feel if, in fact, it's so, that you needed a separate ergonomics program outside of your health and safety programs?

MR. McCAULEY: Let me try. Let me try that one.

When you look at ergonomic program, and the reason you separate the two, or at least the reason we do, is that it's easier to take a bite of a particular apple instead of trying to eat the whole bushel at one time.

Also, with the employee involvement, you're trying to educate those people so that they can focus on an item. If you try to make it so broad a spectrum for them to actually become knowledgeable and because, remember, these are people working out there on the line doing a particular line.

So you're trying to make them a specialist, if you might, and so that you're trying to focus their attention on one particular item.

Now, there are some plants, particularly if you have a smaller plant, and we have some small plants, and they're combined. It's an ergo Safety Committee.

But in larger plants, where you have larger problems by the mere size, then you try to have specialists and they're looking at strictly ergonomic problems and not trying to take so many things into consideration that you get nothing done. You know, you can overcrowd the plate so much that you're now just getting busy but you're never solving anything, and by taking bites you get to some kind of resolution also.

DR. JOSEPH: I think your question is actually an interesting question because, really, you're dealing with the concept of special emphasis. I think this morning Tom Albin from 3M talked about whether we want to put this together as part of the health and safety process. Ford has a health and safety process. I'm sure everybody else here does.

I'm talking to the choir, but the problem is you want a special emphasis because you need it and it gets to the cost question, I think. I don't know, Dave, where you are, but it gets to the issue of the cost question again.

To be honest with you, I think what happens is that industry makes a decision that this is a big enough problem, that it needs special emphasis to get it going, but the ultimate goal is to integrate it into the existing processes, to make it part of the core methods, how the company operates.

I think the greatest day at Ford Motor Company for ergonomics would be the engineers just do it and we don't have to bug them. That would be the greatest day. It eliminates my job, but I have three kids at home and a college education I've got to do, so hopefully it will be a little while longer, or else Bill will get me a job at Ohio State.

But that would be the thing that you need to look at is ergonomic theme, they do it, because it's part of what they think about, and that would probably end the program as a separate emphasis

program. We do it all the time.

Asbestos, a couple years ago. What did we do? Have a lot of emphasis on it. Some people may say we've kind of backed off it, some other people may say we're just handling it as part of the regular health and safety duties. So it depends.

MR. SCHNEIDER: Let me suggest one thing, though. I think, to a certain extent, ergonomics is a different type of problem. People are approaching it differently than they have other health and safety problems in the past. I think when people had a noise problem at their plant or in their workplace, they didn't think about, as much as they do with ergonomics, about getting employees involved in identifying the problem.

They had a hygienist or somebody go out with a noise meter, and it was really an expert approach where experts would come in and analyze the problem and they'd make recommendations to management.

With ergonomics, I think there's a much greater recognition that you need to get employees involved, that if you don't get employees involved that it's going to fail. Therefore, I think we're starting from a different emphasis, a different angle.

So to incorporate into the traditional health and safety program was a little bit more difficult, putting a square peg into a round hole. So I think now, what I'm hopeful is maybe this ergonomic approach to solving problems will spread to other kinds of health and safety problems.

If there is some sort of integration, it'll rub off on the other health and safety problems in solving approaches.

DR. FRAGALA: I can tell you a little bit about the models in health care. In health care, we don't have a lot of people who specialize in ergonomics at a facility. So much of it is done through a committee of program effort.

You'll usually see a central safety committee and maybe a subcommittee or a program group that reports into that central safety committee, so that it is integrated into the comprehensive program, but there is a group dedicated to working with those problems, and I think that's going to continue for health care.

MR. FRUMIN: I think one of the questions you have to address, looking at this problem of compartmentalizing ergonomics into a corner is the issue of accountability and authority. If the people who can get something done in the workplace are working together on an ergonomics team, and there was a safety committee over here that was already in existence and the motivation to start an ergonomics program got a separate group up and running, fine, they're there. They're getting the job done and work it out.



If they're being marginalized, and it was just a superficial effort, then you need to have whatever line of authority in a joint labor management situation, a joint committee, intervene and to have responsibility for it. So it probably depends on the politics of the workplace as to who's going to get something done.

I notice, for instance, in a recent Big Three negotiations there were some different approaches to revising the health and safety programs at GM versus Ford versus Chrysler because of the issue of ensuring that the accountability of supervision and the union leadership in the plant vary from company to company.

I think at GM they decided to have a new plant steering committee, which had to take some more responsibility for making sure that these programs worked better.

We saw the same thing at Fieldcrest Cannon in a case study we had, where if the Ergonomics Committee couldn't do it, the Labor Management Committee, sort of the senior union company group at the plant, was going to have to pay attention to it on a more regular basis.

So it's not really a cookie cutter question or a marginalization as much as, where's the power, who's going to get the job done? If they're not getting the job done, how are we going to get their attention?

DR. JOSEPH: I'd like to add one more little thing, and that is, I think there's a bit of a difference. Scott, you touched on that quite a bit, on the issue. In noise, there is a measuring stick. We know how to do it, it's fairly scientific and proven and it's there. You can take a dosimeter out to the plant floor, teach somebody how to use it, and get a result pretty easily.

The problem in ergonomics there's no charcoal tube, so to speak, for it yet. Because of that, it's very important the employee involvement is there because they know the job. They become sort of the analysis or the evaluation mechanism that we have, and that's another reason why special emphasis has to be there, because you've got to ask them.

We have this charcoal tube, you just walk out there, say, oh, it's not a problem or it is a problem.

But ergonomics is more personal, too. I think that's what you're getting to, Scott, and I think that's another reason for the problem. You go to an office workplace and compare that to an industrial workplace, and you know that the office workers are hurting. You think, man, you compare the two; this person in the industrial workplace isn't complaining but the office person is. You know you've got to fix them both, though.

The charcoal tube is just not there to measure it. So I think if we ever did develop a charcoal tube, it may change ergonomics a bit, but I don't think we're likely to for a long time.

MR. CIMMINO: I'd like to throw one more comment out there. It's the fact that even before there

was a, quote, "ergonomics program," unquote, there was ergonomics practice. It's just a matter of how well people did it. I'll give you a couple of examples.

Office furniture. Somebody went through a selection process and picked what they felt was the best office furniture. Maybe they didn't put emphasis on ergonomics but it was one of the things that they thought of. If somebody looked at a desk and it was two feet off the ground, they wouldn't buy it, and there's a reason for that. But they didn't put a lot of emphasis into the height of the desk.

Hand tools. We already have people who evaluate and purchase hand tools. If somebody looked at a pneumatic drill and the thing weighed 50 pounds, they probably wouldn't purchase the drill, and there's a reason for that. It's too heavy for the guy to lift.

So it's not a matter of implementing ergonomics, it's a matter of improving and educating and refining those skills, that may be a little rough and something a little bit better.

DR. MARRAS: Up here, we have a question on the right.

Q: My name is Jim Burke. I'm with Ford Motor Company. One of the things that Brad mentioned earlier today was Ford's establishment and continued improvement on a video library of solutions.

I think one of the things, because of Ford's size, we found that there are common problems. We don't have plants, different committees trying to solve similar problems that there might have been a solution for in the past, some better than others. Why reinvent the wheel twice?

We can get a repository for these solutions, people can review it, try and find out if something has already been done.

I have a twofold question, basically:

Are the other industries doing that? Something came up interesting today. I saw a presentation from the garment industry, and they had a lot of problems with cutting, CTD, and so forth. Well, gee, guess what? I think Brad could testify that for upholstery in the car industry we had a lot of the same problems.

Wouldn't it have been nice if we could have gone on the web to OSHA and looked at what the garment industry is doing with these similar problems, and can we use them in the automotive industry? Is the industry approaching OSHA, can we establish a web site for these type of ergonomic solutions?

MR. FRUMIN: Well, actually, it comes in full circle. The chair that was installed in this one case study was one that was developed by a supplier, BioFit. Buy chairs from BioFit because our

members were making them. That chair was developed through a competition that was run by the University of Michigan for Ford for its upholstery plants because, as a result of the UAW/Ford joint program, there was a \$50,000 competition to make a chair for sewing machine operators because there wasn't a good one on the market.

So we appreciate the interest of Ford and the UAW, and we want to give it back.

Yes. This kind of spreading of technology, technology dissemination, diffusion, is critically important, and we can do it. But, you know, there are a lot of people who aren't here today at this conference who desperately need the information. For them, it's not a question of reinventing the wheel, it's a question of getting them to stand up and take notice in the first place.

It's not because they don't know. Web sites alone aren't going to do it, and the sooner those of us in this room get started with a joint effort to tell the world at large and the Neanderthals, in particular, that we need an OSHA standard, and we need an OSHA outreach program in general, the sooner we'll get the kind of interest so that people will want to know what's going on out there.

You can put up a web site, you can build it, but if the employers aren't coming, then they aren't reinventing anything. We have to get their attention in the first place.

So we're in kind of a tough situation at the moment, and I hope all of us here can see our way clear to mounting that kind of pressure.

DR. JOSEPH: One comment on that. There was some data collected a couple of years ago about cost-effectiveness of these programs, and I keep hearing this issue and I keep hating to say it, but industry is run -- I think you mentioned it, Eric -- industry is run by costs and we have stockholders and all that good stuff.

The bottom line of it is that we probably need to make better cases because I think it's there. For sure it's there. I think Dave will talk something about some of the cost benefits anyway.

But if we can show it, they will come to the party, and I think that's part of it. But once you got them, once you snag them, you've got to take advantage of that snag because that time period where you got their attention is very short. I'm sorry to say that but that's just the way it is. There's a lot of things going on in history right now, with downsizing and everything else. Once you got their attention, take advantage of it.

DR. MARRAS: One caveat with respect to what was mentioned earlier. Ergonomics is situation dependent. So what works for one situation may not work for another one, and I think that's the only real danger with the solution, such as putting things like this on the web.

If you know how to use it appropriately and understand that this is a potential solution and not

the only solution, then I'm all for it, but you've got to realize that every specific situation is different. What happens in Brad's plants, or even between his plants, in upholstery may be very, very different; different materials, different resistances, different compression, all kinds of things like that.

MR. McCAULEY: I'd be remiss if I didn't say something, too, as far as the State of North Carolina. And I'm not from North Carolina. But that's where we had our citation.

North Carolina OSH has gone in and they've created what they call the North Carolina Ergonomics Resource Center, and through that means, and they're doing it in cooperation with North Carolina State University, and what happens then, if a small employer asks a question of the Resource Center, what they normally do is provide the answers if they can; or they have the resources to refer them to other employers there in the state that have gone through the same issues.

Then we tell them what we have done and then let them tailor-make it to fit them and not just take our program and incorporate it, or listen to three or four different companies, and then try and do a piecemeal job that's going to best suit them. So some states are doing it through OSHA itself.

MR. SCHNEIDER: Let me just add. We are working with some of the Europeans to develop sort of a solutions data base for the construction industry, but there are other things going on. I know, for example, with the ADA taking hold, there's a group, I think it's in North Carolina, called the Job Accommodations Network -- West Virginia? I'm sorry -- and they have an 800 number, and you can call them, and I think they have a web site, and you can get information on accommodations for people that have disabilities which, in some ways, can be sometimes used to accommodate people who may not have as much strength or whatever to do a particular job.

So I think we're slowly going to -- I know the Canadians also were looking at; the Canadian Center was looking at developing a solutions data base, but I don't think that project went very far yet, but I know they were considering that. A lot of the information they had came from a group in Western Australia, called Work Safe Australia, that had developed a whole bunch of solutions, and they were put together by the Canadians with other ones.

DR. MARRAS: I think we have another question.

Q: My name is Gary Maddox, and I'm an occupational therapist. I work at a hospital.

I work a lot with injured workers, especially a lot of repetitive motion type syndromes. A lot of the workers that I see are workers who are deconditioned to begin with; overweight, they smoke a lot, they don't have good diets. A lot of this plays into the ergonomics that I try to teach them because I not only see that they have jobs that injure them but I also see that they have a home life that also injures them as well.

I guess from your perspective, from industry perspective, do you have health and wellness programs in your industries? To what extent are they effective, and how have you gone about setting those up?

MR. McCAULEY: Let me also try that one. When we went into North Carolina and put in the medical intervention, as far as ergonomics was concerned, our success was such that our medical director said, hey, if it works for worker's comp what about general medical coverage? In some of our larger plants now, we've actually put in medical centers, if you might, where that outside medical doctors come in, therapists come in.

One of our associates could be undergoing therapy, and instead of having to go to a therapist's office and lose time, they go to the medical center which is located right there by the plant, and they go through the therapy right there and then go right on back to work.

We have seen a drastic reduction, even in the medical claims now, and we're moving into the field where we're giving a prenatal and postnatal care for the women, naturally, there in the plants, and also now looking at getting into child care. Because we found out -- and, again, most of our areas are rural, and the people have to take off a day or a half a day at least to go see a medical doctor, and they lose money. So consequently they don't go until it gets into a real situation where more than likely it's going to require surgery, hospitalization, et cetera.

We're seeing now that, just like in ergonomics, early intervention prevents all that expense at a later date, plus the reception of the people that are making themselves available to this has been outstanding.

One last point: They have to pay for this. You know, they go to the doctor, and we have a ceiling on what they pay for each doctor's visit, and that's \$5, and then the company subsidizes the rest of it. But our results are such that just in savings on group health claims it more than doubles the savings.

DR. JOSEPH: I think it's another one of these good questions to talk about for a long time, but just a couple summaries. We do have in plant with complete exercise rooms in the plant at Ford. They're basically in-plant exercise areas, and they're voluntary, and they come in, and we also have, we're looking at on-site rehab centers and things like that. But I think a bigger question is, it's almost a piece of the pie.

The solution is not intervention on the job only, it's not employee training and education, it's all of them. I will use a case study to illustrate. This study comes from the vehicle parts shop, not ergonomics. It has nothing to do with ergonomics, but the paint engineer said, how are we going to do coating on the car? The first thing he said was, there's four or five major things you've got to do, and any one of them done improperly can have a negative impact on part quality.

The first thing was is keep the lint off the car, which means have the employee work with

garments in the paint shop.

The second thing is have good coating materials, and so on and so on.

So it's a process and it's a system and includes, yes, most people are away from their jobs half the day. That's important.

The other side of the coin is, our employees are aging. The average age is 46, almost 50 years old, and we're bringing new ones, as the other ones are retiring. Those people are productive, the older workforce. In fact, we call them very experienced, and so that's another way to look at the same problem. They're older, so they may not have the same level of physical capability as some of the younger workers but, you know what, they build good cars despite this.

So that's what we're given. The cards were dealt, and we might as well make the jobs accommodate most of those folks.

MR. FRUMIN: Quickly. Prevention pays, right? We know that. On the other hand, don't oversell the usefulness of wellness programs, in terms of saving money. They're a good thing to do but there's a very limited payoff, especially in terms of the actual numbers of cases that are related to work-related risks. The risks from the job are much higher.

Barbara Silverstein and Tom Armstrong published a fairly rigorous evaluation of the wellness program at Johnson & Johnson's Enthicon subsidiary some years ago. That's a pretty fancy wellness program and they found no effect as far as dealing with work-related health problems.

So it's a good thing to pay attention to for other reasons, but it's got limited payoff.

DR. MARRAS: We'll take a question from the side, please.

Q: Thank you. My name is Marcus Frohart. I'm from Micron Electronics over in Nampa, Idaho. I'll make my question pretty quick.

There's been some excellent data exchanged as a result of this conference. Unfortunately, I wasn't able to be at all of the different topics being discussed, but I was wondering if there were any plans to have some of that data published so that way we can refer to it?

DR. JOSEPH: Yes, Bill's going to publish it all.

MR. FRUMIN: I've been told that they're transcribing the conference, and there's going to be a proceedings from it. So we've been told that everybody should speak in the mikes and present these summaries because we'll get something back from OSHA.

DR. MARRAS: Okay. We have a question in the back, please.

Q: Carl Marian from Eugene, Oregon.

Scott was gracious enough to mention the Job Accommodation Network. It's available all across the country and all of the United States territories by a toll free phone number. That phone number is 1-800-526-7234. It's 1-800-526-7234. They were cooperating with the Canadians at one point to also provide that service throughout Canada, and I'm not sure if that's continued or not.

DR. MARRAS: Thank you. Next question, please.

Q: My name is Ian Chong. Our firm is Ergonomics, Incorporated. We're a consulting group. That's why we have such a creative name. My question has to do with cost justification and just plain justification. Many of our clients are always involved with upper management. Upper management, like was stated before, are not ergonomists, nor do they know what ergonomics means. They look at the bottom line of the financial statement.

Many of our clients are really interested in what worker comp injuries and repetitive motion injuries and time off and all the associated things like that, really cost them.

When we do a project, we are often asked to try to track it. After we do a solution, our clients generally say we don't do a solution. Our clients generally say we don't want to spend any money on tracking, just do some more solutions. So we've never really had the opportunity to track anything significant.

We did do an informal study one time of one of our clients, and we found out that what injuries are really costing them are not twice the stated amount of medical intervention, time off, those type of things. It wasn't five times, it wasn't ten times, it came out to be about 20 times, which is really a significant number.

So my question to you learned gentlemen is do you have anything that resembles any kind of study or follow-up that would put some sort of numbers to these issues?

DR. MARRAS: Let me expand upon that question a little bit because that's very similar to a question I was asking, which has to deal with how one benchmarks and assesses the costs. Can you even measure these types of costs and benefits?

We've got a very dynamic world here. Record keeping is constantly changing. With increased recognition, you have increased reporting. We have shrinking workforces. changing profit profiles.

I guess a bigger question related to that one is what's a legitimate cost/benefit with all of these constantly changing variables? Can you even do it?

MR. SCHNEIDER: Let me just mention one thing. We've recognized that this is a problem in our industry and what we've done is we've set up an economics research network of about 20 economists who meet on a regular basis to talk about the economics in the construction industry and how that impacts safety and health.

Some of them are beginning to work on this problem of looking at ergonomics and the costs and the benefits of interventions. There was a study done on the indirect costs of accidents in the construction industry by Jimmy Hinze at the Construction Industry Institute many years ago, and found it was very high. I think it was about 10 times the direct costs.

These are all important questions that have to be looked at and we have to do more studies looking at the costs of interventions and the benefits and looking at what are all the extraneous costs and how do you measure them. A lot of them we can't really measure. We just have to sort of estimate what they are because there's just no good measurements for them.

For example, one of the things we need to look at is what happens when you make these changes in terms of productivity. We talk a lot about productivity improvements. In the construction industry, productivity is rarely, if ever, measured.

So there's a lot of things like that we need to quantify, and unfortunately very few people in the safety and health field have an economics background. I don't. But that's why we're setting up this network to try to get economists interested in these kind of problems and see what they can do to help us out.

MR. McCAULEY: I think it's a state of the mind how much your company is willing to spend on any injury. How many people do you have to injure before it becomes cost effective? How many people do you have to have lose their jobs because they can't carry on anymore before you change your process.

We looked at that and for us to sit there as professionals and try and tell upper management that we're going to get them an X percent of return on their investment is naive because you're playing with dough. It's going to change on you.

If you're sitting there, and you're actually concerned about the welfare of your people and how many people you're willing to sacrifice that year, then you may have something to argue about.

We've set it up in our company that we have three goals. The first goal is people, the second goal is product, the third goal is profitability, and if we watch after our people and do what's right by them, and do things that may not be cost effective, at that point, by saying that machine is worth and will return X number of dollars, we'll probably see it in the quality of the product that we're turning out, okay?

We'll probably also see it in the profitability because now we can charge the price for a quality



product that the customer is willing to pay out there. A lot of it is intangible, and that's where the culture comes into play. Is your upper management really dedicated to safety or are they dedicated to the economists? Everything's got to be a return or they're not going to look at it.

I question then whether you're going to have a program or not anyway.

MR. SCHNEIDER: One other point is, you also have to think about how many of these costs are not being paid by the employer. I mean, if a worker gets injured in the construction industry and they move on to the next job and can't work for a couple weeks or it affects their quality of life at home, I mean, those things are not being paid for by the employer.

They're not being felt by the employer so it's real difficult sometimes to add those things in or to cost them out or to think about how they're going to affect economic decisions, to invest. It's a difficult issue.

MR. FRAGALA: We've had some successes in trying to measure costs because our workers' comp costs have been so high. Just looking at the direct costs associated with the occupational injury, the compensation payments, and the medical costs, we've seen significant cost savings.

What I've seen a lot of people do, you can spend a lot of time trying to model these indirect costs. As everybody said, it's very difficult to get an exact number, so what I've seen people do is take a conservative figure of at least four times greater.

We can measure our direct costs, and if we take a conservative number of at least four times greater in the health care industry, at least, we've seen significant cost savings from some of the programs we have put in place, but remember our workers' comp costs are very, very high.

MR. CIMMINO: I'd like to reinforce what Jim alluded to, which is in addition to the financial costs there is also a human cost, and when you look at workers' comp statistics and the injury rate statistics, every dot on that chart represents a human being, and when you lower the numbers on that chart it not only lowers your costs but then you also have a guy who is going to go home and have a catch with his kids rather than sit and put ice on his shoulder.

So I think that what management has to understand is that these costs aren't a given and is not simply a cost of doing business. They are controllable. There is an opportunity to reduce those costs.

To have a real commitment, to return a guy when he goes home at the end of the day and walks through the gate, we return him in the shape he was when he walked in because going home with parts that aren't functioning or missing or in a body bag, that's not part of the deal that somebody signs up for when they take a job.

They work hard. They don't make a whole lot of money and I don't think that's too much to ask for.

MR. FRUMIN: From the apparel industry, we can tell you that once you start basing your decisions solely on cost, you can quickly take a low road to a pretty disgusting way of doing business.

That's why we have some people working in slavery in this country. That's why we have 90 Thai women in the suburbs of Los Angeles enslaved in a garment shop. An industry doesn't have to function like that. We don't have to have sweatshop conditions in the poultry industry, the garment industry, in auto parts, in a whole lot of industries, but they exist because people decide they're going to run their business based on cost.

We have ethics, they ought to be there. If they're not going to be there, we have a law. That's what OSHA's about, and we bloody well ought to get on with an OSHA standard so that cost does not become the sole motivator or criteria. If we can't get that together as a country, then we ought to ask where the hell we're going.

DR. JOSEPH: Since everybody is commenting, I guess I will, too. I think the way to properly answer that question is a total cost to model. Cost doesn't necessarily mean dollars. Cost can mean a number of issues but there's a cost of running that company in terms of making it work, making that company stay around a while; making that company produce a quality product.

Then we've got to get rid of this idea of workers' comp costs, medical costs, and this cost. I think those are all valuable as part of the total equation of total cost.

I know Ford now is talking more about total costs models. They mentioned this when we talk to employees and use it a lot with a lot with the engineers when discussing ergonomics -- total cost, that we should put this in or put that in.

I think that when we understand it better -- I don't understand it that well; I'm not an economist either, and I don't even understand the term, I didn't do that well on the first class of it, but the bottom line of it is I do understand there are values that you can put on these things, and we can probably take a look at it and see what adds up.

It doesn't have to be a number, but it adds up somewhere, and we need to understand that.

DR. MARRAS: With that, I think we're getting to the point in the program where we have to end this.

I'd like to thank all of the participants in the panel for their insight, and we really appreciate your summaries as well as your insight.

I'd also like to thank OSHA and NIOSH for putting on a very, very nice first day of this event.

Finally, I'd like to remind everyone that we start again tomorrow at 8:30 in the morning. Thank you.

## Plenary Session II

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Suzanne H. Rodgers, Ergonomic Consultant

DR. RODGERS: I'd like to start the Plenary Session, Focus on Effective Programs in Small Business.

I'm Sue Rodgers, and I'll be speaking first on a general basis.

Carol Stuart-Buttle is a consultant in ergonomics out of Philadelphia, and she is going to be our last speaker.

David Carroll from WoodPro is going to be our middle speaker. David is a small businessman who is going to be talking about his program. Carol is going to be discussing three projects that she's worked on in small businesses as well.

I have a handout for my comments that is copied on two pieces of paper with eight pages of text. This means that you wouldn't be able to read it in this room, anyway, and, therefore, I set it around the sides of the room. There are 300 copies, so I'll watch the stampede at the end to get the material. It's also, of course, going to be included in the proceedings when those are available.

Some of you may look at me and say, "Well, why is she talking about small businesses?", because I mostly work with large corporations. But what I've found in my own practice of ergonomics is that the large corporation is made up of a lot of small plants. Each of them has to deal with budgets. Each has to deal with resources. The difference, perhaps, is that the large corporation can provide corporate resources, and the small plant doesn't always have that luxury. What we decided to do is to make sure that we covered the things that are common to small plants and large corporations and to small businesses, generally.

I had asked Carole Hunter if she could speak on the program because she has a unique approach, I think, to small business ergonomics. She was kind enough to say yes, and then, when we thought we had too many speakers, she was kind enough to pull out. And now she's here, but she said go ahead. So I want you to realize that she is not missing from the panel because she's not willing to speak but because she's giving us some more time for questions and answers. We want to leave about a half hour at the end of our comments so you can ask questions and share your own experiences with us, particularly the small business people.

If you look at the handouts you got with the program, one of them is the Meat Packers Guideline, the original Guidelines for Ergonomics in the Meat Packing Industry. I know this isn't new to

any of you. What I'd like to do is to go back to this and take a look, particularly at Parts I and II. As you know, the first one is management commitment and employee involvement with some subsets. The second one is program elements, which includes worksite analysis, hazard prevention control, medical management and training education.

Roger Stevens and the OSHA group put out their straw man (I call it) back in July of '92. It was a general ergonomics guideline and Roger very intelligently put on the top "Not for Circulation, Do Not Distribute," which meant that within a week every company in the country had a copy of it. I would like to go back to that particular document because I think it has the ingredients that all of us agree ought to be in a good ergonomics program.

What I thought I'd do this morning is just take the two that I find the most challenging -- well, actually, one I find most challenging -- and this is, getting management commitment; and, two is: getting real employee involvement. I'll share with you some of the things I've learned over 28 years of trying to get people to buy into ergonomics in small as well as large plants.

Let's Start with management commitment. We had some good comments yesterday about how to get that. I'd like to share with you an approach that has worked very well for me. It takes no money, is done in a meeting or session where you may be able to get the management team together, such as in a morning meeting. It works very well in large groups, so I'm going to make you do it, too.

If you could all stand up, please. Thank you.

The best way to get commitment is to feel it, to feel what it feels like. Now, if you could take your left leg, please, and raise it 45 degrees. Quality performance is keeping this leg at 45 degrees and not holding on to anything to do it. Okay?

Now, while you're doing that, I'd like to talk a little bit about management commitment and things we can do. Keep it up. Your quality is falling there. Get it up. Get it up. Right.

Essentially, what I did in this particular situation was a spur of the moment idea. There was a speaker before me who was from the corporation and was telling a group of managers in a large subdivision why they should be doing ergonomics. He had all the statistics, and he was going through them.

The trouble was that it was 1:00 in the afternoon. We were in Europe, and they happen to have nice big lunches in Europe, and everybody was sort of, you know, looking as if they'd never quite make it through any talk, not to mention the one with statistics. He finished his talk, and turned the audience over to me, and here I am now supposed to be talking about ergonomics.

Larry, get that foot up again, there. Thanks. Come on, front row. Get those legs up.

I said to myself, let's get them up because they've been sitting for a half hour. So I got them up and asked them, to raise a leg like you are doing now.

I had five benefits written on a transparency that I was showing, talking about "Why Ergonomics?". I spent a lot of time on the first two points on accident and illness-injury prevention, and on peoples' improved ability to perform. Then, I had three more points, which I finished up quickly about things related to reducing errors, increased flexibility, and better utilization of peoples' skills.

I finished my five points. Then I said, "Okay, You can put your foot down." So you can put your foot down.

And then I said, "Can you tell me the last three points I made?" Absolute silence in the room. I said, "Well, why can't you tell me? Weren't you listening?" They said, "No, we were concentrating so much on the discomfort of holding that foot up, that we weren't listening.

I said, "Well, you're telling your people to do quality work, right? You say, do good, quality work; and you've got them sitting around with one foot up in the air all day. How can they do quality work?"

And all of a sudden I could see the lights go on. It's the same thing that was mentioned in yesterday's session by Eric: Quality and ergonomics are directly related. If you hurt, if you're uncomfortable, there is no way you can put all of your attention to quality work; and that hit the chord. That was the thing that they needed to hear. From then on, we had clear sailing. You can sit now.

The point is that they knew they were weaving and bobbing; it wasn't me telling them they were uncomfortable, it was them feeling it, and they understood what was going on.

Another time, I was talking to a plant manager who had just been berated by the corporate safety director because he had a lot of injuries in his plant. When I say "a lot," this happened to be a good safety program, and a lot to them was three.

Again, after being told that he really hadn't done a good job on safety, and he had to get busy, he was getting madder and madder. You could see him holding his anger in because his job was get the product out and to do it as safely as possible. He was not happy with being raked over the coals by the corporate safety director in front of other people. This had gone on for 15 minutes and he was really quite angry, which I could tell because his ears got very red -- he was sort of a fair complexion, and his ears just got totally deep red.

The safety director turned the meeting over to me. It's sort of like having a bad warm-up act, you know. You're sitting there saying, "Gee, how am I going to get his attention?"

So I changed the discussion over to quality, and I said, "You know, one thing that ergonomics really does for us is to make it easier to do quality work.", and I talked a little bit about examples that we had seen in the plant of things that made it hard to do quality work.

The ears got whiter and whiter. Not white, white, but they became less and less red, I should say, again showing me that we had hit a point. He could understand how ergonomics interacted with what he was being asked to do, which was to get a good product out the door.

So, again, management commitment to a large degree comes from understanding how ergonomics can positively influence all of the goals of the company; not just the health and safety goals, but the performance goals of the company as well.

I haven't met a manager yet who wants people to get hurt. It's just that they've got to understand why some people get hurt and some don't. It comes back to the word "cause", the job causing the injury. If the job causes the injury, then why doesn't everybody get it? And that's in the back of their heads when they're trying to understand why suddenly, after doing the same jobs for years, we've got a lot of people getting into trouble.

They really don't understand that if the job causes injuries why there aren't more of them around. As you know, even when you have a problem, the injuries/illnesses are seen in just slightly over 10 percent of the workers.

So that's my basic message on management commitment. Get them to feel it, get them to understand. I like to spend about an hour with them the first day I get there and just ask them questions about what they have to accomplish that year, and what are their goals. What are the things that get in the way of meeting their goals?, and how can ergonomics help them get there. It's very much a partnership when you start getting into the ergonomics program. It's not all injury and illness. A lot of it is performance related.

For the same reason, I talk about fatigue rather than causing injury. The reason I talk about fatigue is that's performance related. Everybody knows that you can be tired on some jobs, that you have to stop and break in order to get recovery on some jobs. Those are the ones that they can very often do something about through a management policy or a management process that makes sure that we don't have jobs out there that create a quick fatigue, a muscular or a mental fatigue that may lead to an injury, or error.

What we see there, too, is that they can identify this themselves, particularly with the meaner, leaner things going on with downsizing and not adding staff but rather trying to find other ways of getting the job done. They feel this themselves, and they'll talk about it. Once they take ownership of the fact that those are problems that need to be addressed, they're very good about supporting the process.

I'll have to say that OSHA citations have always been an effective way of getting management

commitment. I guess I'd rather not get to the point where they have to get a citation because I'd like to think that they were good enough before that, but it certainly is a form of clout.

One thing I noticed, and maybe you noticed, too, was that after the failure in March of '95, of the proposed standard, there were some people who said, "Let's coast for a while now." Fortunately, the ones who had been doing some ergonomics, generally realize that it has benefits that make it something that we want to continually do. But, there was a pulling back by some people who thought of this as a necessary evil. I'd rather do it because it's the right thing to do, rather than because you're going to be punished if you don't.

The main thing I've learned also, and this is both management and employee involvement, is to teach people to ask a lot of questions. I know somebody could probably argue that a consultant's job is to provide information. I find that my major effort is to ask the questions, to have them find their own information, to help them structure what they need to do and to help them structure the information, or find the information that will help them know how much they need to do.

These are things we were talking about yesterday, how big a problem is it? what are the problems you need to address first? and things of that sort. I think it's sort of neat to be able to go in, just ask questions, and get paid for it.

I was told, by the way, also, by the engineering teams that I've worked with (and it was mentioned again yesterday in some of the sessions) that the hardest thing is getting into proactive ergonomics. It's the most effective way to go, but it's very hard to do. Now, if you're a small company and you're getting some engineering done, often that's by contract. In some of the areas I've worked in we've actually had the contractors come in for the ergonomics training so they get that training, the same training that the teams are getting on the floor; they are wonderful, especially in the class, because they have ideas on how to solve some of these problems that may involve more mechanical skills or more technical skills.

You definitely need to involve the contractors in the ergonomics program or else you're going to spend all of your time reviewing what they are doing and telling him not to do that.

When we had trouble getting engineering commitment inside a company where we were building the ergonomics teams in the plants, we wrote a policy that the engineer had to go talk to the inside team about anything that was going to appear in their area. This was whether it was a workplace rework or a line rework, or a choice of major equipment they'd have to work on, and that would include the maintenance group as well as the operators. That has been very effective where it has been implemented. Again, it's still a matter of getting the process set up to be sure it happens.

Number 2 of the Ergonomic Process Needs: Employee Involvement.



What I am going to show you here is the importance of the employee's input. Mark Johnson used this in his presentation in the worksite analysis session yesterday, and because I didn't bring any transparencies, I'll put it up for you. The basic steps in the problem solving part of the work analysis that we do are simply to identify where the risk factors are by body part, and then the second column is what's called Causes on this form, is the "Why?" column. If I see that somebody's bending over, and I've identified that that's more than just a short duration bend, in other words, it takes maybe fifteen to twenty seconds or even more, then the question is "Why are they bending?".

The first thing that I do when I have a lot of people looking at and analyzing jobs is, "What do you see?". And they say, "Well, the workbench is too short or it's not tall enough." That's not what you see, right? That's what you're inferring from what you see. What you see is somebody is bending over. It's very hard to get that process going where they describe what they see first, and therefore, define the risk factors for the body parts at risk. The risk is continuous or sustained bending. Now, Why do they do it?

It's not just because the bench is too short. It may be because they can't see what they need to see, and therefore they have to bend over to get within the right distance to be able to see it. It may be because they can't reach what they need to reach or can't use a tool properly without bending over. They all may have a relationship to the higher workbench, but they aren't necessarily only related to the workbench height.

If you can define the posture and the risk, and then you look for all the possible reasons why they might be bending, you begin to open up a very global way of approaching these problems.

In the final column are strategies or methods to reduce the stress of the risk factor. Those are our strategies for making it better. How do we make it better?

In a generic sense, the risk reduction strategies for physical effort are: reduce the effort intensity; reduce the time of the effort before I get a rest break from it (i.e., a muscle rest break); reduce the frequency of doing it; or reduce the total time I do it before I move to some other activity that does not use the same muscles in the same way. So there are several generic ways of reducing the risk.

This is where we begin to generate our solutions. As we are analyzing our job, we are also identifying strategies that will begin to reduce the stress. What you will find is that when you do this for the body parts, even the ones you don't think are affected, you often emerge with some generic ideas for directions to go that will fix the problem in many parts of the body, not just one place at a time.

I'll walk you through the video that Don showed yesterday using those basic concepts.

This is a gas stove manufacturing line. What do you see as you watch people working on this

line. What strikes you as you see it? I need some of you to volunteer here. The thing you notice the most as you watch this?

AUDIENCE: She has her head in the oven.

DR. RODGERS: Yes. It's been a long day. Yes. She has her head in the oven. Fortunately, the oven's not connected.

So how would you describe that in terms of risk factors?

AUDIENCE: Bending over, bad light.

DR. RODGERS: Bending, poor lighting is a potential problem. Why is there poor lighting, by the way?

AUDIENCE: No light in the oven.

DR. RODGERS: You're right. Okay. And they're not even hooked up electrically. This is a gas stove so we don't need to have electricity, right?

The point is that she is having to reach in. It's really the reach, isn't it? What she's installing is the coil on the back side of that oven. And she has to reach in because she's doing it at this point on the line, for one thing.

When we first showed this, I asked, "What do you see?"; and what do you suppose they said?

AUDIENCE: The conveyor is too low.

DR. RODGERS: The conveyor is too low, right? Yes. Why is the conveyor too low, because she's having to bend over. Right? If she isn't bending over because the conveyor's too low, why is she bending over? Because the reach in is so far that she has to bend over to be able to reach the back side. That's one issue. The reach in.

And you can say, "Well, why does she have to bend so far?" Did you notice the cardboard in the front of the conveyor? That projects another four inches out from the conveyor side. It's moving, as you may be able to tell. That's part of what keeps her away, too.

But the other thing that keeps her away is the fact that she has to reach so far and she has to be able to see what she's doing. She can't do this blind.

We use these tapes in training courses so that when we finish the training course the teams have five projects that they can proceed with. We expect to have their solutions implemented within about one to three months. In this case, it was implemented in about a day.

We identified this as a bending risk, and there is repetitive motion, too. There is vibration and there are several other things, too.

Give me another part of the body that you might be concerned about here.

AUDIENCE: Wrist and hands.

DR. RODGERS: Okay. What's the risk?

AUDIENCE: Strong wrist angles.

DR. RODGERS: Okay. Awkward wrist angles. There's vibration, too. So you would like to find something that would help resolve those issues. As you can see, she has a slight twist in her back as well in order to reach that point with the air gun.

Next, we went through the "Whys", and we came up with the fact that the basic problem is the reach to the back, which is what is driving a lot of the postural elements, so we said, "How can you avoid reaching so far?" Some people looked at the cardboard and said, "Let's not have the cardboard stick up; bend it up, and put clips on the edge, so that won't be a problem." What would you have to evaluate that against? Is it really better? We evaluated that against standing forward reach capability at that location, and it turned out that we really had to get the reach within 12 inches to avoid bending. So it wasn't going to work just to bring it four inches closer. We had a 28-inch reach on that job.

We could look at it in terms of the time of bending. What would you do there? What strategy could you use to reduce the time of bending? It takes 17 seconds of bending out of every 30 second cycle now.

There is more than what determines how long you have to stay bent over? Just think generically now. Type of fasteners, right? How long does it take to shoot a screw? Only a few seconds; but she has to be there longer. It has to do with locating and finding things. So anything you can do to take time off that would reduce the bending time and risk. A lot of people wanted to tilt the conveyor to fix this job; but there is other work going on that would be impossible to do with a tilted line.

The final result of this was when the team whose job this was -- and, believe me, I didn't suggest this -- came in with their solution. They said, "There's no reason why we can't put that coil on before we assemble the oven. So they moved the operation up the line about five places, set up a fixture, put the part on the fixture, and put the coil on at a perfect working height. The oven was assembled down the line, and none of this awkward posture was required in this assembly. The fix cost them \$47, if I remember correctly, the cost to build the fixture. That was it.

So for small companies, without big budgets, that's not really going to wipe you out, is it? That's

something you can put into your regular operating budget. It's the need to identify why there is a problem that I'd like to have you think about. If you don't really analyze why that problem is there, and you simply look at it and say you need to raise the conveyor, you are going to miss the inexpensive and very effective fixes.

I use anthropometric data and reach guidelines to compare what the job requires to what I'd like to have. I use the NIOSH lifting guidelines and the version I made of those for the Kodak books that goes into the percent of people who would find a lift acceptable for my assessment of how serious a problem the job is for a lifting task. I use force guidelines, from Keyserling's studies and others that are published in the literature and again in the Kodak books. I use those to evaluate the job forces I measure and to determine the degree of risk for given muscle groups. You can identify how much of a problem it is and how much you need to change it from the comparisons. Once you've done that, it's very easy for the team to come up with very creative ways of fixing the problems.

Believe me, you have no trouble with employee involvement when you are asking them to use their expertise to help in problem solving. My final point on that is, that if the employees are working together with the engineers, and with the mechanics to solve these problems, there is a wonderful interaction that can't be beat. It's much better than having a consultant come in, frankly.

As a full-time consultant, let me say that your use of a consultant, to my mind, should be to help you understand what the problems are and to help give your team some basic knowledge about ergonomics and risk factors for overexertion injuries. A consultant should facilitate your own talent or work with your contractors to be sure that they build these things into their designs as well.

I'm going to stop here, because I don't want to cut the others short. Just a final observation: empowerment comes from both having knowledge and from having support from the support part of the staff, if you're a person who works on a job like this. What I call it is control; that I feel that I have control of my ability to work safely. That's what I shoot for when I'm trying to explain to management the importance of having the teams be the primary people who do the job analyses; the support personnel are needed to help them to achieve the best solutions.

It's wonderful to see the teams take ownership. I had an opportunity to teach a class where one person had an M.D. degree and a few others had third grade educations and were functionally illiterate. The functionally illiterate ones were actually better at problem solving. They didn't have all this clutter in the way of all the things they knew!

So group problem solving of ergonomic issues really equalizes and builds respect for each other that is needed to solve these problems that are both production problems, business problems, and health and safety problems.

Thank you very much for listening to that.

My handout, by the way, includes -- I'll just tell you in case you don't get one right away -- two lists I made up. One is the components of successful programs and the other is things that retard the ergonomic programs and processes. I want to thank OSHA and NIOSH and the other sponsors for letting me get up here and explain that I have made all of the mistakes that are under the second category.

Finally, Carol pointed out to me when she looked at the handout that I had a human factors problem here. If you get one of these, this is the first page. And then what you have to do is open it up and turn it over to get the second page, okay? And then you have to turn it back this way to get the third page, and then you have to turn it this way to get the last page, and this is a test.

The other material relates to securing management commitment and employee involvement; it was part of a talk that I gave at Pat Devlin's CARE conference last year in Dallas.

And the final one is just a one-page thing I sometimes give to clients who are saying "It's all so confusing; just give me one page." And I put that on the last page.

Thanks very much.

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David Carrol, Woodpro Cabinetry, Inc.

DR. RODGERS: Now we get to the experts. Woodpro Cabinetry is a small company where David Carroll has worked since 1982. He worked 13 years in the residential construction business, of which five were as a self-employed contractor before joining Wood-Pro. There, he started working in the manufacturing areas of lumber processing, final assembly, and the cabinet door production department before being promoted to Director of Manufacturing. David enjoyed his 14-year anniversary with Woodpro this year and is currently serving as the Director of Safety. He has successfully led Woodpro Cabinetry into OSHA's VPP program. Woodpro is the first cabinet company in the U.S. to achieve that status.

Woodpro Cabinetry's cabinet business began in 1977 and currently employs 100 people. In August of 1996, Woodpro advanced from being a merit site to becoming OSHA's highest level of participation at a star site, a record to be proud of.

Thank you, David. David Carroll is going to speak about his program.

MR. CARROLL: Thank you, Suzanne. It really is a privilege to be here. I think about what was said yesterday, and so much for the nice weather in Chicago. I called my wife. We're from the South Central part of Missouri, and they'd already gotten six inches of snow, and school's cancelled; and she's a school teacher, and my kids are in school, and they're happy about that. But I'm a little bit concerned about getting home, with airport and flights and so forth.

You might have noticed the absence of M.D. and Ph.D. in front of my title, and it wasn't just an oversight. We work off of our shirt sleeves, so to speak, in our small company. Suzanne said that I was Director of Manufacturing for a while, and that's true; and now I'm Director of Safety, and that's true, but there's about half a dozen other titles that I have to deal with. I'm doing some things, employee benefits.

I take projects. We just put a boiler in place and a storage silo, and all those take a lot of effort and a lot of time, and any program worth having, is worth putting some effort into. I can't say that we put every effort towards safety and ergonomics, but we have worked hard at it, and as Susan said, we are very proud to be in the voluntary protection program with OSHA.

I said we live way back in the sticks and the hills, in the Ozark Hills of Missouri, and back that far we don't think the Jay Fox worthy redneck jokes are funny.

We also manufacture bath cabinetry, and that bath cabinetry mostly is sold to the surrounding areas and, for obvious reasons, where they have indoor plumbing.

We are a small town. We are going to be celebrating our 20th anniversary in February, and I was just thinking if I could invite all of you folks we could double the population of our town, but we probably wouldn't know what to do with that many people.

In general, we purchase planed lumber, planed on two sides, and we take that lumber in our process, and we rip to width. We chop and cut it to length. We drill it, shape it, sand it, and that is pretty much the process that we use.

Also, we have a finish room and those parts go through the finish room, and we've chosen the after finish assembly method, and there's a couple of reasons for that. The components are finished in pieces, and it gives the workers a better control of the product. If we have a reject, you can just reject one part instead of the whole cabinet.

Several years ago we assembled everything first and then ran it through the finish room.

But the second reason for that is it's easier to handle the small parts. Many times the parts, even in a tote, are easier to handle than if it would be a large cabinet, trying to carry it around the shop or putting it on a cart or putting it on a roller conveyor. So we found that after finished assemblies have been a good approach for us at Woodpro.

Woodpro is a family oriented business. There's a lot of families and relatives that work there.

We care about people, and safety was an issue early on as well, but we really didn't formalize our safety program until 1991. In 1991, we put a great deal of effort towards the safety guide, and that safety guide is constantly being improved. We work hard on keeping a lot of the latest OSHA standards in our safety guide.

When I think about what we have accomplished with the safety guide, you really don't accomplish much until you can get the people to read it and to use it.

I think probably the thing that helped us the most in our company is when we implemented self-directed work teams in 1993. That was a major hurdle for us as we began to develop these teams, and out of each of these eight production work teams, we have one person on the Safety Committee.

Each morning when they have a stand-up meeting, before all the noise and all of the machines are turned on, we talk about safety issues via the Safety Committee members, and the Safety Committee members do several things for us. They've learned how to have an effective meeting. They've learned how to brainstorm, problem solve, and work together on projects. We are very proud of our Safety Committee because they are very much interested. We prepare Minutes after a safety meeting and note the meeting highlights.

One good example is our policy where safety glasses have to be worn. One fairly new employee who has been there about three months, and who is also on the Safety Committee had typed up the Minutes on her home computer and put little color things in there and made it look all pretty. The owner of the company, Leroy, was walking through the plant with his regular street glasses on and stopped to congratulate her. She said, "Well, thank you, but you don't have the right safety glasses on." He was embarrassed about that, but didn't say anything to her. After he walked away some of the people went up to her and said, "Well, it's really been nice knowing you." She really didn't know Leroy that well. I talked to Leroy about it later and told him how funny I thought it was, and so later on I gave him the side shield and he went back out and told her he appreciated her saying that.

But that's what it takes. It takes people being accountable for each other, and people that care about people. I believe that our company is that way, that we do care about each other.

In May of 1994, Woodpro became the first cabinet manufacturer in the U.S. to be in OSHA's voluntary protection program as a merit site, and today we are at the star level. That is something that we are very proud of.

Just a few statistics that I wanted to share:

1982 was a good year for Woodpro. That's the year I joined the team.

We had two recordable injuries that year, and they were both mine. No. No, I'm just kidding.

In 1982, we had two recordable injuries, but we just had 16 employees, and that equates as a 12.5 percent recordable injury rate. In 1990 we had eight recordable injuries. At that time, we had 50 employees, and that equates to 16 percent. So you can see a trend building there. It bounced around some of the years between.

But also in 1990 our workers' comp costs were at \$38,600. Some of these numbers are probably not as relative to you as they are to me, but as I go through those, then I'll kind of share a little bit more information about the numbers.

In 1992, we had 100 employees and 31 recordable injuries. That was the year I was promoted to director of safety. By the way, that was a lateral move.

The very next year, 1993, we had 13 recordable injuries and our workers' comp skyrocketed, because you know how workers' comp works. It looks at the previous years and equates that.

Our mod factor was 1.25 or 25 percent over the rate that it probably should have been or could have been, and our workers' comp costs that year was \$103,824.

In 1994, we had reduced our accident and injury rate. Our mod factor was down to 1.17. That's the year we also became involved more in VPP.

In 1995, our mod factor was 1.07. Our workers' comp costs were down to \$95,000.

It's interesting how the insurance companies like to hang on to that bad year as long as they can. They try to average that. Some of that was starting to drop off.

In 1996, this last year, our mod factor was down to 1.05. We had four recordable injuries, and our rates still dropped to \$61,000 last year. We still are at the rate of 100 employees and for us, since 1993, that was \$42,000 savings. To a small company like us, that's not chicken feed.

Just looking at more statistics, we've had a couple of carpal tunnel syndrome surgeries. The first case occurred in 1988 and involved somebody working in the face frame assembly area, using a nail gun. Some things have changed on that, and I'll talk about that in just a little while.

Another case occurred in 1991. We had several back strains, but most of our accidents are cuts and scrapes and those types of injuries. The CTD injuries were not the most frequent but they're undoubtedly the most costly. They cost more because in just about every case the employee had to be off work for a while. There were lost-time incidences.

So those are the areas that I started to work in. I'd evaluate a department by myself. I'd look at it, identify the jobs, the things that could cause injuries. I'd draw plans to prevent those problems. I'd get all excited about a project and say, "This is what we need to do." Somebody would come up to me and say, "Well, why would you want to do that."



So I had to take another approach, and I had to use the people's side of it. I'd say something like, well, you know, Frank had a back injury over there, working at his work center, and I believe that all accidents are preventable.

If somebody gave me a funny look on that, I'd give them about a five-minute speech about how accidents really were preventable and try to get them to buy into that. I think we have to have that approach. We have to get beyond the point where we say, "Well, you know, it's just an accident, it's just going to happen." We have to realize that all accidents are preventable.

I'd say, "What do you suppose we could do to change that work center, to make it more user friendly, to make it easier to do the job, to make the job even faster, to reduce twisting and turning?" And, you know, people began to buy in. People in other departments would see an improvement in one area, and they'd say, "Well, we want one of those things in our area. We want one of those tables or those clamps."

We have to understand that any effective program is going to take a certain amount of buying. It's going to take people working together, communicating, seeing how things work, because there's always a certain amount of resistance to any change.

Our company's product line has changed drastically over the years that I've been there and if you'll notice that back in 1992 we had a hundred employees, and today we still have just under a hundred. That's not because we've not grown, we've gained a lot in productivity. We're producing a lot more cabinets with the same amount of people. Some of it's machinery, but a lot of it has to do with layout and people answering questions and being a part of the team.

I have just a few "Before and After" picture slides to show you some of the things that we have done. This first picture -- and, unfortunately, they look a little darker here than they did when I took the pictures and showed them to myself -- but these are pretty fresh, too. It's interesting. When you live in a small, rural area, we have a Wal Mart not too far away, about 10 miles, and I took these pictures over to have them developed into slides, and they said, we can't do slides in one hour, we have to send those to Berryville, and that takes a week. So I couldn't do that.

So I had to take it to the next town, 70 miles, to have these developed in two hours, so there's a story behind these slides.

But I wanted you to notice this conveyor where our cabinets are finished is up about knee high. Steve is 6'4", and what he is doing on this line is putting the drawers in and the false fronts are already put on, and the drawers are put in and aligned. You get the idea that we have a wide variety of people, and we have to make the job kind of fit the person.

Most of the people that work in that area are a little on the tall side, and we do have a lot of job rotation going on in that area. So Steve's putting the drawer fronts in the cabinets.

This next slide is just a picture of our cabinets that leave the area where Steve is working, and the conveyor is dropped down because people aren't doing things to the front of the cabinet, they're doing something to the top. They're pushing them. So they're pushing the cabinets down the line, and they're ready to go to the truck in a shipping area.

This slide shows an area in our finish room where we have conveyors up off the floor, and the parts are taken off the track or they're staged on the track in our finish room. You can see most of our parts are handled in totes. In this picture I wanted to show you what we were doing with conveyors. We've got what seems like miles of conveyors; and conveyors have their own set of challenges. You also have to get over them, and so you have to build steps and rails to make those work out right. But conveyors certainly keep us from having to lift heavy totes.

This is just another picture of some of our conveyors, and these have been lowered just a little from where they left the upcut saws, and Cindy's pushing these totes down the line and these are the cut components; they're being drilled, shaped, and sanded in that process as well.

This picture is typical of most plants and what people typically do in them. There's a tote sitting on the floor and Carla's reaching way down inside of it. She'll do that 25 or 30 times a day, reach down inside that tote and get those out. I said "Well, Carla, where are you getting your parts?" And what had happened was that the conveyor was running over with too many parts, so she'd set one off on the floor, which seemed like the wrong thing to do. It's a continual process to get people to learn how to use their totes and use those heights, but it didn't seem to be bothering her at the time to reach all the way down to the floor. After I came out and took a picture of it, then right away she moved it up on the conveyor.

This is a picture of Melvin putting a 4x8 sheet of plywood on our beam saw. A beam saw is a flat saw; it's a horizontal-type saw, and it's got some grippers, and it's key computer operated. Typically to lay a sheet on it you have to put yourself in this awkward position. This is where he's holding that sheet, and when he lays it over, his back is in this awkward position.

Before this saw, we also had a vertical beam saw, and it still required manual lifting; but what you really have to do in an area like this, and for us a pretty big investment is a scissor lift [picture], now we set the full bundles of plywood on that scissor lift with a fork lift, and then Melvin can just slide that across to use that beam saw.

Norman is working in the finish room. We just recently changed our line because we need more dry time between the stain and the seal coat. To do that, we had to run the track around another area and add a booth.

What I wanted to show you in this picture is this track, when it came across here, it drops about six inches and it comes down before it comes down this line, then goes on up to overhead.

The point I wanted to make on this slide was that the finish room team said "We'd like to have

that track lowered a little bit, because our hands are having to go above our shoulders to take parts on and off the track." We decided we'd spend a little extra effort, and we didn't do it just for that reason, but we lowered it for those people to give that extended dry time. That was people-driven; I didn't have to go out and say "Let's look at this before we do it." The people in the finish room knew they needed that done.

The finish room is always a challenge because of all the movements of your arms and spraying, and so forth, and trying to keep your hands below your shoulder height, and the triggering and so forth. The finish room probably has been one of the most challenging areas for us to reduce repetitive motion, because if you rotate from the top coat booth to the sealer booth to the stain booth, you still have all the same motions; and there's some sanding that takes place and some loading and so forth taking off the track.

The wipe station is a little bit different set up motions, and we do have a flat line and some of those motions; so every two hours the people rotate in that room. And believe me, every two hours is not always really easy to rotate people, because it takes a lot of training, a lot of commitment on training to make that happen.

This is a picture of Keith on one of our sanding tables; we sand our face frames in this area. He's working on this face frame, and you can see how he's sanding it now. This is an interesting picture because this face frame is already finished. Keith said "I really feel stupid; this face frame's already finished." And he said "Here I look like I'm sanding on it." "But, I said, I don't believe those people are going to notice that it's already finished. You just keep your stocking cap on and act like you're sanding it."

This is a picture of Terry building vanities on a flat conveyor, and that's the way we used to do it. You can see the awkward position of his back and how he's bending over that area, and the improvement would be on this angled table. Now in between that flat conveyor and this angled table, we used a table for quite a while, and it lasted five years before we went to the one we're using now. It's a metal table, and the bottom part of that table is tiltable. It's adjustable, and we have these arms that hold that side in which made that job a lot easier.

Here's Norman and Joe building medicine cabinets, and we don't do that now, but I wanted you to see how we used to do those; you can see he's nailing, putting the nailer in these medicine cabinets, note the awkward position and the difference between performing that all day long as compared to the table that we now have.

That's an angled table that we assemble our medicine cabinets with, and there's some clamping arms that keep them upright. It does primarily help the bending and the reaching problems, and there's a lot of force in using the screwgun to hold those cabinets together.

This is just a picture of the way we did our hinging doors. Becky's putting hinges on a door, her back's really not at a terribly bad position, but her shoulders are uncomfortable the way she has to

push down. The team identified the fact that that really ought to be on an angled table. We realized that if you tilt that door, that the hinges slide off. So that was really a challenge to us.

Somebody said "Well, why don't we put the hinges on the top?" That was a good idea, so now we do that with an angled table. That's one of our future projects, to finish that table and get it all developed.

This is a slide that I wanted to show you. We sand doors on a flat table, it's a down-draft table. It doesn't really look like her back is that awkward. By the way, Rose works like she's killing snakes, she just goes like crazy and she doesn't want to slow her productivity down a bit.

So she spends her time working on that flat table, and we say, "Well, why don't we just tilt it up?" She said, "Well, that will slow me down a little bit". I appreciate people who don't want to slow it down, but she also has to sand the edges, and if it's tilted, it would be hard to get that bottom done. So we're still working with Rose and trying to get her to develop a little bit better thought process for ergonomics and using ergonomics as a guide to help us reduce injuries. Rose has had some shoulder problems, and usually that drives what people are typically doing, or would like to do, as far as developing a plan to reduce injuries.

I want to share a couple of other things that we're doing at WoodPro. Last year we started doing behavioral analysis for each worker, and this is done by peers. I train the safety team and do the peer appraisal on them; talk to them about safety issues, you know like straining, twisting, turning, reaching, and what we're doing that is unsafe. The form is marked either safe or unsafe; and as people talk to each other and work with each other on those kind of forms, sometimes a little bit of animosity occurs. I think we're beyond that and I believe that people are interested in working safely, whether it's crossing conveyors or whatever.

We also practice job rotation; we ask the teams to set up their own schedule and sometimes we have to encourage that a little bit heavier, to do job rotation. We usually have somebody work at a job for two to four hours. We've identified work centers and how long someone can work at that job and be safe.

We utilize our workers' compensation carriers quite a bit because they have a video library and we'll share those with our employees. We also use them for specific emphasis on a certain area for training.

One of the things that we've started this year is a safety bite -- I call it a safety bite, it's just a little 5 to 10 minute safety talk that I share with a safety committee; and then in these early morning stand-up meetings the safety team can go out and share that information with their team. It takes them about five or ten minutes to share that information, and they seem to really appreciate it, and that's been really, really helpful.

We still have a long way to go, and I do believe we've come down the road a long ways, and I

really just appreciate so much the opportunity to be able to come here and share with you just a few things that we're doing. I know a lot of small companies can do a lot of things as well, and I appreciate your being here, and listening to me.

DR. RODGERS: Thank you, David. It's always fun to see examples of all the good things that are happening out there.

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#### Carol Stuart-Buttle, Stuart-Buttle Ergonomics

DR. RODGERS: Carol Stuart-Buttle told me not to read this, but I think I will, anyway. She is one of the few people I know who actually has a degree in ergonomics. After receiving her degree from Aston-Birmingham, in England, she came to the States and received a degree in physical therapy. I happened to meet her at the University of Iowa where we were attending Tom Cook's seminar on ergonomics. We were all trying to get the cheap rate home. We stayed over Saturday and we had a chance to meet each other and learn about what we're trying to do.

She's done a lot of work for the small and large businesses, she's been a consultant since 1987, and she has an important background to help tell us how to get as much ergonomics information, on a scientific basis, into our programs when we're trying to start teams, programs, and processes in plants. Carol.

MS. STUART: Thank you, Sue. And I'd like to thank NIOSH and OSHA for inviting me to speak.

I also would like to say that it was great to follow David Carroll; I think my talk is going to be very short; he's illustrated most of the points that I'm going to be making. But I've got a few other generalizations to make of small companies.

Small businesses, I've been asked to talk about. I think it's a very interesting area, actually, to work with. First of all, I'd like to say what I've seen as some of the features of effective programs in small businesses. I say in small businesses when actually, I think you'll see a lot of similarities with large businesses; but there are specific characteristics that make it easier in small businesses, I think, to accomplish ergonomics in the way that I feel is the most effective.

To begin with, I think it is very important to identify where the problems are. Now small businesses don't always collect a lot of data. I think the effective programs I've seen do collect data, and certainly David Carroll has the data to say where are the problems, and also then to really look for the root causes. And I think that's an important aspect, because if you really don't look at the context of the system, some of the points that Sue is making, you tend to be fixing a symptom; and that certainly doesn't go for the best -- for really the most effective use of ergonomics.

The other aspect that I have noticed is that the effective companies integrate ergonomics with other company processes, and I think this is a feature that is a natural approach among small businesses. Because of the many hats that are being worn, as David attests, there's more chance of someone from manufacturing, someone who's the production manager, being responsible for safety and health, and a team approach is just the way that they approach most of improving the workplaces.

So integrating with other company processes becomes an easier aspect than for large corporations. Utilizing information resources I think has been very evident in the effective companies; it's also what I've seen as a big problem with a lot of the small businesses.

There's people still out there who do not know what ergonomics is. If they've heard the term, they don't have it very well defined, and a lot of people are putting their heads in the sand because they don't know where to begin with it. But there are a lot of useful resources. I think much of the problem is having a time crunch, and not going and really focusing on addressing the whole issue of ergonomics and what it can do for them as a business.

So it's an issue of underutilized resources. I think there can be better ones generated, though, by trade associations for example. I think trade associations can play a great role to promote the benefits of ergonomics.

But the other aspect of effective programs is fitting the small business characteristics, one of which is informality; and I don't think that you necessarily have to change some of these characteristics or become a different beast, if you will, to be effective.

Less formal actually means that sometimes it's less paper shuffling, and actually less wasted effort. You just get to the root of the problem, you just get on with it, and you effect the change promptly.

It also, because of size, makes it easier for a better, quicker response to the problems that you might see; and that goes along with employee involvement, management responsiveness, or management involvement; that's a more natural aspect, also. And again, the participatory aspect and the quick response I've seen in most companies.

I see problems arising more in middle sized companies when there's rapid change, and often a change of growth and then communication really goes haywire, and suddenly people aren't able to fulfill the job functions that they originally had; new people aren't being hired, and very often safety and health suffers, or workers' compensation control and case management aspects.

These are some of the features that I see of effective programs; but a fundamental problem, I find is for small companies to hear of ergonomics and what it really can do, and also the definition of ergonomics. I still hear people say "Oh, we don't have any ergonomic problems; we don't have carpal tunnel." And they only know of carpal tunnel. They have lots of back problems, "but

that's not an ergonomics issue, that's a lifting problem."

So there is a very, very limited view of what ergonomics is. It's a big problem if there is not a good definition. Because if you're in a small company you don't always have the injuries and illnesses that really can provide a cost/benefit to make the changes. If you don't have a full definition, then you can't do good cost-benefits, and really see that it was worthwhile to make some changes.

And so I think it limits that lost-benefit equation and ergonomics needs to be taken out of just an injury mindset, and a safety and health mindset, and really incorporate looking at performance. Certainly those who are successful with ergonomics often mature to that point of recognizing a broad definition, but I think ergonomics would certainly be snapped up much more quickly if that definition was spoken of more.

As far as what sort of programs I've seen small businesses embracing, it is nothing new to have these sorts of components that you see up here; this is the meat packing guidelines; they've been out for a very long time, and I see that they're very widely used as a guide.

Obviously what's involved in all these components is employee involvement, it integrates or wraps the process, if you will.

These guidelines are based on safety and health management, and I think what often confuses the picture and confuses the definition of ergonomics is having all of these elements as being ergonomics. To me, medical management is medical management; there's nothing about ergonomics in medical management; it's managing medical cases. It affects the injury and illness records that become one measure of how well the workplace is doing, so that it gets included into an ergonomics program.

I think medical management is an extremely important aspect; any company that is facing a lot of injuries and illnesses should start by addressing the medical management aspect. However, all of these program elements I fully support; they're so basic, they're hard to argue against; and they're all very similar to continuous improvement elements, and they work. I've seen them really work.

Let me take a few examples, then, from -- some basic components of the program. A successful program is based on the balance of what you focus on within your program, according to what your problems are. It's not necessarily a focus on automation, as the message some people are getting; that automation is correlated with ergonomics. If you can't automate, you can't fix the problem; and I don't think that's true at all.

So the first example then is a workers' compensation evaluation one. This is a food industry; when they first implemented an ergonomics program, began to address ergonomics, they were at about \$3 million per year in workers' compensation. After one year, they had improved by 70 percent, and subsequently another 10 and then another 70 at the end of three years.

A dramatic improvement in the first year. It happens that their injuries and illnesses were totally overboard, it was the thickest bunch of logs I've ever seen for the size of company. But what they really focused on and what really affected those changes in that first year was medical management. It wasn't redesigning the workplace; they had no medical management really in place, nor case management.

Medical management can be a big problem for small businesses. Sometimes access to knowledge of how to even assess services, or to realize that they can really control that issue. When people get hurt they disappear out of the plant; companies feel they don't have control over the quality, the information they can get back from medical services, or how to access quality industrial medical services, for example, that can be very useful to help them control the problems.

So I think there's a lot of assistance needed in accessing medical management. A major lack of knowledge though is in case management and partly because individuals in the small businesses are wearing many hats, and again it's yet another whole area for them to learn and become familiar with.

Companies need to control the data, especially the quality of diagnoses that come back from physicians that contributes to getting to the root of what the problems are and meaningful changes to the job.

This is an illustration of another process, obviously poultry processing. And this is a department in poultry processing that typically has the highest incidence rates; it's breast deboning, so that you can get your deboned breast parts in those tidy little packages.

Although in poultry plants, you hear of cumulative trauma disorders and back problems, I've walked in to find the biggest problems have been lacerations and dermatitis by far, although they are not necessarily the most expensive problems.

So there are a lot of issues to address in terms of the safety and health. Now what is possible, actually, in this department is automation; but it's not so easy. It's all very well to say it; you have to have a very uniform bird, and not all companies can accomplish that, for various reasons.

So what can be done? Well, quite a lot can be done, and this illustrates some of the benefit in terms of the numbers. This graph shows the percentage difference in incidence rates, after implementation of an ergonomics program. You can see in the first year that there was an increase which is typical to see, as there's a tremendous educational process going on. But a dramatic improvement is seen in the second year, and subsequently in the other two it levels off.

But although the incidence level does not improve much between years 3 and 4 the costs of workers' compensation have reduced by 42 percent, so there continues to be a lot of improvements.



So what was done? There's only so much that you can do in the engineering aspect of that work area. You can certainly fine-tune the postures that are being adopted. Where the companies really found that there was benefit was addressing training. They were being trained in terms of technique; it's a high skill to be on the deboning line, especially for shoulder cuts; and they found that training really was inadequate. People were trying to hold the line without the skill to do the job.

So they invested in really focusing on technique training, and that's really where they got such improvements. So again, changes are not necessarily engineering ones.

The company also got a lot of yield improvements, incidentally. So they began to really go beyond and look at other facts than just getting the measurement of the incidence rates.

Another example, then, to bring out a point I'd like to share with you is from tile manufacturing, where machines stamp out ceramic tiles which are manually placed in a container for the kiln. This actual shot doesn't illustrate the extensive reach that there is to the back of the stack of tiles. There was excessive reach, a lot of problems in terms of the wrists; and quite a lot of skill, because they were picking up a 4 inch stack, 4 inch in width, of small, 1x1 inch tiles.

You can see that there's a certain skill involved from the amount of rework piled down on the conveyor. Another step that they had to do that really contorted the wrist, was sweeping the stack of tiles against a brush that sat vertically in order to get dust off, to achieve quality.

Their cumulative trauma incidence rate was 6.3. The company made a number of changes. The changes that they made were comprehensive; that's one point that I'd like to make: Work pace, task technique, employee training, job design. It's often not just one thing that's going to take care of the problem.

Out of these approaches I'd like to emphasize that they stopped brushing. The important point is that I got the company to think, do they need to do it? They questioned the process, which you've heard other people endorse yesterday and today. The company asked if there was a better way to do the job rather than just reposition the brush.

Rechecking the quality they found that actually there was little benefit to brushing; they'd improved the dust control so it wasn't worth doing anymore. So it's important to really look at the system.

Their improvements were down to zero cumulative trauma disorders; they still hold that since '93, and they haven't stopped there; they continue to make things more and more comfortable, focusing much more on fatigue issues. And they've got considerable net savings.

In summary, then, there's some similarity to what really makes effective ergonomics in small businesses as in large. But it's a question of scale. Ergonomics provides a competitive edge, but

I think that is when there is understanding of the full definition of ergonomics; designing for best performance. It is then that a company can realize true cost/benefits. Otherwise, it may be expensive in some circumstances, if you don't look at those other values of production and quality.

Effective problem solving leads to cost-effective solutions. Good data are needed to really know where the problems are. Also great benefits can come from improving aspects other than engineering, such as job design, and technique training, and these benefits shouldn't be underestimated.

A comprehensive approach I believe also yields the best benefits. Approaches such as improving management, for example, of medical management, adopting a systems perspective, integrating with production methods, and being proactive are important. I haven't mentioned 'proactive' much, but actually if you really integrate ergonomics into the production system then it's a matter of course that you're designing it better when production methods change.

The final point I'd like to say is that seeing the big picture does not necessarily mean a burdensome ergonomics program. Being much more broad minded doesn't make ergonomics more complex. It makes it effective.

Small business in particular, once they get the message of ergonomics, tend to be actually less bogged down in the procedures and the paperwork aspect of a program than are sometimes larger companies. Small companies involve production engineers more and they can respond very quickly in making changes and really keep things moving. And since all our workplaces are dynamic, the ability to be responsive is an important part of effective ergonomics.

Thank you.

DR. RODGERS: Thank you, Carol.

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### Question and Answer Session

Q: Question for David Carroll. I'm wondering, in your compensation package for your employees, do you pay piece rate, is there a lot of O/T, and also is there any profit sharing or bonus paid to employees?

MR. CARROLL: We started a profit sharing program last year, and that has had a positive effect on people interested in saving money and doing their jobs better. In our small company, we have six paid holidays and two weeks' vacation; a pretty nice benefit package.

By the way, we are one of the major employers in Cabool with 100 people.

DR. RODGERS: Thank you. Other questions?

Q: My name is Laurie Kellogg from the Health and Safety department of UNITE! We represent workers in small factories in the apparel industry as well as large factories all over the country. And I guess I just want to ask a minute of indulgence to make a comment about what we see going on in small business and how that relates to this conference.

So let me just start by saying there are some voices that are not here at this conference. We started a support group for injured workers in New York City, and here's a few things that they said when they were asked to describe living with repetitive strain injuries:

"I cannot hold my chop stix, feed my baby, or dress myself. I have not slept through the night for two years. I walk around the house like a mad woman."

Another woman: "I have no feeling in my hands, and many times I've caught my hands on fire while trying to cook."

Another worker: "For 30 years, I gave my life to the job. Now I can't fulfill my duties as a wife and mother, and all I think about is how to end it all."

These are some of the workers, many of them are immigrants -- they're certainly low wage workers, and there are millions of them around the country who are not reporting these injuries, and their employers are not getting the message about ergonomics. But someone is paying for these injuries, and it's all of us. We're paying as taxpayers, because when these people can't work anymore, they have to go to some form of assistance.

They're not getting compensated in many cases by the worker's comp system, and Jonathan Dropkin here from Mount Sinai can give you a study that Mount Sinai did on how the comp system is treating these people. It's taking a year and a half for anybody to get any money; it's taking six months, eight months, ten months to get approval for physical therapy, or in the case of the State of Virginia, these injuries are not even recognized as work-related. What's happening to those people in Virginia? They're going on public assistance; we're all paying for it.

I realize a lot of this doesn't apply to everybody here, so that's why I wanted to say it.

In New York, 100 percent of carpal tunnel cases are rejected by the insurance companies, almost 100 percent. We've got a big problem, and I'm very inspired by a lot of what I've heard here. But in the case of many of our small employers, they will never do today what they can avoid until tomorrow, and to that end, I guess my comment is I really think it's incumbent on the progressive employers that I've heard from who have inspired me here. It's incumbent upon many of you to get involved in stopping the rhetoric.

Get on board with an ergonomics standard not because I want to go to 5,000 small factories and say "Hey, I'm going to call OSHA on you." I don't have any intention of doing that, that doesn't help me as a union person. But I do need to go to them and say "Get on board with ergonomics and partner with the union, because if you don't, some day OSHA could show up, and there is an ergonomics standard."

That's why we need a standard, because it sets out a guidepost and it reminds some employers, not you guys, but some employers, what they should be doing; gives us a way to talk about what they should be doing. And I also hope that many of the progressive employers here will kind of speak out more about what I think is the rip-off that's occurring from some insurance companies, ripping off of employers, workers and the public by not accepting these cases as work-related.

By the way, in the Mount Sinai study, it shows that of that 100, almost 100 percent of the cases that were rejected, a few years later we checked up -- they all went thru the court system, and guess what? They were all valid. Or most, 99 percent of them were valid.

But in the meantime, those workers got evicted. I found one of them living in his car. That's how bad it got.

DR. RODGERS: I want to thank you for your comments. What's terribly important to realize, as you said, is that we have the converted here rather than the unconverted. I know as a consultant, I don't get called in by the people you're talking about. The answer, I think, as you've suggested, is to use every available means of making sure that people who are not sensitive to these issues are not only made aware but held accountable for them. One thing I use myself, having done some courses for some major corporations here who have overseas plants, is to tell them that what I'm seeing particularly in the Far East and Asia is that they're doing a lot of these things right, and they are much more competitive by doing that. And, if these people are not going to move forward, they're not going to be around. So I think we're getting some help from the marketplace in the global economy in that sense.

Carol, did you want to say anything relative to the medical management on that one?

MS. STUART-BUTTLE: Well, I think that those sorts of cases, in my experience, have been not necessarily struggling with dealing with medical management, they are just not dealing with it. I think that's part and parcel of the problem. But, I think it's unfortunate that perhaps you have to also press the buttons that really make people wake up. That is to say that some of the points that Sue made, that you don't get the same quality from people who are hurting. And push the quality production aspect, and the benefits in the reversed sort of way. That's still downplaying the fact that people are injured, which is not a pleasant thing to be doing, I think. But if it gets ergonomics in there, and they begin to realize the benefit, and the people aren't injured, then you have still accomplished that goal.

DR. RODGERS: I think you may agree with me, too that some of these things go in cycles. I

think we're in a bad cycle right now because of the downsizing, the stress on everybody, the high medical insurance costs, and things of that sort. I see people taking shortcuts who never took them before, partly because of those issues. With a lot of support from the people who are trying to make sure that these things are done right, we should get to a better part of the cycle pretty soon.

Is there any other question out there?

Q: I'm Carl Marion from Ergometrics in Eugene, Oregon. I have two questions for David. First of all, I'm really impressed with what you've done in your plant. I was wondering, first of all, did you use any kind of incentive program in conjunction with your safety committee awareness? And secondly, could you give us some ideas on any creative financing methods that you came up with to justify the scissor lifts and other equipment and worksite modifications?

MR. CARROLL: First of all, the incentive; we do have an innovation program; we pay it in \$2 bills. It could be one \$2 bill or up to a dozen \$2 bills, which would equal \$24 for ideas. And we encourage any kind of an idea; it can be a small one to a large one, but that's the range that we pay. And, that has got some enthusiasm going, I believe, on the safety issues, but it can be any idea as well. So the ones that are earmarked get a special plaque and award quarterly. At our annual banquet, we have a lot of recognition that we do for that kind of thing. So as far as dollars out, it's not very much compared to the recognition; you know, they get a parking place, there's a few things we do like that.

The second part of that is how we justify equipment and machinery and so forth. We just get to the place where we know we need a scissors lift, and we talk about it, what kind to buy. A lot of times we'll buy used equipment, but most of those, we just put in place. We know we need to have them; it's just like a dust collection system -- I don't know how you could ever justify a \$200,000 dust collection system other than you just need to have a good environment. And you just need to have it cleaned, you need to get rid of the dust; I mean, it sure saves some sweeping and cleaning. Some issues like that now, some of the tables and some of those things, the teams can do themselves. They don't even have to ask management; they can just start and build those things and make those changes themselves.

Q: Sue, your handouts sold out pretty quick. Is there a way some more can get generated before the end of the day?

DR. RODGERS: It's going to be in the proceedings, and there may be a way, but I'd have to pay for them.

Q: There will be a proceedings?

DR. RODGERS: Yes. There are going to be and I've handed it in for the proceedings. There will be some available; and if you're really hot to trot and you don't find one, I've got two

up here. Okay?

Q: Rich Rebar from SmithKline Beecham.

Just a quick comment: I represent a large pharmaceutical manufacturing facility. I know that we're talking about small business, but we're not really that far apart, because we treat each of our facilities basically as a small business. They have their own management, their own staffing, their own problems. We have to approach them individually. So from the standpoint of looking at big business versus little business, we have a larger control over it, but we still have to approach them on a small business standpoint.

And to address an issue that the woman before brought up, we're talking about the U.S. and how the conditions are here. Think about Third World countries like India and Mexico, some of the very backwards countries. Our philosophy is that they're the same as us, and that they have to follow the same standards that we do; and we're trying to give them, the same level of help. So, realize it's not just in the U.S. that there's a problem with repetitive strain injuries, but more so with the Third World countries, because they don't have the option of equipment and that kind of stuff.

DR. RODGERS: I think that's why its exciting to see the creative solutions that come up when you don't have a budget. If somebody says they can't do ergonomics because they don't have any money, then they really haven't even tried. The creative solutions are the fun ones, and they are effective; and they involve the teamwork, as you were talking about, that gets you to where you need to get.

I can't tell you how many people I've seen who put in scissors lifts when all they needed was a fixed platform, a wooden platform to raise something. They weren't going to use the height adjustment; they just needed it higher. That's the difference between \$200 and \$5,000 in many cases, and you don't have to have as much guarding.

Other questions?

Q: Ivan Most, University of Southern Maine. I've got a question for the consultants. How important do you feel it is in working with small businesses to use benchmarking? Having them visit similar firms and see what they're doing. How important is that?

DR. RODGERS: I just want to make a quick comment then I'll turn it over to Carol. I was working with a major corporation for about five years, they had a management change. I met the new head of the industrial relations department at a dinner party when I was doing a course over there, and he says "Well, we've just benchmarked another company; we've just been down there and they have a great program." I had to tell him that the person who had done that great program had come to their plant to learn about ergonomics three years earlier.

I think getting information is great, and I think it's important to see other plants and how they do it. That's why I'm visiting the NAVISTAR plant tomorrow. I haven't been in the NAVISTAR plant, and I learn something every time I walk in a plant. That's very important.

But to benchmark to the extent of not using your own culture and your own situation to develop your program, I think, is a cop-out. You ought to be investing enough of yourself, that it's your program, not the other company's program. WoodPro is a good example here of a program that has worked. Use the elements, but make it your program.

Paula Bohr said yesterday on a health care study that she gave them forms and they remodified the forms. You've got to have that ownership to the point where they will feel they can modify the forms and make them work for them.

Carol maybe wanted to talk about this.

MS. STUART-BUTTLE: Yes, I think that a lot of companies do work within their own industries to get some idea of what's going on, how things are done. I've also seen it work negatively; I've seen some industries say "Well, you know, why should we be doing it this way? Nobody else does." And resist making great improvements, essentially in process, because they've benchmarked in the negative fashion.

I think that most companies do because they want to know where they lie in terms of relative competitiveness. And what I really encourage is that those companies that really can break away from that mold of just doing what everyone else is doing, can sell it back; really be an example of where things can head. What I do see is that sometimes they say "Heck, we've got a tremendous leg up here," and they keep very quiet about it, because they know that they're doing something pretty cool. So I do encourage sharing tremendously, and, again, I think trade association forums are a good means to really promote better ways of doing things.

DR. RODGERS: David, do you want to comment, have people come in to look at your program?

MR. CARROLL: Sure, yes. In our trade association, KCMA, Kitchen-Bath, we annually tour other plants, and we have had other plants come in. That's great to be able to see other companies just like ours. But, like we said, in any plant you go into, you can see some really neat things happening, and we've tried to capitalize on those kinds of things in our own program.

DR. RODGERS: Okay, the gentleman at the microphone.

Q: Yes. Workers' compensation insurance is a large financial piece of the picture. Are there any examples of insurances acting in a proactive way to help finance up front rather than simply having the club of excessive or continuing costs?

DR. RODGERS: Would you give us your name and company?

Q: I'm Dr. Donald Herwin, an occupational physician from Kalamazoo, Michigan.

DR. RODGERS: Okay, I know of a couple; I don't know if you want to speak to that? He was asking about whether there were insurance companies that are working together to do the ergonomics; is that what you're asking?

Q: Yes, including any premium benefits or such for forming committees doing work up front to help finance this.

DR. RODGERS: Yes. I can tell you my own experience on this. I was asked by a company in Sacramento to come out because they had tried selection testing for people doing warehouse work, and had had problems. Ten people would come in for jobs, and seven would be rejected for one reason or another; they'd have three left and only one could pass the physical capacity test. So it was 10:1 for their hiring. They decided they might look at ergonomics. And the doctor who served the company was working with his workers' comp insurer, which is a medium sized company.

The first year I went out and the company paid for me to be there and do the training. They got an 89 percent reduction in workers' comp costs in the first year. The insurance guy said "What did you do?" And they said, "Well, this lady came out and taught us a little ergonomics." So he said "Well, I'd like to bring her back out." So the insurance company paid for me to come out for two weeks, four days of which went to the next phase of the training for the first company. They've done all of the ergonomics since then. And, the rest of the time the insurance company took me around to six other clients who had some workers' comp problems. We spent a half a day with each of them, and then did two one-day seminars.

It was a very interesting experience, because I went to all of these small companies; there was a church pew maker, an ice company, and a plant and tree nursery, that type of thing. And it was fascinating to me that so many of the problems are very similar across them. The insurance company paid the bill; they were very interested in reducing the cost of workers' compensation cases.

So I know it does happen; that's a reasonably small insurance company, but I know they're very interested in this. I also have trained claims adjustors, as I think some of the others you may have done that too.

Q: There's also a lot of rhetoric about managed care programs for occupational services meshing with workers' comp programs or self-funded programs. Are there any examples that you can report on in terms of ergonomic applications in such financial and service models?

DR. RODGERS: I don't personally have information on that; I don't know. Is there anybody in



the audience here who knows about that?

MS. STUART-BUTTLE: Well, I haven't met much fore-money coming out of managed care groups personally. Certainly, I see loss control as being very active, but I think that depends on the state as well. In Pennsylvania, they've recently written that loss control needs to be offering -- not necessarily personally offering the services, but offering access to services of some nature to control their worker's comp. This has encouraged the loss control people themselves to be addressing the issues.

So there's a lot of assistance out there. Certainly loss control needs to offer some free assessments; I think that tends to be going on for a fee. And I see a lot of occupational groups coming in from the worker's comp standpoint and offering a broader service to address some of the problems. There are very many routes to get some assistance in reducing their worker's comp dollar that I meet all the time.

DR. RODGERS: I'm getting the high sign from Larry here that we've got to stop. So thank you very much for your attention, and we'll be up here for a little bit if any of you didn't get a chance to ask your questions.

[Whereupon Plenary Session II ended.]

## Office

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Nancy Larson, American Express Financial Advisors

MR. ALBIN: I think it is fitting since this is an office ergonomics session to talk about glare filters, which those of us up here could really use from these lights. My name is Tom Albin, and Dave LeGrande and I are co-chairing this session.

I have the pleasure of introducing our first panelist this morning, Nancy Larson, M.S. and C.P.E., certified professional ergonomist. Nancy is the corporate ergonomics manager for American Express Company. She has an undergraduate degree in psychology and a masters degree in industrial engineering from North Carolina State University. She obtained her Board certification as a professional ergonomist in 1994. She has five years experience consulting as an ergonomist for a number of industries, including manufacturing, meat packing, medical and office environments, and for three years she has been the ergonomist for American Express Financial Advisors in Minneapolis. Nancy is a member of the Human Factors and Ergonomics Society, and sits as a member of the HFDS ANSI-VDT 100 Revision Committee. Please welcome Nancy Larson.

MS. LARSON: Good morning. The information I am presenting this morning is from a subsidiary of American Express where I was the ergonomist for American Express Financial Advisors. Two years ago there was a company name change. Some of you may recognize it more as the former IDS Corporation.

American Express Financial Advisors is located in Minneapolis. We have an employee population of about 10,000 employees, 5,000 in our corporate headquarters located in downtown Minneapolis and approximately another 5,000 located in various financial planners offices through the United States. We needed to have an ergonomics program that didn't just address a one-site location concern, but also one that we could very easily transfer to remote locations which might have only be a couple of employees rather than a large concentration of employees.

A full time ergonomist was hired in the spring of 1993, and the need for the position was created or recognized from the corporate real estate department. They had a lot of issues regarding work-related muscular skeletal disorders. What we are going to do today is talk a little bit about my approach towards the program, what we have done from within the corporation for the last four years at American Express Financial Advisors, and some of the results that we have seen.

The staffing for the ergonomics program at American Express Financial Advisors was a one full-time ergonomists manager in 1993, and it was expanded in 1995 to include an ergonomic

assistant that helps with some of the programs. There are currently two full time people working on the program. We take the approach of macro ergonomics and deal with ergonomics not just as dealing with work-related muscular skeletal disorders, but trying to address and enhance human performance throughout the company and in all aspects of all our jobs.

In order to achieve this, we have created some departmental partnerships internally. First, is the corporate and field real estate. Corporate real estate is responsible for creating a setting for proper work to be produced within our headquarters in Minneapolis. Field real estate provides a setting for all of the other locations throughout the United States. Collectively, they have the task of making sure the stage is set so employees can do their job, and we have a strong relationship with them. We also have collaborations with the individual business units. Some of them are small; some of them have several thousand employees. It is their responsibility and job to make sure the products and the company's goals are met in an efficient and timely manner. We have good strong relationships with them, and they understand that we can help them with that process.

Property services is an area that is near and dear to my heart. The original champion for the program was in property services. He went up against upper management who did not feel that there was a need for an ergonomics person full time, found the money in his own budget and got permission to hire someone, even though they weren't going to formally put it on the record. I came in through the side back door.

Risk management monitors our workers' compensation claims. Many of the traditional things that you have been hearing about ergonomics within our organization are under the umbrella of Risk Management, the medical care and those types of things. We primarily provide them assistance in performing workers' compensation job assessments. We will talk more about those in a minute.

We also work with our legal department regarding regulations and laws. The Communications Department helps us with developing our training materials, making sure that any communications that we have are well done and are effective. Finally, technology's job is similar to real estate, only theirs is not to set the stage physically for the work space but to provide the appropriate software tools and hardware for the people to do their jobs. We provide them information and services as well in the area of product evaluation.

So those are the primary collaborations, and on any given project, we collaborate with one or more of these groups. So the key elements of what our program has been is there is a coordinator. I strongly believe that you have to have someone whose job, whose responsibility, whose pay check is based on the fact that they do ergonomics on a daily basis. Ergonomics will be something that will be acknowledged as important by lots of people and maybe even get on many of their to do lists. Unless you have someone that is primarily devoted to doing this in a large corporation, it will always end up on the bottom of the to do list. I don't know about you, but I never get to the bottom of mine. So I believe that it is very strong that you have someone to

be a coordinator to be a catalyst, to be a communications person, to help interpret what is going on within the company and set priorities.

You also need management commitment. In my case a little bit of that management commitment was a double edge sword. One week after I started my position, they were almost through deciding which furniture standard to purchase for over 1,000 employees, and I was called into the meeting with the facilities people. The vice president for the Facilities Department after 10 minutes into the meeting of the discussions said, "I have to leave, whatever Nancy says, I agree with." Well, that is an interesting position to be in the first week in a new job. We did change the furniture standard, and as you will see as the program evolved, that was a key piece for having some of the results that we have had.

The other thing that you need management commitment for is for allocation of resources. Our upper management didn't feel that there was a need for a full-time ergonomist. Someone in that middle upper management did, and he stuck his neck out.

Let's go back to those internal partners. We don't have a formal ergonomics team. We don't have a schedule where we meet every Tuesday on the fourth week of every month. We pull together teams based on what efforts we are working on. We draw experts from the areas that we are dealing with. We concentrate on a project, and then we all go back to other things that we work on. That seems to be working very well for us.

Early on we recognized the need to establish some baseline information, and that has allowed us to have some sense or feeling of how the program is progressing. Then we determined what measurements were needed to make sure that any individual project's success. We needed to figure out what kind of measurement procedures were important to those internal partners and finally what was important to management, what was necessary for compliance to any regulations.

There were several Initiatives over the last four years. One was in the area of furniture standards. I have talked a little bit about that already. First, the work surface standards. Previous to that timely meeting right after I was hired, the work surfaces were set at a 28 and a half inches and the surfaces were stark white. They had identified some problems with the standard. We changed the standard to a maintenance adjustable work surface, we also changed the color from white, which was creating some vision and headache problems, to a cream, taupe color. They were also just completing a chair usability test, and we were able to tag onto the very end of it. Again, after evaluating the chair standard changed. We were now prepared to address a large reorganization of the company that was going to happen in six months.

So, I came in at a very timely and opportune period in the history of the company. What was going to happen? In November of 1993, our client service organization called the GSTs, the geographical service teams, were reorganizing. These were approximately 1,000 of our highest computer use employees. Our highest "at risk" people for developing aches and pains.

We were able to create a process where we could customize work stations and provide training. We were able to make training mandatory because before they moved they had to attend. So, the two furniture standards decisions that were made in March of 1993 came back in the fall to help define the ergonomics program to have great impact on what we do.

We also at that time evaluated ergonomic computer accessories, wrist rests, copy holders, and foot rests. We standardized some basic products and made those available to every employee out of a budget from facilities. It was not up to an individual unit's budget to plan for accessories. It comes out of a central pool of funds. This process is maintained today as well.

Then another standards decision that happened two years later was monitor size for the GSTs. The technology group was evaluating changing from 17 inch computer monitors to 22 inch computer monitors. There was a huge problem with integration into the work space. There is a lot of extra cost involved in that. The service that we provided to Technology was to take a very good hard look at all of those different client service jobs, and, based on criticality, and on information needs at any given time, whether they really needed the larger monitors or not. We provided that information back to those teams. That information helped them with their cost effectiveness and made sure that the people could perform their jobs. If they really needed the larger monitor, they got it. If they didn't need it, then they stayed with the 17 inch monitor.

The next category of our initiatives was the workers' compensation program. We quickly partnered with Risk Management to address people with workers' compensation problems to provide them an analysis of their work station and assure that appropriate accommodations were made from the ergonomics side. Again, we were working with Real Estate on this because they actually made the accommodations. We determined them. They made them, and then we developed procedures for follow-up. In this particular arena, Risk Management owns the problem. We provide them services within part of the whole issue of trying to address work-related issues contributing to musculoskeletal disorders. They do the medical management part. They do the record keeping and all of those types of things.

Going back to the client service reorganization that happened in the fall of 1992, we were able to tag on mandatory employee training in ergonomics to that process. Business Units, another internal partner, provided us with two hours of time for every employee to attend training. Over the last years we have managed to streamline that training to an hour and a half. We would tell the people about what ergonomics is, that it was there to help them do their job better; it was there to help them be productive, it was there to help them be comfortable, which will also help them have higher job satisfaction. We discussed what work related musculoskeletal disorders are. We gave them some background information on different types of symptoms. We talked about where to get help within the company if they started to develop any of the symptoms. We talked about ergonomic guidelines for computer use, how they should sit, where they should put things, and then we created an individual profile on each one of these people.

Now, they are going to be moving workstations, they will have furniture that is adjustable,

accessory items, and it is going to be a total breakdown and rebuild of the work space. So, just as you can do in engineering changes on the manufacturing floor when you are changing out systems, we were able to do that within our office environment, as we changed our furniture systems. We provided the installers with the appropriate height for installation of the different work surfaces. We provided tags on the work surfaces so that when telecommunications came in, they knew where to put the phone. We provided information about where the computer should go so that it didn't have to be lifted two or three times. It was put in the right place the first time. We provided information for the work station services for all of the other accessory items. If there was a fax or fish it was positioned appropriately from the very beginning. That process is maintained today. Every time someone moves within our organization from one work station to another, the work station is customized.

The other thing that happened at the same time was that the accessories were provided to the employees. At the training they heard about symptoms. They heard about what to do. They heard about accessories and what they could do for them, and then they were given the opportunity to choose which accessories they felt would help them do their job. There was some fear and trepidation that everybody was going to take everything. That didn't happen. People took the one or two accessories that they felt they needed, and they didn't take something that they didn't need. Our average cost ended up being about \$80 per person for ergonomic accessories during this move time.

So what did we achieve by this? We took our highest risk people because their jobs are the most intense. We were able to provide them with information about furniture and work station layout so that they could use the information we gave them during training. We didn't just train them and just send them off to the same place. We were able to give them the tools to actually use that information that we gave them.

The second thing that we needed to do within the office ergonomics area was to address the ergonomic needs of all those people in the remote locations. Again, we partnered with our field real estate people, along with communications, and we created an ergonomics video and training guide book. Now, the plus on that was that those products have come internally to corporate as well. We use those products in our internal training as well. We also established with an external vendor a listing of specific ergonomic products, just as we did in-house. They are available to all Amex employees, regardless of their location. It is a small select set of accessories, but available to everyone. We distributed all of that information through the office manager system in the spring of 1994.

We have recently added manual material handling and back care training. We started with identifying our highest at risk jobs. About 90 to 95 percent of our people spend most of their day working on the computer. However, we do have a print shop. We do have a loading dock. We have a cafeteria, and we have a mail room. We have manual material handling risks associated with those particular jobs. So we developed and implemented that training program in 1996.

What did we measure? How do we figure out if we are doing something that is going to be beneficial to the company or not? Originally we started with a comfort, discomfort survey that was distributed to all of those employees at training. It is still distributed to every employee at training, but we use the 1,000 surveys from the fall of 1993 as our baseline. These were people who have not had previous ergonomics training, but they have been doing their job. We felt that it was a valid baseline. That is where we started. Then we did an annual randomly administered survey. Those are some of the numbers that we can compare base to our baseline survey. In the annual survey we gather information about how people are feeling about the ergonomics program and any work-related discomforts they may be experiencing. We also asked them some specific questions about how ergonomics has been of value to them or not of value to them. So we add a little bit broader feedback to our program.

We gather workers' compensation data. In our case, some of this data was difficult to get because we had one insurance company that gathered information in one way, and then it got transferred to our broker and our broker had different categories. One type of claim in one area often was transferred into another claim area in another report. It was very difficult to find out what was really going on and to have some consistency. What we ended up doing is going back through all the records for several years and reclassifying cases ourselves so that we had consistent classification of cases.

The annual survey is done on a random basis. We usually get between 300 and 400 responses every year. We start to have a nice pattern of what is going on.

Here are some of our results. The blue line is the 1993 fall survey, our baseline survey. That is directly comparable with the redlines. When we did our first annual survey, we only included employees who had been part of that GST training and the move process. That shows within the categories of headaches, neck and backs that we managed to make some nice progress.

The next year, the yellow line we did a full company survey because by that time we had started to address a larger and larger percentage of people within the company. We have a workstation move rate within our company of about 65 percent per year. So the odds are that if you work for American Express Financial Advisors in Minneapolis, you are going to relocate your work space every year, and it is mandatory that you go to ergonomics training during that process. As we were getting a bigger population base attending training, we felt that we could start to survey the whole company.

The green lines are from this last year, and we have implemented a different type of survey process this year. We wanted to try to capture the data in a little bit broader sense, so we have revamped our survey. It was part of a survey that is tied with corporate American Express. The green lines may not be as close of a comparison as what the other three are. I think they are fair, but what we have done is gone from a three-point scale to a five-point scale. There is a little bit of shifting in there, and it needs to be more strongly analyzed. I haven't had the time to do it because we just got the data last month. The green line I am not as confident about. It looks

fantastic. I would love to say that this is exactly what it is. I don't think that they are going to be significantly different, but there may be some differences, and I don't want to mislead you.

One of the things that you do want to be aware of is if any of these particular types of measures was influenced by external factors to what we were doing within our program as what we were doing within the program itself. For example, changes in workers' compensation law, changes in job availability in the community. Some people would be more reluctant to leave a job if reemployment is difficult. What other types of psychosocial factors may be going on within your company and organization and reorganization issues. Any of those things at any given time can come in and make all your efforts look worthless or they can enhance your efforts so much that they are almost unbelievable. One of the difficulties we are experiencing within the role of ergonomics is that so many other factors feed into these issues as well. We can't just say that it is a work station. We can't just say that it is a tool. There are a lot of other things that we need to make sure that we are addressing or at least taking into consideration. The assumptions that you make, the questions that you ask, they all will influence how your responses come around later.

Three more categories are for shoulders and elbows. Again, you can see that for the most part we have been making some really nice progress. We have some hiccups here and there. We also have this information stratified by job categories so we can actually go back and pull out our client service people. We can pull out our programmers. We can pull out our administrative assistants and get a little bit more information about what specifically is happening within a specific job category. Maybe we can customize our efforts a little bit better that way.

Finally, hands and wrists.

One other category of measurement is the all mighty dollar, cost per claims. These are just for upper extremity cumulative trauma disorders. Total claim dollars per year, and we have had a nice drop in there. This goes up and down and up and down. This one is very interesting because one of the problems with workers' compensation dollars is you have to wait years to see whether it is going to happen. These are all undeveloped dollars. So they are subject to great change. The more recent years are more subject to change, but what I have done here is go back through the past years, back to 1990, and at the end of every year what was our data point?

Unfortunately, right there is a very small green dot. That is last year, which is not a real promising start. We will wait and see what happens, but it may be an indication that we need to refocus some energies. I would much prefer to see it down lower again. We don't know what is going to happen over the next two years, and we will just have to wait and see. As you can tell by the pink line, as those dollars develop and mature over the years great changes can happen. Sometimes they go up and sometimes they go down. Most often they are going to go up. Just for comparison purposes, this is our total dollars for musculoskeletal manual material handling problems and strains.

One other measurement that I said we took was asking people the value they had gotten from



ergonomics during our various surveys. As you can see, between 80 and 90 percent of our employee population across the board said that it was a valuable use of their time. It means that we are doing a decent job of meeting their needs, giving them information, and making good use of their time. Everyone is working harder and harder these days, and no one has time to waste. I am very proud of that particular response, and the fact that we were able to get them to change behaviors. I don't care if all they did was change the height of their chair. It made a difference and helped things get better for them. That is what we were trying to do.

In conclusion, the things that I would say were the biggest promoters of our program and helped us to have some effect is the fact that there was a champion, that we did have management commitment. It was uneven. It will never be even across the board. You grab it where you can find it, and thank them heartily. Next, we developed Cross-function initiatives, I don't own the furniture issues within American Express. I don't own the risk management issues. I don't own the technology issues. I provide them services and information so they can do their jobs better. That is the key piece you have to get across to them. You have something to offer them. You are not just taking from them or trying to make them do more work.

Our measurement procedures have been very helpful. Most of them are dollar related. It is pretty tough to find productivity measurements within an office environment when your productivity is determined by how many phone calls come in that day. So that is a difficult one for us. We are still struggling with that issue. We have a couple of things we are trying, but they have not matured yet.

Take advantage of opportunities. If I had been hired a year later, this program wouldn't have happened. There was that timing with the reorganization, the new furniture, new standards that allowed a lot of these things to happen.

Finally, we are finding out that we need to do some refresher training. We are going to be working on that in '97. We need to take very careful consideration of what is called those ODAM issues, organizational design and management, how the program is incorporated with the corporate culture, how the people are feeling they are valued and how the jobs are designed. Thank you very much.

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Robert Morency, L.L. BEAN

MR. ALBIN: Thank you, Nancy. It is now my pleasure to introduce Dave LeGrande. Mr. LeGrande's background in the field of labor and management relations and occupational safety and health includes some 28 years of work and academic experience. He was initially trained as a nurse in the healthcare industry, and in the furtherance of his academic skills, Mr. LeGrande took leave of absence from employment within the trade union movement to attend the School of Labor and Industrial Relations at Michigan State University where in 1975 he received his masters degree. In 1979, Mr. LeGrande became the Director of Occupational Safety and Health for his present employer at Communication Workers of America. Dave.

MR. LeGRANDE: Thank you, and as all of you know who was here yesterday, Tom is the ergonomics specialist at 3M. I think the really useful element of these presentations is that we learn that practice and theory or theory and practice actually comes together and works as it regards ergonomics and the office environment. Our next presenter will further example that point. Robert Morency, Jr.\* has worked for L. L. Bean for 17 years. Since suffering from bilateral carpal tunnel syndrome in 1988, his focus has been on reducing the risk of cumulative trauma injuries to fellow employees. His current responsibilities in employee health management include assisting L. L. Bean's management and employees to recognize, evaluate and develop controls for ergonomic concerns and company work environments. In addition to his work with L. L. Bean, Bob is also President of R&D Ergonomics. In that regard he designs unique office environment products, of course ergonomic in nature, focusing on providing upper extremity support while performing computer-related work.

MR. MORENCY: I would like to thank the organizers for the opportunity of presenting today.

My role at Bean is to help employees and management to reduce the risk of injury illness. I, personally, suffer from bilateral carpal tunnel syndrome. My wife has even a much more severe limitation. She has had two elbow surgeries and has limited use of her dominate (right) hand. So when it comes to ergonomics we, my wife and I, both really feel that it is important to prevent injury because we know that once it gets to a severe state it is very, very difficult to control.

I work in all of Bean's environments, whether it is production assembly, or material handling and the retail environment, which is a mix of all environments. I was asked to speak on offices environments today.

Bean has about 4,000 regular employees. We have approximately 9,000 at peak. Sixty percent of our business is done in about a 12 week period around the Christmas season. So that poses some very unique opportunities for us, some obviously very unique problems also. We have 28

facilities from Elsworth, Maine to Lincoln City, Oregon. Luckily, most of them are focused along I-95 in Maine, so I really don't have to travel too far. We did around \$1 billion in sales, and again about 60 percent of that in a 12 week period in 1995. We have 24 hour customer support, which is very similar to the telephone folks who have been speaking before me where we have to have multi-shift, multi-user work environments. We also send out 150 million catalogs, answer 13 million calls and two million in December alone. So the old phone lines are really humming. We have 4,000 computers, and we, like all of the other folks in the industry, are using technology to service our customer better and also to reduce cost.

In 1991 I was transferred from the Manufacturing Division where we were successfully reducing injury/illness rates by approximately 79 percent, to Corporate Health Management. The management had just sponsored a team of folks to look at the injury/illness rate in the telephone areas, which was running about two times that of Material Handling and the production assembly, which was unheard of at that time. We had a group of folks look at the environment, a real multi-disciplinarian analysis. We had a company doctor, a physical therapist, an RN and some employees and myself look at all the issues that were involved. What we did, along with some employee surveys, was identify these risk factors; unsupported upper extremities; the wrist flexion and extension; incorrect point of operation height; -- and that is my favorite acronym, POOH, point of operation height -- unnatural neck postures; lack of back support; leg support and glare.

We had management's commitment and support. What we had to do is go back and get a budget. We were fortunate enough that with state required VDT training, and I believe we are one of the few states that actually mandates VDT training, we started to train folks. We started with employees in management, and then we went to the Purchasing and Facilities folks, which I must point out is absolutely imperative that you work with the Facilities folks and the Purchasing folks. If they don't buy what you need and they don't install it in a correct manner, it is really not going to do you a lot of good.

Then we created our work station set up guidelines. We tried to keep them as simple as possible because we knew that from an employee health perspective we wanted to push the guidelines down the organization right to the hourly folks so they could do the work, as they were closest to it. Then we researched and created our toolbox. I like to call anything that is used from an ergonomic perspective in the office a tool. We don't call them accessories. We like to relate to a carpenter with a hammer. If you take his hammer away, he can't work effectively, and we feel that if you take the ergonomic tools away from an office worker, they can't work effectively either.

After we developed that tool box, we created a three ring binder with pictures of all of those tools and distributed them to the office planners, the installers and all of the folks that would need that toolbox. We created a system for analyzing the work stations and modifying them in the high risk areas. Facilities went in and modified the work stations. Then we went in reanalyzed, validated and did a comfort survey, which I will get into in a few moments.

These are the work station guidelines that we use, and, again, we try to keep them as simple as possible because in some areas, depending on how good the work station has to look, in the executive area there is obviously much difference than the computer areas that are next to a computer control conveyer that don't have to look quite as well. So we set guidelines so that we could allow people to fit the work station, but it wasn't really dictated how it had to be done. We like to see the wrist straight and forearm supported in the category of wrist and forearm. What we find is that I can usually do this in every crowd. I can't see a lot of you folks. If you look around at the folks next to you, you will see that they are trying to find a way to support their upper extremities. Now, luckily, the people at the front desk have a table, but in theater seating like this, if you look around virtually everybody is finding a way to support their upper extremities. Do you see anybody holding their arms out in front of them while they are working at a keyboard. It doesn't work.

So the next thing that we would like to do is limit the reaching, and that was especially effective when we started getting the graphical -- the mice were coming into our environment. The next thing we like to see is the neck straight and the head over the shoulders. A lot of time that is created by really poor work station design. Back support, in a seated position only, and you can see where our guidelines allow people to be in a sitting and/or standing position. One of the things that we find is that when you can allow people to sit or stand while they are working on a computer or talking to a customer, their freedom to move allows them to increase the blood circulation, not stiffen up and generally be more comfortable during the day. That is one of the important features of our program. The last thing is leg support because if your feet aren't supported, then you are not very comfortable.

We have a preferred work station design, and if you look at it, it is a corner and sometimes a U. What we have found is that a corner or a U-shaped work station much better replicates the normal, comfortable reach zone for a human being, which is basically windshield wiper shaped in nature. If you look there is overlapping and center and then towards the sides. When you put a computer user in a corner, put the computer in the corner, that obviously increases the depth too, which is one of the concerns now with the larger computer screens. L.L. Bean is like many other company leverage of technology. Split screens and 24-inch monitors are not uncommon in some areas. Then the keyboard usually spans the corner, and we, again, advocate using a forearm support, of which I have some pictures a little later. We find that forearm supports support a much larger part of the human anatomy, the neck muscles, the shoulder muscles, the forearm muscles, and we have had very good success, especially with folks whose capacity has been reduced, using forearm supports.

This is generally what we are looking for. When we go in to improve a work station, if we can say that we have made changes, positive changes in these types of areas, this is what we are looking for. We want to provide upper extremity support. Like I just indicated, when people do not have anything to support their forearms, a lot of times they really tense up and that is very demanding on the upper extremities.

We want to provide engineering controls to straighten the wrists and straighten the neck, straight work stations, large screens. If the screen is not in front of the user, you are twisting, that is not very comfortable. We like to adjust the work station to the point of operation height, and we determine that by simple measurement, comfortable seating position, arms at approximately the right angle. Take the tape measure and measure it, and that is where we would set the point of operation height or the work surface height. We do not advocate the use of keyboard trays because what we have found is that keyboard trays drive the person away from the work station, increasing the reaches to the mouse and/or the other tools, which could be the telephone, rolodex, fax machine, printer or whatever tools that person needs to complete their task. Unless you have a keyboard tray that is made very, very strongly, it does not provide any forearm support. If you lean on it, it will go down. Also, we want to make sure that we do provide back and leg support and eliminate and reduce glare.

Some of the key features that we have found using our work station guidelines are: we do adjust the work surface to the seated or standing point of operation height; elbow height; and we do that by maintaining a database. We measure the folks and single shift, single user work stations are set up for that person so that when they come into work everything actually fits them. Then we will adjust up and down, depending on the personal preference. We have had to do that before.

We have found that when you provide someone with adequate forearm support, their comfort level increases, and we definitely advocate the use of sit/stand work stations, especially for folks with back issues. What we have found is returning people back from surgery, allowing them the ability to sit or stand has greatly increased the rate at which they can tolerate working. It has been very, very successful for us. At first people said you can't key or you can't work on a computer while you are standing. Well, that is because no one ever really tried it, but it does work very effectively. I realize that some of the folks at this conference have made reference to the misuse of EMG data, and I must say that this EMG slide is not intended to be considered research. It is definitely only meant to be as an indicator because what we have found is that when you actually do support your forearms, there is a drastic reduction in the amount of upper extremity muscle activity needed to maintain in that position.

What do we do for a single shift, single user work station? Well, we have training and education, which right now is a videotape. We are in the process of going to intranet VDT training. The offices are set up to the individual's needs, and we really try to get to the needs versus the wants. We really focus on the needs of the individual. If they need a chair, we get the appropriate chair for them.

The offices and the computer work stations are designed and built to the office ergo guidelines by facilities incorporating the latest ergonomics research.

The employees adjustments or modifications are tracked on a database, and that allows employees adjustments to move with them.

Many multi-user work stations have user sit/stand height adjustability. Sixty percent of our permanent work stations are user sit/stand adjustable. These work stations will go from 24 inches to 38 inches by the user just releasing the lever and bringing the work station up. We also have ergo reps to help those folks to find the necessary tools. We have a variety of tools accessible at the different locations so employees can find what they need.

Here is the survey results from 1992, which is the first year after we implemented the program, you can see that we asked the folks to rate their before and after comfort. Their before comfort in 1992 was running about 2.1. Their after comfort was running about 4.1. We took another look at it in 1995. As you can see, there was a significant improvement of the before and after work station comfort. In 1995 they were running just about the same. What you will notice is a difference in after modification comfort of 4.35.

We did get a significant reduction in loss time injuries. Lessons learned, educate purchasing and facilities. Stock all necessary ergo tools. Everything that we use is stocked. We like to say that commitment isn't asking someone to wait six to eight weeks if they are in pain or discomfort to get the tools that they need. They need to get it quickly. In the handout you will see a rush request usually gets addressed in about 2 to 3 days. It is very quick. I have had times where I asked and received a 24-hour turn around. Incorporate ergonomics into facilities, office planning and installation standard operating procedure. Now, they do it, and I only get called when it is a real serious issue. Be flexible. Things always change.

That is a typical before the work station. This is one of the work stations that has been modified. You can see it is a corner. There is a wrap around forearm support that literally looks like a horseshoe. It actually looks like a high chair tray, and it provides a lot of forearm support for our folks. This is one of the multi-shift user work stations. As you can see, the point of operation height is too high. The person's elbow is below the work station, and there is really no forearm support.

This is one of our sit/stand work stations, and as you can see, the person can get their elbows actually in relation to sitting and standing anywhere because it does go up to 24 inches and 48 inches. That is in the seated position. Note that it is a small corner work station. It has forearm support. It has an adjustable CRT stand, and the work surface does go up and down. This is the same work station probably 20 seconds later, and the whole transition takes about five seconds, from standing to sitting. People actually do it when they are talking to customers, and you can see that person go from seated to standing.

This is just one picture at the end. We have found that some folks do need alternative keyboards for different reasons. It is a very small percentage of our folks, but we do have needs sometimes to go to specific keyboards for reaching issues or shoulder issues. We also do have those too. Thank you.

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Nance Ballman, Communication Workers of America

MR. LEGRANDE: I have the privilege -- and, indeed, I mean this -- of introducing the next two speakers in part because -- I shouldn't say in part, but completely because it represents for the Communication Workers of America and US West the real proof that industrial democracy, indeed, is the way to do it. That is from the union perspective, the unionized environment is the way to do it.

At CWA, in terms of brief background, US West is one of the many telecommunications companies we represent through the United States. We represent some 600,000 members in the US, and of that group more than 450,000 work for major telecommunications companies throughout the country. We began our VDT ergonomics effort, in particular VDT ergonomics efforts, in 1979. By 1981, we had already begun to work with elements of the soon to become US West, originally Pacific Northwest Bell, as early as 1981. Then later with Northwestern Bell in 1982 and 1983, and then more specific to the presentation today, with Mountain Bell in 1985.

Now, because we are in an industrial democracy within labor management structures that are represented through collective bargaining, there is a certain amount of give and take, with the understanding that there is a center point. Hopefully, the center point is actually not center but left of the center, from the union perspective, but often it is sometimes to the right of the center. So, indeed, the give and take process is one that can sometimes be somewhat tedious and laborious but one that is beneficial to all in the long run.

To represent our point specific to CWA and US West, this morning are Nance Ballman and Chris Plott. Nance is a member and executive officer (secretary) with Local 7201 in St. Paul, Minnesota. She has been in that position since 1989. In addition to that, she is a sales and service consultant with US West, and she has been in that position for 31 and a half years. At present, among other things in her job with US West, Nance is the District 7 representative, which is a geographic area which entails 14 states in the Midwest to the Pacific Northwest, on the Joint Mutual Occupational Safety and Health Committee. Nance deals in that regard almost specifically, not entirely, but almost specifically on ergonomics issues, and with that in mind, our next speaker, Nance Ballman.

MS. BALLMAN: Thank you, David. It is always nice to follow David because he actually takes up about two or three of my slides. So we will go through this pretty quickly. I do want to thank David LeGrande for inviting us to be here and also NIOSH, OSHA and the other sponsors of this program.

This is the overview of our presentation today, and I will cover the background on US West and CWA and our experiences in ergonomics. Then Chris will talk on medical management. Then

he will talk on three specific work groups of US West. It is the Operator and Information Services, which is our long distance and information operator. He will talk on the Remittance Processing Services, which is our bill payment processing center and then the mass markets which is our business offices. Then he will speak on some of our observations and our conclusions.

I am going to start out with some of our background so that you understand our organizations and what we are about. David did give you my background as a union officer and also as an employee of US West. The background on Communications Workers of America International covers 50 states and Canada. We represent over 600,000 members that work in telephone industries such as US West, the other Bell companies and AT&T. We also represent members in newspaper, printing, TV communication, law enforcement, hospital workers and many other fields. CWA is broken down into eight different districts, and US West is in District 7 of CWA.

The US West background: US West is the regional local telephone company for 14 Midwest and Western states. We employ about 45,000 people. Twenty thousand of those work in occupational titles in office environments.

Our work in ergonomics at US West really started about 10 years ago. We were one of the first office environments in the United States to experience a significant rise in incidents of cumulative trauma disorders in 1986 in our Denver Operator Services office. Phoenix was also one of our hot spots, and at that time we got a lot of national press.

We have had joint labor management involvement in addressing ergonomics issues since 1988. In 1989 a regional joint safety committee was formed as a result of that year's labor contract. The committee elected to focus on ergonomics, and it actually evolved into a joint ergonomics committee. I really feel fortunate to have safety and ergonomics committee language in our contract because very few labor contracts do that.

In 1990, there was a joint request by CWA and US West to NIOSH to study the possible health concerns associated with our operators. This request resulted in the agreement by NIOSH to perform an evaluation at US West. During the timeframe of '90 to '92, the Joint Committee worked on identifying needs. We developed and implemented programs and procedures, and most important, the ergonomics training and education for our members and employees. We continue each year to jointly look at and revise our programs and training needs.

We have an ongoing process to evaluate our ergonomic seating, furniture and equipment. Our Joint Committee was instrumental in getting the company to provide funding for ergonomics upgrades to furniture and equipment across US West in 1992. In '95 we went to Salt Lake City, which is one of our mega centers and had a team of our employees actually participate with us in evaluating the office chairs that we could purchase. We have found that the more we work jointly and involve our members, the more successful our program is.

In 1993 and '94, the company went through an engineering process and created mega centers.



We took advantage of the opening of those centers to invest in state-of-art ergonomics furniture and work stations for more than 7,000 of our employees. I was involved in the work station selection process, and once again, this was a very successful joint program.

Because we cover such a large geographic area -- we have 14 states, 45,000 employees and 69 CWA locals within District 7 -- implementing an ergonomics program can be very challenging. One of the things that we have done is to use our existing joint safety state safety committees, which we have in each one of our 14 states, and those are co-chaired by a CWA member and then also the state safety manager. We use that as our communication channel.

I really feel strongly that without our joint working relationship the coordination and communication to our locals and back to our International that our ergonomics program at US West would not be successful. Chris will now cover more information on our program. Thank you.

MR. LEGRANDE: Before letting Chris do that, we have our own little bureaucracy up here, but occasionally bureaucracy works, particularly when we make it work. As I said earlier, it is a real pleasure to introduce both Nance and now Chris.

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Chris Plott, US West

MR. LEGRANDE: Chris Plott is the ergonomist for US West. He has 13 years of experience and is a Certified Professional Ergonomist. He holds Masters degrees in Industrial Engineering and Business Administration, and a Bachelors degree in Kinesiology. His work experience entails a number of areas of ergonomics, including applied ergonomics, user computer interface design, human performance modeling, simulation and human factors evaluation and test of complex systems. It is, indeed, a treat to work with Chris, directly and indirectly, from 2,000 or so miles away, in part because I know in working with Chris the work is being done pretty much as if the union were doing it or an extremely competent person was doing it. That is, needless to say, what objectively both the union and the company would like. Chris.

MR. PLOTT: Thank you. Dave is a little generous there, I think, in his comments, but the first thing I am going to talk about is our medical management program. In 1991-92, we started to be more aggressive in implementing this program, and it has had very nice payoffs for us. Part of what we have done is to make it easier for early reporting through an 800 number that all employees are made aware of and that they can call to report any injury, illness or incident. We try to remove some of those barriers to get some of the reporting taken care of.

We have early treatment by an appropriate type of professional healthcare provider. We work with the local healthcare providers to pursue conservative treatment strategies, we have

negotiated with the union a return-to-work-light-duty policy and have had that implemented by local managers. This is relatively consistent, if any of you went to the presentation yesterday on medical management with a lot of the approaches they were advocating there as well. The results of this have been a real dramatic reduction in our cost per case and workers' compensation cost.

As you can see, in 1990 we were at about \$9,000 per case. In the last quarter of '96, we were down just under \$2,000 per case. There is a dramatic reduction in our cost per case in addressing these injuries and illnesses.

With that I am now going to move into some quick case studies. I hope I don't turn the fire hose on too fast for you, but I have a fair amount of information to cover here. Operator and Information Services, as Nance mentioned, are the folks who will answer when you call up and ask for information. They give you phone numbers information or help in making calls. These are the folks at their desks, pretty much tied to the phone most of the day. There is not real high intensity keying, but just call after call after call, in terms of the processing that they are doing. It is the character of the job.

That was the first work group with which we had cumulative trauma disorders occurring and where we first started taking action. Management of that organization took ownership of this and wanted to try to address these issues within their organization. They developed training and bought specialized equipment tailored specifically to the job functions and how they were done. A work smart training program was established in 1990, and this was specifically targeted at these jobs.

It talked about body postures and the risk factors associated with those and how to get into good body postures. They had stretching and exercising activities. It had keying technique activities in terms of keying lightly and timing of keying and so on and even some biofeedback to achieve desired postures of the hand and wrist.

All centers were done on a center by center basis over this 1987 to 1985 period it. It wasn't a flash cut. It was rolled out over time. They upgraded to state-of-the-art furniture and equipment. By state-of-the-art, I mean fully adjustable for a wide range of the working population and for sit/stand capability and also fully adjustable seating.

Another part of this program they had regular follow up and assessment by the managers and coaches. The managers and coaches would, on a regular basis, sit with the employees and not only assess their ability to do the job but also their posture and techniques and give them feedback on that and make sure that they were using good ergonomic practice.

I will do a quick review of one of latest and greatest work stations. We have a fully adjustable chair there, the terminal and keyboard for the system. There is no mouse with this. The stand is independently adjustable for the keyboard surface and work surface. This one happens to be

powered. You can just press a button and it will also raise and lower it. We have counter balance and cranking type mechanisms as well. These are shared work stations. This is a seven-day-a-week, 24-hour operation. When a person takes a break they may not end up at the same work station, so they have the capability of moving some of their accessories and so on around with them and they do that.

As a result of this, we have had a very nice drop off. We had a little dip in '91 and then it bounced back up. We had a very nice drop off since that time in these work groups and in bringing our rates down. They are still a higher rate work group, three cases per hundred employees, but we are moving it down considerably with some of these interventions.

The next work group we will talk about is Remittance Processing Services. These people open up the payment envelope, take a look at the bill, take a look at the check, record how much you paid and send the check off to the bank. Historically, this was a semi-automated work process involving repetitive hand movements, often with awkward hand and sitting postures. It was a real hot bed for us for awhile.

This is an example of the before hand postures. What this person is doing is holding the bill and the check in one hand, separating them out so they can see the amounts and then 10 keying into the system. This person happens to be a one finger 10 keyist, so you can see the improper posture associated with that. So it is not too surprising we were having some cases here.

In 1993, management decided to redesign and upgrade the centers to increase productivity through the introduction of new automation technology. At this time, labor and management discussed the impacts of the changes on people's jobs because of the injuries and illnesses they were having in these work environments, the desire to introduce automation and so on. Because they were going to be totally revamping these centers and introducing new technology, management agreed to introduce concepts such as job enlargement, job rotation and ergonomic principles into the new center design. So this was up front before they ever started picking and purchasing equipment. They agreed to try to pursue these processes with the union, and management largely did the design and implementation of this.

The new centers were implemented in 1995 and '96. Once they got to the final implementation, local labor management teams worked out the details of how the different centers would operate. In the redesigned centers, the mail flows through several automated processes which are controlled by the workers. If the mail is clean, so to speak, it will flow right through with people only having to move the mail from work station to work station. There are other cases where you have to handle fall out, but again, this is managed by the employees. The production criteria is that you get a pile of mail in the morning and you want it out by the end of the day. That is the basic goal of these centers.

All employees learn all job functions and are rotated between the functions, both during their shift and across shifts over time. So they are not doing the same thing over long periods of times.

In addition, detailed ergonomics analysis were conducted for each of the individual work stations and any specialized engineering or training interventions were put in place so that we could have folks working safely.

This is a picture of one of the new machines with the person at the work station. Have you ever noticed the little bars on the bottom of your check? That is a little magnetic strip that a machine can read. Our bills have the same little strips. If you put your bill in right side up, facing forward, the check behind it, right side up, facing forward, with no bending, spindling or mutilating or staples, it will flow right through the system. A person will never have to interact with it, other than to move it around. What this machine does is to magnetically read the account information off the bill and the person's check. It will optically scan the check amount and read that, and if it can read it and understand it, it will reconcile the books. Any fall out of that process is where we get the people doing the different tasks, perhaps having to open letters, reorient the mail, or do the billing reconciliation.

I remember what that person was doing before with having to separate that check and that bill and doing a 10 key, now we have an optical image that comes up on the computer screen, with the person's account information as well, and the person can just reconcile it right from that.

Automation was used in a good fashion to eliminate a lot of the ergonomic hazards in this particular work setting. As we can see, our rates are very dramatic in this case. We are almost to the point where we have completely eliminated cumulative trauma disorders in these work centers. They have only been in place since '94 or '95 so there are dramatic effects in this particular case.

Our last case study is with our mass markets group. These are the people who process customer orders, handle billing questions and so on for our customers of residential and small business service. Whenever you order phone service you talk to one of these people. They were our second large work force affected by CTDs, and they have the second highest rates for us. So, again, it was a group of special attention for us.

In 1993 and '94, we went through a reengineering process and went to a mega center concept where we consolidated people from around the region into about 16 centers in major city hubs. With this consolidation there were also total remodels of facilities, and with this we introduced, again, state-of-the-art ergonomic work stations and seating into these new mega centers. So we were very opportunistic in this case to bring in these work stations when we were doing a major rework anyway.

We just paid an incremental cost for ergonomic furniture instead of having to buy it out right.

This is an example of one of the new work stations. Again, the unit fully adjusts up and down. The keyboard tray is independent, room for the mouse and so on. These can be adjusted to sit/stand for most of the work force. They aren't quite sit/stand for very tall people. The

results in this case is a nice drop. We had a drop in '93 prior to the installation, and it also drops in '94 and '95.

In '96, you noticed that that bounced up just a touch. Basically, the size of our work force in '96 reduced and bounced us up. The reason the size of the work force reduced wasn't because of the downsizing but because when they originally did the mega centers, they also moved in some of the operations people who do the initialization of service and repair calls. They ended up moving those people back into our network operations work force. So we got the incidents, but the population shifted back to another work group. It is a little bit of an artificial blip up there in '96.

Some observations and conclusions -- and this should really be called some odd things that we have seen, in addition to our successes. It is some stuff that we can't quite explain and bothers us, but it indicates that there is some other phenomena going on.

The first is what I call the mega center spike. There are a couple of interesting things going on in this slide. We had such a nice drop in 1995 that I kind of got concerned. It was almost too good to be true that we could reduce our injuries and illness rates by that much. So I went back to look at the data in a little more detail, and much to my surprise, this is what I found.

On the right-hand side here, we have our mega center implementation. It was about here in the fourth quarter of '94 that we started actually building out these centers, and it wasn't until in here that people started actually moving in. So we had our drops starting kind of before the centers were actually installed. Perhaps we had instantaneous affects of the furniture. That is hard to make plausible, but we had these drops happening there. Then here we had this huge spike in our second quarter of 1994, which basically made 1995 look good. It was because 1994 had such a high spike in it. It was during this period that people in these centers were actually having to reapply for their jobs and find out if they were going to get moved, if they had jobs, if so where, and so on.

There was some downsizing that occurred. Most of the people who left the company did so voluntarily. There were less than 10 percent who left involuntarily, but in this mega center shift and the way it was going to go had been known since early in 1993.

We had this spike that occurred right here. I am not entirely sure exactly why it happened. Anecdotally, in talking to our union folks and talking to managers and things like that, one thing that may be happening is that because people are worried about whether or not they are going to have a job, or whether they will leave the company voluntarily or not, they may be reporting before they lose their benefits if they are suffering from these symptoms. So that may be one explanation.

It is probably the most plausible explanation for why we have this spike.

One less savory explanation is that if a person is on benefits, it is harder to let them go. So maybe people were getting on the benefits wagon to be able to ride out their jobs longer and so on.

Then another possibility is that the stress of this period could have resulted in higher actual rates and so on. If OSHA had come in during the second quarter of '94, we would have been a little concerned about what we were seeing. But, again, it was a transitional spike based on a reorganization that we saw.

The second phenomenon that we see in our operators services environment is the location affect. NIOSH found this as well when they went and did their examination. They found that there were very powerful affects based on where people were at.

What you have here is all of our operator services offices in a scatter plot. Each point is an office, and here we have the incident rate for that office and there we have the number of people. Now, down here these are all relatively small offices, fairly well clustered. There are less than three cases in any of these offices.

What I am interested in are these up here. We have our larger offices, over 200 people, but with dramatically different rates. This is an environment where we have very consistent training, very consistent job functions, very consistent furniture and equipment. All the standard ergonomic interventions had taken place. Yet, we have these dramatic differences in rates. These are in geographically different regions. This is in the Southwest. These two are Rocky Mountain regions and these are Midwest here.

This one out here we can kind of explain because of the particular state that it is in. Until the fourth quarter of this year, they didn't really recognize a keyboard related CTD as a worker compensable claim. So that is likely to result in some under reporting in those environments.

These are a little bit harder to explain, however. Anecdotally what we are hearing in talking to different people is that in some cases the work ethic of the community is different. In other cases it is the management style in these different offices that are different. Union activism is different in the different offices. In one of these cases we have had a very successful attorney who has obtained some very large settlements in that particular office. So that may be influencing it as well. I don't know exactly what is going on. The illustration here is just to point out that even when we have done a good job and have incident rates going down, there still there appears to be other factors that can powerfully affect the reporting of these type of injuries and illnesses.

Standard ergonomic interventions can be very effective and we can do well with them, but there is no cookbook approach. We have had to take unique approaches to each of these different environments to address the issues. Other factors also seem to have equally powerful affects, at least on a local basis.

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## Question and Answer Session

MR. ALBIN: Any questions, if you can come to the floor microphone, please, or comments.

Q: Karl Marion from Ergometrics in Eugene, Oregon for Bob. I was wondering with your sit/stand work station whether you had a cooperative effort with a manufacturer to produce those or if you produced it as in house. Secondly, if you have seen any benefits to using Microsoft or a similar type of keyboard.

Mr. Plott: For the sit/stand work stations, we worked with three different vendors to provide the equipment. The only OEM manufacturer that couldn't meet our recommendation was a Weber napkin made out of Upper State New York. We actually have them installed in Hayworth System furniture, but they are available from Hayworth, from Invincible Office Furniture Company, which I believe is in this area, and the last one is General Wood Working in Massachusetts. Again, it is a Weber nap unit, and it does have 24 inches of throw. It is a very nice unit.

We have not implemented from any mask scale perspective alternative keyboards. I particularly do not like -- and this is my opinion only -- the Microsoft natural keyboard. I think anything from an ergonomic perspective, like a keyboard or a chair or a work station, needs to be adjustable for the users. The engineers designed it for someone. They didn't design it for everybody. One of my major beefs with some of those keyboards is they make you reach a long way to the mouse, and the Microsoft natural particularly does have a real long reach to the mouse.

For our sit/stand work stations we work through Miller, Steel Case, and Hayworth, the big three. They went to other vendors to get their other units to do the sit/stand height. We had them go through that process to and we have a variety of different types in use.

With regard to the natural keyboards and so on, we kind of shy away from them. If somebody has a prescription or a special need or whatever, we will provide them. The biggest issue that I tend to have with them is our work force doesn't really touch type that much anymore. If you are not a touch typist, those keys become kind of hard to see. Hunt and peck typist find they aren't that effective. So we tend to meet the needs of the individual with regard to those.

MR. MORENCY: I would agree with that. Seventy percent of our folks are not touch typists. If we do get into alternative keyboards, I would like to have something that moves, either the Lexmark or the new Cherry keyboard, something that allows for some flexibility and the fact that it doesn't have the number key at the end of the keyboard. Most folks do not use that part of the

keyboard very much. It forces you to reach that extra four inches or five inches for the mouse.

MS. LARSON: We have also done some casual investigation of various alternative keyboards and found some very unique problems with some of them. One of the problems being the fact that six months later most of them are not manufactured anymore, but also another one that had the enter key right next to the delete key, and some of the layout of the keys have changed enough so that they are awkward to use. You need to be careful about those kinds of things, as well as the issues that deal with posture and addressing the keys that way.

Q: Neal Taslity, Executive Director of the National Repetitive Strain Injury Foundation. I have a few questions. As long as you folks just mentioned the alternative keyboards, I know the NIOSH funded study at Marklin by Professor Merklyn is going to be made public at the end of this month or at the beginning of February. It was a two-year test, and I think that some of the results that he found will have implications and answer some questions about some of the concerns.

Q: A question to Nancy Larson regarding the surveys you do, are they anonymous surveys?

MS. LARSON: Yes, they are, very definitely.

Q: Another question regarding the facilities, the budget that you mentioned for the ergonomic tools or work stations would come out of the facilities manager's budget. One of the things seen throughout the country is conflict between the safety managers or the human resources or personnel and the facilities groups because there of a limited budget. With downsizing their marching orders are to reduce their cost for new capital improvements or accessory items. One of the things that some companies have done, which has drastically changed the attitude of the facility managers, is to have an accounting which would then debit their budget for workers' compensation claims associated with poor ergonomics so that you would then have a real incentive to get the job done earlier.

Many companies that do not make changes until a doctor or a medical professional has in writing made the request for the change. Often times that occurs way down the line where it is too late already to prevent the problem.

Another question regarding graphics where you showed that you were able to eliminate all but, in most cases, between 10 to 20 percent of the problems. There are some physicians that do this on a full-time basis that have been able to get rates down as low as two percent or practically the problem has been totally eradicated as 98 percent or some of the figures that I have discussed with some of the physicians. It seems to me that that five or 20 percent still represents, in term of total dollars, a huge sum. What is being done to get to those others who have more significant problems and need more refinement to reduce those problems?

MS. LARSON: I think we have a multi-part question here. First, to address the facilities issues and charges back to facilities, in many cases that may be inappropriate because facilities only set



the stage. You can provide someone with all the right tools, but if they don't use them appropriately or the job is not designed well, it is still not going to be effective. So I would be hesitant to say that that would be an effective strategy.

An advantage with putting all of our accessories into a standardization process is it relieved the managers of the responsibility of looking at catalogs trying to identify the correct products. It also allowed our purchasing people to do their leveraging act and to ensure a cost effective product. We stock it in-house, and have 24 hour standard delivery within our system. I know that it is not typical but it works for us.

The question regarding the graphics, there may have been a misinterpretation of our charts. The discomfort chart showed everything from occasional discomfort to almost daily discomfort. Our VLS rating for our industry is a .75, and we have seen that come down and become a very nice number. So it is not just showing the severity. Those are not people who are all workers' compensation claims. There are people who have a problem once in awhile, and so we are trying to address the issue much further upstream than just the reactive, after someone has filed a workers' compensation claim. We have seen some nice reductions, about 20 percent of our workers' comp. claim numbers as well. Did that answer your question?

Q: The concern was that in many of these problems there has been a dramatic reduction in claims, but still not eliminated. Many physicians believe that 98 percent of these problems can be eliminated. My question is as we are here sharing information, what is it if you cannot get someone to be relieved of their symptoms? Sometimes I know it is impossible because they have already had surgery and it may be too far down the line and they have some permanent damage. But, in some other instances what kind of research are you doing or do you need to get those people adequately and properly situated to their work station, the hard cases?

MS. LARSON: Yes, and there are always going to be some.

Q: Because those tend to be the most expensive. Those are the ones that end up in litigation.

MS. LARSON: Exactly. That small percentage may cause a lot of dollars to go out the door. I think that we have to remember that this is a multi-faceted problem. It is not just what happens to the person at work. It is what happens to them 24 hours a day. There are some genetic factors that play into it. There are personal health issues that sometimes play into it, and in spite of the fact that we can design a job that has very low risk factors, we can create the perfect work station or as close to it as possible, there are always going to be some people that have problems because they are human beings and they are alive and we don't work properly 100 percent of everyday.

So what do we need? I guess we need better information about where are some of these root causes. We know that there are well identified risk factors. We know that there is a correlation. We don't have dose effect, but we don't have that for very many things in this world. We also know that we are not going to be 100 percent effective.

MR. ALBIN: Let me call on the next question, if I may, so we are moving questions around. To the microphone at the back of the room, please?

Q : Yes, I have a question for the CWA people. I believe I heard Norton Hadler. You probably are familiar with Norton. He is the man who is playing Don Quixote against the whole concept of cumulative trauma and ergonomics, and I think most recently he rather brashly declared cumulative trauma a dead issue. He has cited the CWA/NIOSH studies and declares that his analysis of those studies fails to give evidence that there were work-related cumulative trauma problems and perhaps fails to give evidence that there were ergonomic aspects in contrast to say stress issues or other sorts of non-bio-mechanical issues. I would like to hear what CWA has to say about that.

Mr. Legrande: In brief, Dr. Hadler has a unique viewpoint that not many in his profession hold, and certainly he would suggest that the disorders associated with workers in VDT jobs are psychosocial and certainly not work related. The data speaks for itself. Dr. Hadler's comments are not agreed to by the majority of his peers in the medical community. I don't think it serves to debate his thoughts only to suggest that there is data that shows a relationship between physical ergonomics, as well as psychosocial concerns and the occurrence of work-related musculoskeletal disorders.

MR. ALBIN: Any additional questions? Let's take this as the last question.

Q : Just in response to what LeGrande said about Dr. Hadler. I have read most of Dr. Hadler's materials and heard him speak. It was at the conference of occupational and environmental physicians several years ago where he actually said that he believed that the problem was that the workers needed to raise the threshold level of pain and endure the pain. This is something that, I think, has been viewed throughout this dilemma as that the people that have these injuries have lower thresholds and are whiners or malingerers when, in fact, our experience with the RSI Foundation is just the opposite. There was a recent report on this that just came out in one of the medical journals. The hardest working people are the ones that are most susceptible because they keep on working with the pain. They work beyond their threshold level of pain until they do permanent damage, and those are the ones that then have the serious problems. I think it is just the opposite of what Dr. Hadler would suggest with the threshold level.

MR. ALBIN: Thanks a lot. Why don't we conclude this session? Thanks for your patience in allowing us to run a few minutes over. Certainly, if you have any questions, the presenters are still here and there are also papers that were left on the registration table. Thank you.



## Warehousing

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Mike Jenkins, American Warehouse Association

MR. JENKINS: This is my home town Chicago. For those of you not from here, this is not a significant snow storm. You will not have trouble leaving today. So don't get nervous and leave our session early.

I am Mike Jenkins. I am President and Chief Executive Officer of the American and Canadian Warehouse Associations, and I represent companies engaged in public and contract warehousing, distribution center management and logistic support services. We are a trade association that is 106 years old, and we provide our members education, training, marketing, government affairs, et cetera.

I would like to set the stage for the warehouse discussions today with just an understanding of the significance of logistics in today's business. In the United States the logistics industry is a 700 billion, with a "B", dollar industry that will grow to \$900 billion by the year 2,000. Logistics because of its significance in the United States has become a board room topic. Feature articles in Forbes, Fortune, The Wall Street Journal and USA Today have all focused on logistics as the last bastion of competitive advantage for American business. When I was in France in December, they are telling the same story there and all around the world.

Warehousing is the heart of the logistics industry because today's warehouses have become product transformation centers where the product is finished, packaged and priced before it is distributed. Now, most of you who are familiar with warehouses have to work real hard to get away from the historic image of warehouses being dark, dirty, dangerous places. In fact, some people might describe it as a dark and dirty place with boxes stacked up for Kojak to knock down. That is not true.

Today's warehouses as product transformation centers are clean, bright and safe, and today's warehouse is an information technology driven facility with people as the most valuable asset. Today's panel, effective warehouse ergonomics programs, is going to take a look at three different approaches to ergonomics in the warehouse workplace. Our three speakers this morning are Chuck Swanderski with Lowes, Dave Forte with J.C. Penney and Richard Murphy, Jr. with Murphy Warehouses.

Now, before we start with the first speaker, I would like to give you the rules of engagement for the next hour and a half. Each of the speakers will talk for about 20 minutes on their particular applications of ergonomics, and at the end we will have to 20 to 30 minutes for questions and answers. We would be delighted to take any questions that you might have, but if there is

information that you would specifically like and aren't comfortable asking that question, feel free to write it on the back of your business card, either a question or a request for information, give it to me after the session, and I will see that it gets to the correct speaker or to the agency who has graciously hosted today's event.

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Chuck Swanderski, Lowes Co., Inc.

Transcript for this presentation not available

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David Forte, J.C. Penney Catalog Fulfillment

MR. JENKINS: Our next speaker is Dave Forte, and Dave is the Catalog Division, Ergonomics and Methods Engineering Manager for the J. C. Penney Company. Dave has a B.S. degree in Industrial Engineering from Columbia University and has 18 years experience in his career, including assignments at Colt Industry, TRW, Stanley Works and now J. C. Penney. Dave joined Penney as the industrial engineer at the Manchester, Connecticut Catalog Fulfillment Center, and he has held positions as Senior Industrial Engineer, Assistant Industrial Engineering Manager, Division Materials Handling Manager and now in his current responsibilities includes the Catalog Ergonomics Program, Capital Program, Methods and Cost Benefits Study Program and productivity improvement and simulation studies. Dave.

MR. FORTE: Thanks, Mike. Good morning. As Mike mentioned, my name is Dave Forte, and I work for the J. C. Penney Company. We are very happy to be here today. Jennifer and Margo, if you are out there, thanks for inviting us.

This morning I would like to share a little bit of information with you all about an ergonomics program that we currently have in place in our Catalog Division. But let me first start by giving you a little bit of a background on our company as a whole.

The J. C. Penney Company is a Fortune 500 firm with annual sales of about \$23 billion. These revenues are generated from sales in our retail stores, our catalog operations, drug store sales and insurance and banking services. Now, of course, the Catalog Division is just one part of our organization. The Catalog Division operates six fulfillment centers at various locations around the country. We have a total of about 12 million square feet, and we employ approximately 5,500 people or as we refer to them, Associates. Our Associates perform a variety of activities, which include material handling, production activities, as well as office support functions.

Now, going back to about the end of 1990, we did some research at that time, and we started to become aware that there was an increasing trend in the number of CTD injuries. We did an in-depth study of the situation, and we came to the conclusion that we needed to implement an Ergonomics Program. Now, we had never done this before. This would be our first time. So we did two things. We went out and we tried to learn as much as we could about ergonomics right away. And we went out and we hired an ergonomics consultant. We worked with this consultant for about a year, and at the end of that year, we felt we were in a position to be able to conceptualize what this program would look like.

What I would like to do now is cover this four point program with you and then talk a little bit about how we implemented each of these different aspects of the program. I know you have heard this a few times already in this conference, but I need to say it one more time. A good Ergonomics Program, and a complete Ergonomics Program, consists of four basic elements: ergonomics training, work site analysis, medical management and a formal communication process.

Now, with regard to ergonomics training, the first commitment we made was that everybody was going to receive training. We didn't want anybody to get missed in this process, and because it is a team effort, it really is important that everybody receive ergonomics training in our facilities. We decided to implement a four layer training process from the top down.

The very first training we initiated was our Ergonomics Engineering Training. This was a three-day seminar, and we gave it to all of our Engineering, Loss Prevention, Personnel and Medical Managers. The purpose of this training was to cover ergonomic principles, risk factors, medical management; and it also contained a workshop on how to perform an ergonomic job analysis. We gave this training to people that would be involved in coordinating the program, and people that would be involved in performing studies and making recommendations on how to improve the workplace. This was a three-day seminar, and it was intensive training.

The second level of training was our General Management Ergonomics training. All of our management associates received this training, and this was a one day, eight hour class. This class covered ergonomic principles, risk factors, medical management, but it did not involve the workshop on how to perform an ergonomic job analysis. This was designed primarily for first line Supervisors.

Our third layer of training was our Associate Ergonomic Orientation training. This was a one hour training class that we gave to all 5,500 associates. The purpose of this class was to create awareness about ergonomics, the importance of it, risk factors in the workplace, symptoms of CTDs, so they could be recognized if they were experienced, and the importance of reporting immediately.

Our final layer of training was what we call Job Specific Training. We did a lot of studies in our Centers, and once the studies were completed, we made improvements to these jobs. Many times

we ended up with new methods. So what we would do is put together a job specific training video and outline, which was about one hour long, and we would retrain all of our people so that they would understand the new method that was to be used and the importance of working correctly.

So as you can see, we have a four point training process, and we train from a three day seminar all the way down to one hour, and we train all of our Associates. We found this approach to be very effective.

The second very important component in an Ergonomic Program is work site analysis, or often it is referred to as ergonomic job analysis. Now, the size of your company will pretty much determine how you approach this process. We had a lot of activities in our facilities, and we have a lot of people. So what we decided to do is to create two lists. We had a primary list and then a secondary list. On the primary list we put the activities that offer the greatest opportunity for improvement, and then on the secondary list we put the activities that offered opportunity for improvement but not quite as great as the first list. Then all the other activities that never made it on either of these two lists were activities that were in pretty good shape and didn't offer really any real opportunity at that time.

Once we completed our two lists, we proceeded to go down the first list, the primary list, and perform an ergonomic job analysis on every activity, make recommendations, install the improvements and give job specific training. When that process was completed we went to the second list. We did exactly the same thing. We did an ergonomic job analysis. We made recommendations. We implemented the improvements, and we gave job specific training.

Now just to give you an idea of the scope of these two lists, there were about 13 activities on the primary list, and there were nine jobs on the secondary list, for a total of 22. These 22 activities represented about 75 percent of our work force.

The third important aspect of an Ergonomics Program is a Medical Management Plan. There are a lot of different things you can do in the way of medical management. One of the very first things that we did was to get a handle on our CTD statistics. We developed our statistics, and now we monitor them on an ongoing basis. Some of the other things that we did included initiating workplace walk-throughs. We do this on a weekly basis. We put together teams of trained professionals, and they go out into our Fulfillment Centers and they meet with people, they look at activities, they evaluate and they make recommendations for improvements. We found this to be a very effective process.

We developed an alternate duty plan for people that have injuries and are recovering. We were very surprised to find out that often times they recover faster while they stay at work and work, rather than simply stay at home. So we came up with a list of jobs where they could work on light duty and still remain in the same schedule and still remain productive.

We came up with a list of classes that our trained medical professionals could attend so that they could get additional training in the treatment of CTDs. We stressed the open communication process and the importance of reporting early to all of our Associates. We want to treat these injuries when they are simple cases of tendinitis, rather than full blown cases of carpal tunnel.

Finally, one of the most important things, I think, that we did was to put down in writing our medical management plan, which includes all of the items that I just mentioned, along with the procedure for examinations, for CTD treatment and for follow-ups.

The fourth and final important part of an Ergonomics Program is a communication process. Now, again, like medical management, here there are a lot of things that you can do in the way of developing good communication. One of the very first things that we did was to establish an Ergonomics Committee in each facility. This committee consists of approximately 10 to 15 associates at all layers of the work force. We have the Center Manager on this Committee, and we have individuals from the loading dock on this Committee. The purpose of this Committee is to coordinate the program in that facility, to give feedback and input into the process, and we are very happy to say that this is a very successful tool. We weren't sure how this would work at first. It was something new for us, but we found that it is very effective. We get a lot of useful feedback from our people and a lot of good representation from all levels and areas of our facilities.

Some of the other things that we did in the way of communication include setting up an ergonomics hotline. We realized that we have a lot of associates that might be reserved in giving their comments. So we set up this hotline where they could call in and make suggestions and would not have to identify themselves. We also set up a formal suggestion program where people could put their ideas on paper and then we could follow-up with them later and talk to them. We also have extensive refresher training courses with question and answer sessions where people can talk and give feedback.

Again, we really stress the open door policy. Our people understand that at any time they can walk into their supervisor's office and talk about an ache or a pain that they are experiencing. They can talk about ideas that they have to improve the workplace or anything of that nature. So as you can see, our program is a four point program, and it includes training, work site analysis, medical management and communication.

Now, for those of you that have yet to start an Ergonomics Program but are thinking about it and you are yet to take that leap, this next slide is for you. Depending on the size of your company, an Ergonomics Program can be a major project. It certainly was for us. So what I have done here is I have laid our project out as if you are a Project Manager starting a new major project. I have done this for a couple of reasons. I think it is important to see the steps that are involved and to note that we didn't do everything at once; and I think it is important to see the timeframe here and to know that some of these things take place over a long period of time.



So starting from the top down, our program development took about a year, and we did that through 1991. Training began immediately, and when we finally began training our 5500 Associates, that took us eight months. So it took a long time.

Work site analysis and improvements took place over a three and a half year period. That primary list that I mentioned took a year and a half to get through, and then the secondary list took another year and a half. So that didn't happen overnight.

Medical management we hit very early in the game and worked on intensively for about a year and a half. Now it is a relatively routine thing, and we do it on an ongoing basis.

Finally, communication, we hit intensively for one year to develop our different programs, and now it is a routine thing and we do it on an ongoing basis. But, you can see looking at this major project, it took us about four and a half years to get to the point where we are comfortably at now.

Okay, I have talked a little bit about our four point program, and I have shown you what this picture looks like as a major project. The last thing that I would like to talk to you about today is our Program results. For those of you that are yet to start a Program, I think you will be interested in this. I have divided the results into two categories: reduced CTD injuries and cost savings. Although I am probably sure that some of you are more interested in hearing about cost savings first, I am going to review the CTD injuries first.

Back in 1992, our incident rate for the division was 12.0, and that is shown on the bar chart on the right-hand side. By the end of 1995 our incident rate for the division was 6.02. We had reduced the injury rate by 50 percent. Now, the bar charts on the left-hand side represent our five major processing areas in our Fulfillment Centers. You can see some departments were a little bit better off than others. By the end of 1992, we had reduced injury rates by 20 to 25 percent. By the end of 1993, we had reduced injury rates by another 20 percent, and then by the end of '95 we had injuries down by about 50 percent in total. So we feel this was a very successful process for us. We are very happy to see these results.

Now, let's talk about cost savings. When we started our program we really weren't thinking at all about cost savings. Our initial goal -- and it should be the goal of every program -- is to reduce injuries in the workplace, not to gain productivity improvements or cost savings. But to our surprise, there were some nice benefits associated in the way of cost savings.

What I have shown here on this chart are three graphs. I have one graph here that represents expense, and in the category of expenses I have included the cost of training, which includes the cost to train and the cost to be in training, and also the cost of our managers to coordinate the program. The second graph I have on here represents our capital investments, which is the cost to make improvements in the workplace; and the third line, the one at the top is cost savings, and these were the dollars that were returned to us in two of three categories. They were reduced

hours due to CTD injuries, and they include non-redundant reduced Workers' Compensation claim costs.

Now, I have not included under cost savings productivity improvements for a couple of reasons. One, because that is not the goal of the Program, and number two, because I wanted to show you here today that there are significant benefits associated with the program, even when not considering productivity improvements.

Now, as you would suspect in the beginning years of the program, our expenses were high and our capital investments were high. By the time we got to 1995, we had already invested a million and a half to two million dollars in this program. But something interesting happened. Our cost savings also started to increase at that time. By the time we hit the middle of 1995, we arrived at a break-even point. We had saved back all of the money that we had put into the Program, and now with this Program on an ongoing basis, we save about a half a million dollars a year, net, on this program.

Now, we are very happy with these results. We feel the program was a success, and just to quickly summarize here, going back to the very beginning, it is very important to have a complete ergonomics program. That includes training, work site analysis, medical management and some kind of a formal communication process. Sometimes it has to be laid out as a major project, but you have to understand that if it is a major project, it doesn't happen overnight and everything doesn't happen at once. The best advice we can give you is to take it one step at a time.

Finally, if you have a good Program, you will see results. I don't know if you will see the kind of results that we saw because every company is different in scope and the nature of the business and the size of the company, but I am pretty sure you will see benefits. You will see benefits in reduced dollars due to CTD injuries, reduced Workers' Compensation claims and productivity improvements. At some point you will hit that break even point and probably see a net positive cost savings. Thank you.

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Richard Murphy, Murphy Warehousing Company

MR. JENKINS: Thanks, Dave. Our next speaker is Richard Murphy, Jr., President of Murphy Warehouse Company, and I would like to just pause for a moment and make sure you understand the difference between the distribution centers that Lowes and J. C. Penney would operate, which we would characterize as private warehouses or distribution centers, and public warehouses. Public warehouses or contract warehouses are companies that store product for others and may

have multiple customers in their locations. So as Richard talks this morning, he will be referring to multiple customers in his presentation.

Richard is the President of Murphy Warehouse Company, a logistics support services company which provides distribution, warehousing, transportation, value added services, administration, fulfillment services for both domestic and international clients. Richard received his MBA from Carlson School of Management in the University of Minnesota. He has an MLA from the Harvard Graduate School of Design, and he has a BLA from the Institute of Technology at the University of Minnesota. He is an active member of the American Warehouse Association, Council of Logistics Management and Warehouse Education Research Council. Richard.

MR. MURPHY: What I would like to talk about, as Mike mentioned, is a little different perspective, and I refer to it as a practical approach. One of the reasons that I call it that is because I am going to take two different perspectives this morning. One is that of a small business perspective. As Mike eluded to, we are not the same size as J. C. Penney or Lowes, and, therefore, there are different issues and questions that one has to ask themselves. What is affordable to a small business? What is manageable to a small business? The other perspective that I want to take is that of the public warehouse distribution industry, which I will talk about in just a second.

What I want to do today is to talk about where we started, what motivated us to find solutions, what are some of the things that we have implemented, did they work, and what were the results that we had? The key, obviously, is if we have no results, why do it. One of the questions that I hope to answer in the next graph is: "Was our program effective?" The graph that I show here is an 11 year tracking of our workers comp. modification and experience ratio. For those of you who deal with that side of your business, you will know what a mod. rate is. Basically, we started back in 1987 at a 1.5, and we today live at a .5 credit ratio.

Now, is that a significant event that we have accomplished? If you look at our industry, which is a fairly risk prone industry, the transportation and warehousing industry has an average of roughly 1.0. We are 50 percent below that, in terms of how the insurance industry rates our company and the activities that we do, which has a direct bearing ultimately on what we pay for insurance. The next slide is a graph over the last 10 years that shows what was our cost per hour for workers' comp. insurance. As you can see, our highest point was \$2.35 an hour. We are now living with roughly \$1 an hour of cost, which is significant savings to a small business.

David talked about savings in the half a million dollar range. I am talking about for our size company in today's dollars a \$140,000 to \$160,000 savings. That is significant money to a small business.

We have also during that period seen the number of claims go down almost 50 percent and the claim losses reduced by 400 percent. The severity of the types of injuries that we would see also went down during that period. What is nice is that while we were working so hard on this

program, our business took off to where our labor hours almost doubled during the process.

Now, what is this public warehouse industry that Mike talks about? You will often hear it referred to as contract warehousing, depending on the contractual relationships. You will hear it referred to as third-party logistics or out-sourced logistics in some business publications. Basically, its profile is small businesses. We act as a bank for goods/products. We do not own the goods/products in our facilities like Lowes and J. C. Penney would. We are a service industry. We are not a manufacturer or distributor in that standpoint. We have a large variety of products that we handle yet basically have no control over the product configuration that we see in the warehouse, and we deal with the global marketplace.

Now, what do I mean by those last two comments? This is a picture of a very typical inbound, international container load, fully loaded. This is actually a good one, to be honest with you. It is very difficult to deal with some of the ergonomic issues that we would all like to implement because of the nature of how things come in from the global marketplace. The U.S. industry has done a much better job of unitizing, which could include palletizing or putting onto slip sheets, etc. to reduce the amount of hard labor required to load/unload containers.

Who is Murphy? Well, we are located in the Twin Cities where we have a lot more snow than Chicago does, unfortunately. We are a family owned and operated business. I represent the fourth generation. We have 135 employees, and operate 1,300,000 in square feet. We provide a myriad of services to our clients, as you can see, everything from warehousing and distribution, transportation, administrative services, et cetera. We deal, as Mike eluded to, with a smorgasbord of customers, roughly 150, dealing in everything from food/groceries, food service, healthcare, beverage, tobacco, chemicals, retail, to you name it.

Now, where were we 10 years ago? Well, we found ourselves, especially at the change of seasons - when you stop and think about when people, especially in a warehouse environment, get back injuries, if we hone on that for a minute - they generally occur in the spring and the fall when the temperature changes. So we found ourselves with back strains and injuries. At that point we also saw a growing number of carpal tunnel cases. We were starting to get concerned about some of the severity and long term effects of what we were seeing. So we started to ask ourselves: "What can we do to address those issues?"

The first thing we did was look at the process itself. We have a person who is hurt. Why do we have to make him or her feel any worse than they already feel? Why do we have to continue to deal with somebody who is in a depressed state, often angry - not necessarily at you; it could be at themselves - why continue this negative trend? So we started to ask questions of ourselves. Could we change this whole experience of going through an injury situation and make it a more positive experience? Now that may sound like an oxymoron, but it is more than an attitude. Obviously, the person is hurt, and you can't necessarily make them feel better when they are hurting, but you can at least change the process to a positive nature versus a negative one.

So we started asking questions: How can we help our injured associates feel better? How can we make them feel safer and more comfortable in understanding this whole process that they are going to go through and the financial protection that they are afforded, especially in the State of Minnesota, which may be different in some other states? We wanted to convey that we cared about them, and I truly mean it. We care about our employees, and we wanted them to understand that even when they weren't here on a daily basis. We wanted them to know that we wanted them back. We didn't want them sitting home alone, watching TV or whatever, going stir crazy or getting further depressed.

Again, I can't stress enough how important this first process issue is to this whole procedure to turn it into a positive experience. We then turned to the issue of bringing them back to work. We work very hard here because this is not an easy thing to do, especially in a smaller company. Our goal here was to ultimately return the associate back to their original job when they could do it.

Now the key to this whole process is that it is a very timely process. You have to be proactive. You can't let the process just grind along. You have to push it on behalf of your associate. Otherwise, the wheels will slowly come crashing. The doctors need to know that you have light duty or alternate types of activities. We coordinate very closely with the workers comp. carriers, the doctors and therapists that develop the proper restrictions for job creation and for work hardening processes.

Some of the things we have done include light duty. We may have somebody literally answering phones in an operational office while they are recovering. They may only drive a forklift and not do hand picking. They may be a janitor versus a warehouseman. They may do relabeling types of work. We have had some success stories where we have brought people into the office from the warehouse environment. We have had two people who are doing significant things for our company who have gone from the warehouse through the office and into management.

Now, these efforts were great. We were very successful, but it still didn't find solutions to the cause of the injuries we were seeing. So we started to look at the next plateau. As much as I would like to use the proper wording here, and I am sure the sponsoring agencies would like to hear that the regulations that they have implemented motivated us to go to the next level - and I do say this with all due respect - but that isn't what motivated us, quite frankly. What motivated us was the more practical side of it, which is that I have a skilled work force that I cannot replace. They are not necessarily walking around with suits and ties on like you and I are today, but they still do a very important job, and it is much more technical than it ever was. I can't physically replace them easily.

It takes us, we figure, at least 12 months to make somebody off the street who is green into an effective warehouse person. Why do I say that? Because you can only do so much in a classroom. In fact, very little of it can be done in a classroom. They have to experience it, and it takes time to experience it.

Another issue that we find that my previous speakers probably don't have is that we have little or no turnover in our company. Therefore, I am also dealing with an aging skilled work force that I have to find a way to protect. And lastly, our employees, quite frankly, are our friends and neighbors. Remember, we are a small company. I know everybody. My management knows everybody, and the employees know everybody. In many ways it is a family, and we run it as a family. If you think about your family, you would treat them differently than you would a stranger. That is how we like to look at it.

So we went about developing a series of solutions to prevent and reduce the number of situations which could expose any of our associates to injury. What drove this effort philosophically was that if a product can be handled mechanically, we would attempt to do it.

What I want to show over the next five categories is a series of slides of some of the areas that we looked at. The first is, quite frankly, the seating. Our people sit on these seats from six to nine hours a day, going over dock plates, which are usually not level because of the nature of trailers. They are constantly shifting gears because of the nature of their work, and it is a hard job to sit on a bench seat like this. So we went through and replaced most of these old seats with more ergonomically designed seats to provide better cushion, to give better contour to their backs, to provide lumbar support, to give them better horizontal slide support, the arm rests, as well as the seat belts.

Now, as much as I would like to say that this is the ultimate solution, interestingly enough, there are still a number of our highly skilled and middle aged older work force who don't like these seats. They don't like them for a couple of reasons. One, they can't literally shift from one bun to the other just to change position from time to time. I mean, it sounds silly, but we all do it in our chairs. I can see some of you moving from time to time. You can't do that in an ergonomic seat. The other thing is these seats make it very hard to slip in and out when you are trying to pick orders, if you are picking off of a forklift. And finally, if you have any weight to you, it gets harder to turn around because you don't have the room to slide, to literally turn and look backwards. So these seats have pros and cons.

The other thing we did was to look at where the levers are. Can you imagine sitting for nine hours a day holding your hand up like this, moving these levers? You have four levers there that are constantly being used for different manipulations of the product. It is very tiring on your arm. So we have worked with the vendors to begin to bring into the fleet something much better where he can rest his arm on the armrest, if necessary, where the levers are down lower.

As I mentioned, we try to find equipment to handle products mechanically. I am showing you one of the most obvious examples. Ninety percent of the time when you have damage to a bag product it is on the bottom, which makes sense because it happens generally down where the weight is. It doesn't happen on the top where it is easy to remove. The traditional way to solve the damage problem is for you to totally repile the entire pallet to get at the bottom.

So what we have done in working with the vendors is to buy a piece of equipment where we can flip the entire pallet 180 degrees so that we can take the damages - like I said 90 percent of the time they are on the bottom layers - off so that the warehouse person doesn't have to handle the other 90 percent.

Another piece of equipment that we utilize is a squeeze clamp. Basically, it applies pressure against the product to lift, and this picture shows it lifting a unitized load. We also use it extensively to pick entire tiers or just one layer of product so that a man or woman does not have to get down and throw those nine cases on that layer.

As to Drum product, it is very hard to deal with 55 gallon drums or any type of drum product. They are generally very heavy. You literally man handle them. We had one serious injury years ago from it, and so we have developed barrel clamps to pick up things like this.

Now, where we can't find equipment to solve some of our problems, we implement what we call an activity rotation program where a person may only work for two to three hours on a particular task. Let's say it is floor loaded bags of milk that came in from overseas, and these bags weigh 50 to 80 pounds. It is a tough job to do eight hours a day of this type of work. So we generally put somebody on there for two to three hours, pull them off for the rest of the day and shift somebody else in there.

The other thing we do, and I just want to talk about one of them, is what can we do to the facilities to help improve the process. We do a lot of work with the railroads, and we have started to bring the cars indoors because of the nature of our climate. What I want to talk about is the issue of the distance between the rail car and the dock and the issue that a man or woman can walk up to the rail car and open the door at an ergonomic height and distance. Many of you, probably in high school, worked in a warehouse at one point in your life, and when you went to unload a rail car, the first thing all you had to do was climb or jump down to the rail level, which is dangerous in its own right. Then what did you have to do? The next step is you have to reach up, because if you think of a rail car, the dock is already four to five feet high. You are standing down there, and the locks are up here. The second thing you realize is that the lock and door won't move. Because of the environments that these rail cars go through, any form of lubrication they put on the doors doesn't stay there, so they tend to rust and they tend to get sticky. So you are standing there in the worst ergonomics position trying to pull this door, and you are standing on an unstable surface because you have gravel to stand on or you have got rain or ice. So what we have done is we have literally brought the dock, in our case, indoors. It works even in a warmer climate to where a warehouse person can walk up to the car at the height that would make ergonomic sense, and either use their natural leverage or use a forklift to push the door open. We have been very successful in helping reduce injuries with this close clearance rail dock set-up.

Lastly, even though we are a warehouse company, we have not forgotten the office. We have installed ergonomically designed work stations to reduce the workplace injuries here. We work

very closely with a physical therapist, and some of the things that we have done is buy all new chairs for the lumbar support, the leg support, and the arm rests. The desk tops can be changed in half inch increments to fit on a custom basis the particular worker, and the keyboard height, and the types of keyboards are custom fit. Now, I know that there is an article in USA Today Newspaper that we all received in the hotel today that says that these keyboard devices don't work. Well, that may be true, but any of the people we have who use these will never go back to the other ones. They would quit before they did because of the help it gives to the arms and the shoulders. Maybe it doesn't help the wrist, but it does help other parts.

We have also provided anti-glare screens. One last item in the office, we are trying to utilize more and more is a technology called EDI (i.e. electronic data interchange). Much of what we as an industry receive in orders from our customers requires key punching to put into our systems. We are trying to do more and more of this activity electronically. It is a struggle sometimes due to the demands placed on our customers' MIS departments from other segments of their business.

The other area that we get into involves the employee, and one of the most exciting ones is what I call our exercise program. As I mentioned earlier, we used to see seasonal problems with backs, stiffness, strains, you name it, and we began to look at what our people do in the warehouse. We started to realize that in reality, they have the exact same needs that a trained athlete has. So we brought in a physical therapist who worked on a three part program. The first part was to talk about spine mechanics. How are we built? What did evolution and nature give us back here in our spine and in our legs that allow us to do anything? How do we know when we have exceeded the design limits that nature provided us?

Once our people understood the basic mechanics of their construction, the therapist then went into talking about what are proper lifting techniques, and pulling/pushing/ bending techniques. Lastly, we went into a series of exercises of two types. Remember, it is no different than a professional athlete. Our people are professionals, and we look upon them as an athlete in the sense that you never see an athlete at any sport that attend not warm up before they start. So our people do warm-up exercises that they have been trained to do, and they do stretch exercises. If you ever think about it, after half time what do you see all the athletes do? They stretch. They are still warm, so they don't need to warm up, but they still need to stretch. So our people also have been trained in stretching exercises to do after they come back from lunch break or an extended break of not doing active type activities.

Now, to make it easier for people - and quite frankly this helps a lot - it is mandatory, and we pay them to do it. It is on our time. It is not on their time. They don't have to come five or ten minutes early to do it. We don't do it in groups like you think of the Japanese doing it. They do it standing by their forklift or whatever. There is nothing fancy about it.

Somebody mentioned belts, back belts. We provide those when a man or a woman wants them. However, they have been trained to understand that a belt is not necessarily there to give them support. It is in many cases a better tool as a reminder that if they turn one way, they get a certain



sensation that reminds them that they are not doing it correctly. We don't rely on the belt to give the support.

Management was included in all this training. The office also went through a similar process for they have certain types of exercises that they do, et cetera.

Now, in order to make sure we were all on the same wave length, and particularly the middle managers because they are in the trenches on a daily basis, we had a special formal training program where they became sensitive to unsafe situations and practices. They are the ones, in addition to the work people, who are actually there, who are walking, looking and seeing things and we needed them to be able to walk by a situation and say oops, wait a minute, maybe you should do it this way, gee, this doesn't look like a safe practice, etc.

The other thing we have done, which most people are doing, is forklift training. All of our drivers are certified, and one of the things that we do is we don't throw a new person out on the floor and say go to work for eight hours driving a forklift. It is no different than any of you. I have a daughter who is 15 who has a driver's permit. I would never allow her to run out there all by herself for eight hours. Why would we do that with somebody on a forklift who is driving in a closed environment which can be very dangerous? So we start them out maybe a couple of hours at most here and there so they slowly get used to it, as part of their training. Then we also team couple them with a senior person on a buddy system so that over a period of months they can begin to ask the questions that they need to get answered with a senior person. We also utilize refresher sessions during our safety meetings.

Monthly safety meetings are run by the chairman of our company. That is how important we consider them. They are in small groups. Everybody has to attend them, but what is interesting is we try to, whenever it is possible or whenever it happens include recent accidents or injuries as case studies, and we do it as soon as we can after the incident while it is still fresh in everybody's mind. We bring the person in where it is appropriate, not to embarrass them - and they understand that - but to talk about why it happened or how did it happen so that they can, from their perspective, convey what they have learned through that process.

Lastly, we have an employee safety committee which is employee run. It meets on a quarterly basis. All areas of the company are represented. They deal with studying various injury situations because they can give us the floor perspective that often those of us involved in management just can't give.

In closing, as I have mentioned earlier, we have measurable results that are positive. Our costs are down. I think this approach that I have tried to quickly give you is a successful approach. I think it is affordable and manageable for small business, and I think, quite frankly, it is the right thing to do. Whether it is the right thing to do because I need to protect a skilled work force or because these are my friends and my neighbors or because we care, we all work together as a team. The key that I want to leave you with is that it is the right thing to do. Thank you.

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## Question and Answer Session

MR. JENKINS: Thank you, Richard. Now, I think we have just a few minutes for any questions that anyone might have. Who would like to lead off? Okay, we have one. Go ahead.

Q : I have a question generally directed at the warehousing industry. As you people probably know, OSHA is coming up with potential standards in ergonomics. Prior to that in the past in some draft regulations has been the use of the NIOSH lifting equation as part of the OSHA standards. In my opinion, it has a very bad affect on the warehousing industry or anybody that is stacking cases or pelletizing or depalettizing cases or bags or anything like this. Have you people addressed this and do you feel the same way I do?

MR. MURPHY: Well, let me try to answer that from a general perspective. First, we think a common sense practical approach to all of these programs are what is appropriate, and, in fact, just before this sessions started I was having a conversation with Dr. Waters from NIOSH about our becoming involved in doing further examination of warehouse positions to take a more practical approach to measuring the risks. I expect that we will do that over the next several months. Do any of you want to comment on that?

Q : Our experience is we sell bag goods at 80 pounds, 90 pounds, quickcrete, and things of this nature. When we did an accident review, we found that our employees didn't get injured lifting the heavier bags. Theirs was more of a repetitive lifting. You know, I see no difference between lifting an 80 pound bag and two 40 pound bags. I mean, if somebody wants 80 pounds of quickcrete, you are going to give them 80 pounds of quickcrete. It is either two bags or one bag. Two bags, I will take a chance and maybe not bend my knees, maybe lift incorrectly, but our data that we have taken a look at is more from a repetitive lifting. We can't isolate one product no matter what weight it is that would cause somebody to get injured. If they would come up with you can't lift over 51 pounds by yourself anymore, case closed, we would have a major concern with that because that is our business.

Q : Well, that was my question. It is not whether we could use this as a guideline or anything like that. If this NIOSH lifting equation becomes the law, which is possible, does this present a real problem to the warehousing industry? I think you mentioned the 51 pounds. However, if you analyze the jobs that are doing more than three or four cases or bags a minute, the 51 drops to something like 20 or 25 pounds. It goes down pretty fast when you apply the frequency factor to it.

Q : I was going to say usually in our end of the business it is when the compliance officer is in as to what we get cited for. He can see somebody buying one bag of goods at 80 pounds and

say beautiful. He can see buying four pounds, but it would cause us some major problems, that particular thing, if it were definitely law enforced. It would cause us some problems.

MR. MURPHY: That was one of the reasons why I showed that slide about the container. I think some of the questions that you raise have to be taken in light of the economy that we are all into here, and it is not necessarily just domestic but it is a world economy. What we do here will have ripple effects, pro or con, either way, and what will it do to business in the interim.

To answer your questions -- I didn't understand your question initially. You were asking if we believed that some strict interpretation of the current formulas and other guidelines would have an impact on the industry. The answer is absolutely yes. That is why we currently are so actively involved in working with OSHA and others in trying to develop practical hands on guidelines for the industry.

Q : I have two questions, if I might. The first one is for Chuck and Richard. If you guys could talk a little bit about the cost benefit process that you went through for some of your improvements, and then the second one for David is did you have the same -- we looked at a four and a half year pay back period, if you will, on some of the things that you did. Did you sell that up front as a four and a half year pay back period or how did that come about? Looking back at 1991, how did you sell the program versus retrospectively looking at it and seeing it to the point I have here?

MR. FORTE: If I can go first, the cost benefit analysis in our industry, we look at total cost of shipping, storing and moving goods. We don't try to isolate cost benefit and ROI strictly on back support, safety shoes, mechanized conveyors and things of this nature. We have a real good idea of what it cost us to ship goods. Part of that cost also included reworks on damages, rerouting because of poor sortation, accidents, the time it takes to investigate accidents, workers' comp. cost, light duty cost, what I call you can't work full tilt cost, so you are actually doing a lighter job, we are paying you a wage to do a lighter job.

But, the biggest thing on cost and return on investment is that you have to look at a total picture of what things cost you. I will go back to putting a .40 broom hanger up to protect a broom. Well, I can sit there as an ergonomic consultant or as an efficiency expert and say you are spending 1.3 hours per week looking for the broom. That is \$7.55 plus benefits. If you put the .40 broom hanger on, you have improved your efficiency. So you look at the total package of what things do for you, and it helps us out to do the cost benefit.

We try to sit in on every decision that is being made. We were involved in a planning session, and we had a five page punch list for our newer distribution centers, what we wanted. We try not to be a separate entity because then it becomes very, very difficult to give an ROI on pure safety, pure ergonomics and pure workers' comp. because some of the things, my philosophy and our company's philosophy is let me control the frequency of injuries. Costs of injuries depends on so many variable factors that I don't have a clue as to how you control the totality of it, but if no one

gets hurt and no one slips on this and no one gets hurt, then we don't have a dollar problem.

MR. MURPHY: I will be honest. We did not do any cost benefit analysis, not because we can't, but because it really didn't matter to us. We knew what our issues were. We knew what our work comp. costs were, and we knew we lived in a state that was extremely generous, if you will, on the work comp. program, and we had to find a way to stay competitive.

We also are probably much more sophisticated because of the service nature of our business in ABC cost accounting. So I know exactly what it costs us to do a service for any particular customer, and that is why the cost per hour has a value to us. This may not necessarily be what Chuck referred to, from an overhead standpoint.

MR. FORTE: To answer your question at J. C. Penney, cost benefits was not an issue in selling the program. About the only thing we discussed was cost avoidance. We saw a trend, and we didn't want the injury rate to keep increasing. So we talked about future cost avoidance. Going with the program was not based on cost savings. It was not a problem solely because I have been with J. C. Penney for 15 years now. They have always been a very people oriented company. We have extensive safety programs, rep meetings, all kinds of things, and as soon as our executive management found out that this was something that would improve the workplace for our people, it really was a no brainer.

MR. JENKINS: Next question.

Q: My name is Tom Doyle. I am an ergonomics consultant with the State of Ohio, and one of my specialties is in occupational vibration and also dealing with whole body vibration. I have measured vibration in a number of vehicles, including forklifts, and I was interested in Mr. Murphy's comments about some of the ergonomic seats. As I have recommended these ergonomic seats for warehouses, which may be similar to yours, and this is the first time I have heard objections to these types of seats. I find it very interesting.

I would like to kind of pursue that a little further, and I also wanted to ask Mr. Forte there from J. C. Penney if you have ever had any experience in changing out these seats on forklifts.

MR. MURPHY: I made those comments on the old seats and I showed the picture on purpose because it is not that we haven't changed them all, it is just that there are a few people who prefer the old seat style. Again, some of it is related to the size of the individual. It is tough to find seats to fit everybody's bulk, if you will. I am just being honest, and I am being honest about the fact that even the smaller people who are sitting there driving all day need to change their position occasionally. You can't do that as easily in an ergonomic seat. Again, the issue of trying to turn back for a bigger person is also very hard to do. So I don't have any other solutions. There are a few people that have asked to keep the old seats because of that, and we have granted that because, again, it is their preference.

MR. FORTE: At J. C. Penney we have a very large forklift fleet. We have about 600 vehicles, and we replace a lot of them each year on an ongoing basis. We have a very good partnership relationship with our forklift suppliers, and each year before we purchase we review new technology, new vehicles. We get them in our facilities, and we let our people use them. We get feedback from them. So our people would use these vehicles, have an opportunity to tell us what is comfortable, what is not comfortable. I will be honest. We are limited to a degree by what is available, but we do everything we can to make sure that we get the best equipment for our people. That includes seats, seat belts, controls, everything.

MR. JENKINS: One last question.

Q: My name is Ed Frederick. I am an industrial hygienist with Michigan OSHA, and I wanted to clear up a misunderstanding that I may have had regarding something Chuck said. You increase the size of your isles so that workers would move their feet and turn their whole body instead of twisting?

MR. SWANDERSKI: No, that was one of the options that we had. From the design standpoint, that is the way it is. We did not do that. That was one of the things I said we could do to get them to get in position. A lot of times I think that by design we force employees to do things that aren't necessarily good, but by redesign we could force them to do -- I will clarify this. We would force them to do something better in that they wouldn't be twisting, but they would be carrying, which in the long run may end up being more of a deficit than just the normal twisting motion. Is that okay?

Q: Yes. Speaking on behalf of OSHA, even though no one asked me to, the gentleman's concern here that we are suddenly going to become the box police on the weight, and performance standard versus a specification standard, that is something that I think industry always has to be concerned about. When we talk about a performance standard and then make it into a specification standard, there is an unfairness there that I think can be related back to our desire to write a violation. I think the three gentlemen that spoke today all have excellent programs, and if we do come up with a standard OSHA will go out and review those programs. Especially in J. C. Penney's case, you know that when you have a program that is run over 50 states you can have deficiencies at a given location. That is what we will be doing is going out and looking at deficiencies in otherwise excellent programs.

MR. JENKINS: Thank you. I concur with you. Keep reviewing J. C. Penney's program. With that, I would like to close the session by thanking the speakers, Chuck Swanderski of Lowes Company, Dave Forte of J. C. Penney, and Richard Murphy, Jr. of Murphy Warehouse.

## Mining

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Joe Selan, Advanced Ergonomics, Inc.

My name is Joe Selan. I represent a company called Advanced Ergonomics out of Dallas, Texas, and I will be presenting the third presentation this morning. So I will be giving you a little bit more information about myself later on. Suffice it to say that at this point I am the moderator also for the mining break out sessions.

What we are trying to accomplish here is to present to you some case studies, some success stories in the mining industry. In terms of a little bit of background about myself, I became involved with the underground mining industry in about 1981, as far as some research projects that I was doing in conjunction with the U.S. Bureau of Mines.

Back in 1981, if you were characterizing what are the demands of underground mining and what are the ergonomic issues associated with underground mining, I would have characterized them thusly: very significant strength requirement associated with the job, lifting 50 to 100 pound bags of cement or whatever, cinder blocks, trash, ber, et cetera. Very intense, although short duration endurance requirements associated with the job -- the shoveling activities, the cribbing activities, et cetera. Very extreme posture requirements associated with the jobs. Mainly, I think a lot of us think immediately about low coal situations when we think about the awkward postures, but a lot of these awkward postures are prevalent regardless of what the seam height is in our particular mine.

Environmental conditions, you can have things ranging from extremely cold working conditions all the way to extremely hot and humid working conditions in some of the copper mines in Arizona, for example, as well as the vibration issues that are so prevalent in the underground mining industry, which we typically associate with vehicles that the people are riding around in. I know some of you in the room may be interested in surface operations. Certainly the vibration issue is probably the most prevalent or the ergonomic issue that we see in surface mining operations. So you had all of these issues back in 1981.

To fast forward to 1997, how do we characterize the ergonomic issues associated with underground mining today? Sadly, I would characterize them in almost exactly the same way I characterized them in 1981, which is to say that even though we are here to talk about some of the success stories that have occurred in underground mining, the promise and the opportunity of ergonomics really has not yet been realized in the underground mining industry. I think this is borne out just by some of the statistics.

In 1984, the mining industry had the second highest incident ratio for back injuries, second only

to the construction industry. Back injuries were the leading cause of lost e injuries in the mining industry. In a NIOSH 1996 study, mine workers were exposed to a higher number of ergonomic risk factors compared to workers in any of the other comparison industries that NIOSH looked at in the '96 study.

So the ergonomic issues are there. The ergonomic issues are evidenced in terms of ergonomic analysis, as well as the injury data that we see in the underground mining industry, and yet ergonomics has really not blossomed in terms of a discipline that has really taken root in the underground mining industry and has served to address a lot of these issues.

So going into the three presentations -- and this is something that we may want to come back to when we get to our question and answers at the end of the three presentations -- I guess the burning question in my own mind is what is it about the underground mining industry? Is there something genuinely unique about this industry that has caused ergonomics to be less well adopted or less well accepted overall in the industry? I think that is a big question that all of us need to leave here with and see what each and every one of us can do to help realize the potential and the opportunity of ergonomics.

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Tim Martin, Southern Ohio Coal Company

MR. SELAN: The first presentation is going to be done by Tim Martin. Tim is the Safety and Health Manager, Southern Ohio Coal Company, Meigs Division of AEP. Tim has over 23 years experience as a safety professional in the mining industry. He currently serves as a board member for the Home Safety Association, an officer for the Ohio Safety Congress Mining Division and has served as Executive Board Member for the Meigs Galia Mason County Hazardous Material Response Teams.

Tim is active with the American Society of Safety Engineers and serves as secretary for his local chapter. He has 10 years of experience in fire and heavy rescue and is certified as an emergency medical technician and has logged over 200 hours of air medical rescue. Tim is currently working on an M.S. in Safety Management at Marshall University. He is a certified mine foreman, mine rescue trainer and mine safety trainer. Tim served eight years as Chairman of the Ergonomic Committee and has worked with developing other ergonomic committees within AEP's Mining Operations. Today Tim is going to share with us some of his experiences with AEP's ergonomic efforts. Come up and speak with us, Tim.

MR. MARTIN: I want to tell you a little bit about what we do at American Electric Power. First, I will tell you about our company. AEP Power Corporation operates about 23 major power plants in the U.S. Actually, we have one nuclear plant, the Cook Nuclear Plant.

We have over 18,000 employees. We provide service to over 7 million customers for electrical

services, and we burn 47 million tons of coal per year. We mine about seven of that, so we purchase quite a bit of coal on the open market.

The AEP Fuel Supply Division is basically made up of six operating companies, Southern Ohio Coal Company, which is located in southeastern Ohio, Windsor Coal Company, which is located up near Wheeling, West Virginia and Central Ohio Coal Company. We have a river transportation division in Laken, West Virginia, Conesville coal preparation plant in central Ohio and our Cook Coal Terminal in Paduca, Kentucky.

The AEP fuel supply system has over 1,900 employees. Again, we produce in house about 7 million clean tons per year. We transport over 22 million tons of coal by river. Our river transportation division has 14 river tow boats and about 500 barges which operate on the Ohio river. Our Cook Coal facility in Paduca, Kentucky transfers over 13 million tons by rail to barge. We operate four major prep plants, one being the largest in North America, three underground coal mines, which one holds two world records for long wall mining production.

Our typical underground operations is on a three shift production basis, five days a week. We use our weekends to do our p.m. and construction work. Our typical operation employs around 200 to 300 employees that work underground. Some facilities have surface operations, and will have up to 230 employees. We operate typically one long wall and two to three continuous miner sections per underground operation, and as Joe mentioned, most challenges in ergonomics you will probably find is due to the simple fact of the restrictions in mining height. It is not as bad as the media has portrayed the height of mining, but our particular mines run approximately 55 inches in height. There are times that some of the miners will have to perform work in conditions as low as 36 inches.

So to kind of relate that in a laymen's sense, try in the next couple days when you get home to get underneath your kitchen table and pick up about 50 pounds and carry that around for a half a mile, you might get some concept at times of what some of these miners go through. When you look at improvements in ergonomics, that is quite a challenge when you have to work in those type of conditions.

Our safety and health programs at AEP really starts with an extremely strong corporate safety culture that starts right from the top. I can't say enough about American Electric Power. Their dedication and concerns for safety is right from the top right down to the bottom. They are very concerned about each employee's safety and health, and making sure that person gets home as safe as possible. There is a very strong belief in employee training and development. Team concepts and bench marking is practiced throughout the entire system. We have extremely proactive accident prevention programs, just too numerous to mention today. We believe in cross operational audits. We do a lot of open audits with all of our operations. We have an extremely effective industrial hygiene program, and include some of this training with our ergonomics committees.



We developed an understanding for our needs for a change in ergonomic improvements back in early 1988. Our typical work force averages around 45 to 48 years of age. We are getting to be an older work force. Considering production goals, to stay in the competitive market, especially with the Clean Air Act, we have to learn new ways to be more productive and efficient. Improve safety and employee relations, that was a very important goal of ours, reduce cost and, obviously, the efficiency is the bottom line of our operations.

Coal mining is somewhat typical with other types of production and material handling industries. We see a large number of back injuries. Knee strains is what we are basically seeing a lot of today, shoulder type injuries, rotator cuff tears and a lot of neck strains. As far as carpal tunnel syndromes, we don't really see a lot of that in the mining industry for the fact that it is not related or equal to a productive line type of a setting of manufacturing where you have a lot of repetitive motion.

Early 1989, AEP Fuel Supply, set standards and objectives to initiate and implement ergonomic committees at each of the six operations. Our basic objectives were to establish a committee at each facility that would make ergonomic improvements in the values of repetitive type strains and injuries, to provide support and direction to each of those committees from a corporate standpoint, to give them whatever they need, whether it be technical or financial support, provide the necessary training for all of our committee members, particularly the chairmen of the committees, provide the necessary funds and technical support from our engineering departments and most importantly, provide some type of a method for follow-up and make sure that the proper feedback gets to the appropriate people.

Basic committee structure within our six operating companies established a charter to give some guidelines and rules of how to function and to give the committee official status. We see anywhere from eight to twelve members per each one of our committees at our sites. A chairman is elected to chair all activities, and then either a secretary or a coordinator is appointed to help document and plan the meetings.

This is a typical line-up of one of our ergonomic committees at an underground facility, you will see members of the senior staff on that committee. This is an example of one committee we have at our Mine 31 operation. The mine superintendent is actually the chairman of the committee. You will see our general mine supervisor, our safety supervisor, general maintenance supervisor, shift supervisors, belt coordinators, long wall maintenance and production supervisors, and most importantly our workers. Our Chairman of the UMWA Safety Committee is heavily involved, along with the local union president. We have just total, full support from all of our union members and officials to participate in these programs.

The official committee meets on a regular basis, we have subcommittees that are designed and broke out from this major committee. Department heads normally chair the subcommittee. It is made up of general underground employees or surface employees, operators, beltmen, mechanics, general inside laborers, just a spread of the work force. Those are the people that

know the jobs. Those are the people that know the problems in the mining industry, and to be honest with you, since they are the ones doing the work, they can be the most creative and most innovative with ideas of problems that we need to address and improvements.

Our basic committee starts out with a required monthly meeting. It is planned on a regular basis at a minimum of once each month. The senior committee will meet twice a month or however often it is needed, but at least we meet regularly once a month. We conduct surveys and audits to identify problems. We will break up into teams with one of the subcommittees to do surveys, to do audits, to do observations underground and on the surface to find out the areas that we are having problems in. Then we select projects for improvement that has any type of ergonomic value to it.

Again, I talked about the support from the top. There is a strong safety culture and the direction that the corporation gives. I can honestly say that they have empowered each committee with their support. In my years of experience, we have never been turned down for any financial support for a project. We select a project. We vote on it, and once it is voted on, we assign the project to be completed. Obviously, one of our functions is to make sure that we report back our successes and make sure that feedback is spread to the appropriate people.

One of the things we are charged with is developing action plans for solution improvements and to provide the necessary management and the support to make sure these projects go. As you have seen the list of the senior officials on these ergonomics committees, they are the people that can make these things happen, particularly with the maintenance, engineering and the senior production managers. They have the supervisory abilities to make these projects happen quickly, and make them very successful.

Some of the common projects that we have done in the mines deals with a lot of material handling, lifting devices, and a lot of new tool designs. There is a limited amount of tools that are designed specifically for the mining industry. So we have to be innovative in-house designs of our own.

Equipment modifications, the same thing. However, today most of the mining equipment manufacturers are starting to listen to us. We require, demand a lot more from these people with the specifications of how the machines are designed to fit the operator. In the past, they were very independent and really did not have any interest in helping us out in that area, but with the interest in the mining industry in ergonomics, they are starting to listen.

Equipment control redesigns and things as simple as material packaging, are key starting points. One thing that one of our committees have changed that is interesting is a miner that would do out-by work and construction work to pour concrete, would pack 100 pound bags of concrete individually by hand in some of these low conditions. You can imagine being underneath your kitchen table packing 100 pound bags. Our committees have worked with the manufacturers of these products and asked them to design bags that would hold 50 pounds or even 40 pounds of

material.

One interesting thing I noticed was one of the committees made one improvement with an administrative approach by designing a logo that would prompt the person picking up this bag to put himself in the proper posture before the bag is lifted. It is a small round logo with a person bending down with his back locked in, his knees in the proper position, making a proper lift, and it has some script on it that describes this. What is most interesting is our manufacturers put the logo on their bags for us, and I was in a local hardware the other day and saw some sack crete laying in the center isle, and our logo was on that bag. So it has gone nationwide. That came from the coal miners. It is quite interesting.

I have got a couple slides of a couple of the projects that we completed. It is fairly simple. In the mining industry, especially underground, we have a lot of power problems with logistics of getting power to certain areas. Some of the simple things we initiated was to place throughout strategic locations on the surface electrical hoists up to five tons to be able to lift some of these parts out of the pick-up trucks and place them onto a wheeled cart where they could be rolled right onto the elevator, taken underground and lifted by another electrical hoist and hoisted onto another piece of equipment. I had a personal experience with this. My grandfather at age 26 spent the rest of his life in a rest home from that very same thing of lifting a heavy item off of a truck.

An example of a stationary lifting device such as this, lifts approximately 2,000 pounds a day and about 260 tons per year. So with this device handling the material electrically instead of by hand, we are saving around 15,060 hours of labor a year which equates to about \$54,000 and about 260 tons, which is quite a bit. Another area that we mentioned was man trip seating. We designed seats with head rests, here as you see where the miners wear heavy belts with tool pouches that when they sit in their seats it digs into their back. So we made areas with indentations that would allow the person to sit better. There is a lot of seating improvements in man trips, shuttle cars, scoops, and 100 ton haulage trucks on the surface. We have done quite a bit of work in this area.

Underground shops. Things as simple as logistics. Locating shops under grounds and keeping employees from traveling clear outside to haul heavy parts. It has helped out with the reduction of exposure. As you can see, the average time to travel outside is around one hour. So the situation of traveling underground gets to be quite difficult sometimes.

Track sand for friction on the rails, employees would have to carry 50 pound bags to their vehicles, sometimes up to 1,000 feet. We installed boxes, distribution centers where the employees could pull their vehicle right up to the box, scoop the sand out. This obviously eliminates quite a bit of handling. It equates to a labor cost of over \$22,000 a year and a figure of 260,000 pounds not handled.

I have a short video clip that I would like to show you. It is a Project from our Parker Run Facility, and it is titled "The Ergo Bus". This particular project was spearheaded by our

shift foreman that was wanting somehow to utilize power tools in the mine. I will let this video better describe exactly how this works. Do you want to cue that up for me, please?

(The video was played.)

MR. MARTIN: They did a very good job on that. Just to close, we ask, what exactly have we accomplished with our ergonomic programs at Fuel Supply? We definitely have reduced our accidents, reduced our compensation costs drastically, increased productivity, reduced down time, increased a lot of employee involvement, and our relations with our employees has really grown quite drastically.

A few reductions in our lost time accidents, since we initiated the program in 1989, you can see a nice trend, a downward trend in what we have accomplished. The same in the incident rates. In 1995, we were down to 1.82. This year it is going to be just a little bit higher. So we feel like we have really accomplished a lot. Most importantly, probably one of the biggest achievements that we have made in 1995 under a rating of the U.S. Department of Labor for the area of safety for all underground mines in the United States, we were rated number two in the nation for 1995. We feel that without ergonomics programs, we couldn't have accomplished this. It had a very strong role in accomplishing this in 1995, and we know it is going to take us closer to our goals in 1997.

Thank you.

MR. SELAN: Thank you very much, Tim. We do appreciate that, and also our thanks to Mr. Glassco for his assistance on this one.

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Daniel E. Anderson, Consolidation Coal Company

MR. SELAN: Our second speaker is going to be Dan Anderson. Dan has 20 years service with Consolidation Coal Company with positions ranging from project engineer to assistant superintendent, and his current position is chief inspector at the Corporate Safety position. Dan has a BS in Mining Engineering from Penn State in 1976, and an MBA from Pittsburgh in 1983. So, without further ado, let me introduce to you Dan Anderson.

MR. ANDERSON: Good morning. I will tell you a little bit about Consol to start things off. Consolidation Coal Company, for those of you who don't know, is a rather major player in the coal market. The 1996 production was 71 million tons. We currently employ around 8,300 people, operating primarily underground coal mines. We have 18 underground coal mines running right now and three surface mines. The mines are located in West Virginia, Virginia, PA,

Ohio and Illinois. We have a joint venture up in Canada.

Back in 1992, the ergonomics effort got started in Consol, and the way it got going was that we have a safety task group that gets together every two months to kind of review what is going on from the safety standpoint of the company. This safety task group was having a meeting in April, and they started looking at the 1991 accident statistics. It became apparent to them when they were going over the '91 accident statistics that we had a problem with strain and sprain type injuries. What we had in 1991 was 170 reportable strain and sprain injuries, which constituted 36 percent of our total reportable incident rate.

We took a look at this and started asking questions as to why this was happening, and this group put together some factors. Some of them have already been discussed, but a) our work force was aging. The average age of the hourly underground worker in Consol in 1991 was 42 years old. This developed primarily because we hired an awful lot of people back in the 70's, and these big, strong 20 year olds that we hired in the 70's were now pushing 50. Two, it is a very labor intensive business. As Joe had mentioned prior to this, we still do a lot of activity that involves a lot of lifting, a lot of dragging and a lot of lugging and tugging. Three, a lot of these activities were repetitive motion type activities, shoveling, crib setting and things that go on underground which you use the same basic muscles and you do it over and over and over again.

Our compensation costs were escalating in the way these guys have already told you. Conditions underground were kind of unique. Crawl under your kitchen table, I believe, was the way Tim put it, and it is a good way to explain things. It is tough to maneuver underground. You are in a confined area, and it is just hard conditions.

Organization-the safety task group decided to go ahead and get things going. They recommended to the Executive Vice President of Operations to put together a formal ergonomics program, and what evolved from that was a fairly simple organization. At the corporate level we got things going: a regional ergonomics coordinator was selected in 1993. The regional coordinators were the Assistant Vice Presidents. From that point, the regional coordinators were in charge of selecting a mine site coordinator for the ergonomics program. The mine site coordinators typically were assistant superintendents, the number two guys at the coal mines. Once again, it was kind of important that you pick a guy at the mine site who could make things happen. The assistant superintendent basically has everybody working under him, except for the superintendent. He was the guy that could get a job done.

Let's talk about training a little bit, and I will go back up to the podium. The regional coordinators were put through a formal training session. We brought a paid consultant up to corporate headquarters and the regional coordinators went through a training session, a two-day training session where they discussed the ergonomic principles, biomechanics, muscle physiology and those kind of items. The mine site coordinators were then brought up to the regional headquarters, and at the regional headquarters they were put through a condensed version of that program. They went over the same type issues.

I will show you a couple of slides that we used at the regional sessions. This one was at our eastern region. It covered things such as the four "E's" of ergonomics: events, employees, equipment and environment. We covered the ergonomic risk factors. Of course it is repetition and posture and some of the ergonomic keys of success. I have a couple of the important ones here in putting together a program and what we found from experience was communicate, don't duplicate. Most of our coal mines are pretty similar operations, and what you find out is that if you don't communicate and if you don't document things when you are doing them, you will find everybody doing the same thing, inventing the same wheel over and over again.

Another one on this list is look for early successes. It is a very important point, and I will get to that here in a second. The mine site coordinators were given a fair amount of flexibility as to how to get things going at the mines themselves. Most of them set up committees very similar to the committees that was discussed with Southern Ohio Coal Company, superintendents, mine foremen, upper management types at the coal mine. A lot of those committees also involved the hourly work force. Another very important facet of getting an ergonomics program started is get the ideas from the guys that do the job, very important. They are the ones that can give you the best ideas.

We did a little different thing. I was a mine site coordinator at the Enlow Fork Mine at the time, and I will primarily discuss what we did at Enlow. It was a little different approach. Having gone to the regional training session, I went back to the mine and talked to the superintendent, and we decided that we were going to try to solicit as many ideas as we possibly could. We did this by going first to the foremen. We held a meeting with all the foremen at the coal mine and talked about the ergonomics program. We talked about why we were initiating an ergonomics program and asked them to take a good hard look at the jobs that their people were doing for them and see if there wasn't some way that we could improve the way they did the jobs, reduce the likelihood of injuries and also pick up some efficiency in the process.

Then we held general meetings with all the employees at the coal mine. We invited everybody upstairs into our training room and held a big pow wow. The guys rotated at the coal mine. We brought them up on a Tuesday morning and had about a half hour session with all the employees, and we asked them for their ideas also. The third thing we did is we ran an article in the monthly newsletter highlighting the ergonomics program and asking, once again, for ideas.

I was kind of surprised at just how many ideas came in and how fast they came in. We had an excellent early response. A lot of people thought we should have been doing this a long time ago, and they were appreciative of the fact that we were starting this program. So what we decided to do was to get some quick hits, and like I said before, it is very important. (Turned on slides.)

I went down to the belt line one day. Franny was shoveling the belt, and I noticed that the shovel was different than any that I had seen before. I asked her where did you get that shovel, Franny. She said I brought it from home. Now you know you have got a good employee when they bring their own shovels from home. This is a good girl. Anyhow, the shovel that she was using was an

aluminum shovel. We have used steel shovels in the coal industry for 100 years. She went to Agway and bought an aluminum shovel, and it was amazing how much easier it was to clean up the conveyor belt line that she was working on with an aluminum shovel versus a steel shovel.

The second important lesson that was learned was I went outside and I ordered six shovels. I had them put in the warehouse. They instantly disappeared from the warehouse, and if you are going to buy something and you have 30 guys using shovels, don't order six of them because I had 24 people in my office the next morning wanting to know where their aluminum shovels were. So we ordered a bunch more. It is simple, easy, effective. It pleased a lot of people, and it didn't cost much money.

Well, I am certainly not going to get an award for photography on this one, but let me try to explain a little bit. Our battery scooper car we use underground for hauling materials, hauling supplies around. What you have when you get in a battery scoop car is kind of a confined cage area. You have to curl down in this thing, and then we have these roll over lids that come back and protect your back area. So when you are driving this scoop car around and you happen to bump into something and you hit the rib, it doesn't roll in and break the neck. Anyhow, getting out of this battery scoop car has always been a particular pain because you have to be a contortionist, basically, to get this lid back up. You have to do one of these numbers and throw this lid up. This rope cage is protecting your back.

One of our mechanics at the mine was a tinkerer. He liked to build things. So he came up and he asked. He said you know, I know a better way to raise that lid. Let me spend \$15 and give me four hours and I will show you what I can do. So we did, and he came up with this. You can't see it very well on this picture, but it is a handle. It is a shiv wheel and it is roller. What it does is instead of having to go through all this motion to get the lid up, now all you do is reach out in front of yourself, pull down on the handle and bang the doors up and you are out of the scoop. Once again, it was effective, simple, and it didn't cost much money.

The unique little cart here for those of you that are familiar with the long wall. The long wall can be a 600' to 900' huge piece of equipment, and what you have to do with a long wall is when it breaks down you have to fix it. So you have to get parts up and down this face. You can find basically a walkway that is two feet wide and five feet high. So anything that you have to take down to the other end of this thing, you have to get it through this confined space. One of our mechanics, once again, got tired of all the back breaking work that was involved in dragging parts down to the other end of the long wall and built a cart. This little cart sits up on the hand rails, and what you do when you want to take something down is you put it up on top of the cart. If it is parts or tools or whatever, you strap it onto the cart and then take one hand and push it down. It is nice, simple, quick and easy.

Now, we have these in most of our coal mines right now. It is called a zip mobile, and actually the engineering print that we drew up to have these things manufactured says zip mobile because

the guy who invented it his name was "Zip".

How effective has the program been? We can take a look at statistics. It is real simple to look at some statistics and find out where you are. If you take a look at production you know instantly how many tons you have loaded just by looking at the numbers. If you take a look at what it is costing you to mine a tone of coal, it is a pretty easy number to generate. A basic IR rate for safety is a pretty easy number to generate. Some of these projects when you undertake them, it is difficult to identify just exactly how well they are paying off.

A case in point, Frank right there is carrying a cement block. Our mason is underground. Our guys who construct stoppings -- for those of you who aren't familiar with what stoppings are, it is a cement block wall that separates good air from bad air underground. What we used up until we took a look at it was a 53 pound concrete block. A typical mason will handle 250 or 300 blocks a day. It is not so bad when you are stacking this high in our mines that have seam height, a lot of seam height. They get real heavy when you get them up to this area. So we took a look at those cement blocks and decided to see if we couldn't find one that was lighter. We went to a block manufacturer and, indeed, they could make a lighter block for us. The problem with that lighter block is that the aggregate that they use is dug out of a swamp someplace in Louisiana, I believe, and it is an expensive product. So what we got when we switched to the light weight block was a .30 per block increase in prices.

That particular coal mine uses 100,000 blocks per year, and you are looking at \$30,000 a year. Can you justify that? I believe you can. \$30,000, while it is a substantial piece of money, if you save one operable back injury, you have got that \$30,000 back. Time will tell.

Other projects are very simple, very easy to calculate. The lighter block went down to 38 pounds. We went from 53 to 38. The only other problem with that particular light weight block was that because of the way it was designed, the aggregate, we went from about 2,200 psi compressant strength down to about 1,100. So we loss some strength in the deal also.

The scoop works. Once again, we talk a little bit about a scoop. When we set cribs in the coal mine -- and a crib is like a rectangular log looking thing that you stack blocks up on top of one another and put them up on top of the roof to hold your roof up. When we do that underground we unload them in palettes, and a typical process prior to having these extended scoop forks was a two-man job. One guy got up. He wrapped the chain around a set of palettes, drug the rope off of a scoop. The operator in the scoop then drug these two palettes back in. They went and did the reverse process to unload.

We took a look at that process and went out and spent \$12,000 on a set of extended forks. We put that onto a front end of a scoop, and what it allowed us to do is instead of unloading two cribs at a time, we can unload three. So we went from delivering 120 crib blocks per trip up to 180. Also we eliminated one guy. He didn't have to be here. He could be doing something else because these things you can operate them from inside the scoop cab. It is very simple. We went in and



did time studies with this operation with the industrial engineers. What it proved is that we were getting a 30 percent increase in productivity on this particular operation. If you do the math, those scoop forks were paid off in a matter of months.

There are easy ones and tough ones to justify or to look at or to try to figure out what the results are going to be. Now, has the program been totally wonderful? Well, we have got some things that we need to do yet. Mostly getting that communication thing going from the mine site, back up to the plaza and then back down to the mine site. In my current position, I get to go around the company and take a look at all the coal mines, and what I see as I go around is that coal mine A has already figured out a problem, and coal mine B isn't there yet because we haven't done such a good job communicating.

We are taking a couple of steps to rectify that right now. We are putting together an ergonomic data base. The data base is set up on a data base management system. It currently has about 300 entries in it, and what we are going to do with that is get it dispatched to all the mine sites so that if they are going to do something with a scoop car, they can ask a couple of questions to the d-Base management system and find out what people have done with scoop cars.

The second thing we are doing is we are going to put a picture catalog together. A picture is worth a thousand words, but basically we have taken and documented our ergonomics projects, taken a picture of it, and this is Franny with her aluminum shovel, and we are going to put together a catalog that we are going to distribute to all the mine sites. That should also help in getting the information out there and getting it to everybody that needs it. I brought some other slides with me just to show how simple some of these projects can be. This guy designed a tool that -- we used to do this particular job. It is taking a pin out of a piece of pan line. We used to hit it with a hammer and bang and slam and break things. This guy got tired of doing that. he designed a little tool for popping these pins out. It is simple, easy and effective.

Dragging tubes around the section, it always came with little rings on them, and we did this for 100 years. A ring you could only get two fingers in it. One guy said why don't we put a loop on there. We went to the manufacturer to get a loop put on the tubes so now you grab them and drag them around with your whole hand.

This guy is putting up a roof support. He decided that it would be better if we prepackaged those particular type bolts, as opposed to carrying all the parts around. He was right. We had the manufacturer do that. We saved them money because their palette costs were cheaper, and we saved ourselves money because it was a lot easier to handle.

I will show you a couple of real quick complex projects. That is a belt tailpiece, and somebody had the idea that those jacks that you see sticking up in the air used to sit separate from the tail piece. So when you moved the conveyor belt, you had to tear down jacks to put them on the tail piece and go through a bunch of motions. What we do is we just attach them to the tail piece

so now when the tail piece moves the jacks go with them. It is a very simple process.

We have a set of rail trucks for recovering rails. A rib protector that was attached to the continuous miner. It is a fairly expensive project but one that has paid great dividends. We haven't had a guy hit with a piece of rib since we put those on the machine.

What this slide shows is a crane similar to the one Tim showed you on the ergo bus. It is kind of ironic that we use these two particular guys to do this. They are both body builders. As a matter of fact, the one on the back is the former Mr. Ohio. He could pick that whole jeep up if he wanted to, but in handling heavy parts, the crane comes in real handy.

Just in closing, I show you that all projects are not a success. We gave a shift foreman an assignment to try to figure out how to advance tubes through the face a little quicker than what we were doing. He decided that maybe if we put this ring gizmo up we could slide them instead of attach them the way we normally do. I had my doubts when he came to us with this proposal, but we went ahead and tried it anyhow. It didn't work. So not everything is a success.

I thank you.

MR. SELAN: Thank you very much, Dan.

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## Question and Answer Session

MR. SELAN: Let's go ahead and open things up to the audience here. Sir, do you have a question? Could you direct it to whoever?

Q: Yes, I am Scott Schneider with the Center for Workers Rights. There are a couple things. One of them, with regard to Cypress Amax, I guess, what I am wondering is: Is that the extent of their ergonomics program or are they doing all the things that AEP and Consolidated are doing also because it seems to me that you are doing a disservice to the workers if you are not reducing the physical requirements first to see how far you can reduce them, before you start selecting people out. It seems like then you are doing a disservice.

MR. SELAN: We are taking a look at what are the engineering controls that are available to them, and the engineering controls are going to be, hopefully, systematically worked into the work environment. The physical ability test battery is something that could be plugged in immediately. The engineering controls are something that are more a long term gradual phasing for Cypress. Yes, it is not being disregarded by them at all. I think there are benefits associated with taking a look at what are the things that we can be doing now to reduce injuries in the workplace, as well as what are the things that we can be folding in on a more long term basis.

Q: I have to disagree. I mean, I don't know the mining industry that well, but I have worked in the construction industry, and I have done some ergonomic work with firefighters who have very high physically demanding jobs. You would be amazed at the changes that have gone on in the last 20 years in both construction and firefighting. If you talk with firefighters and they say oh, yeah, 20 years ago we had these very heavy turnout coats. Now they are lighter weight. We had brass couplings, and now they are made out of plastic. We have lighter weight hoses now, and all sorts of things have happened.

In the construction industry there is a lot more power tools being used. There is a lot more mechanization that is going on. There are enormous changes that have gone on in the last 20 years, even though it seems like it may be the same job. I am sure the same is true in mining in a lot of respects. The equipment has changed tremendously.

MR. SELAN: Yes, I don't want to over simplify my position. I certainly am willing to admit that there have been improvements in the underground mining industry. There certainly hasn't been that level or degree of improvement that we would like to see, but there have been improvements that have been made. There are still great physical demands associated with this type of work which is just not the type of level of physical demand that everybody can acceptably perform without increased risk of injury.

Q: There is also a lot of self-selection too. Not everybody wants to be a miner or aspires to be a miner because they just know that they are not even going to apply. So I think there is a lot of self-selection in there.

I do want to mention with regard to the masonry blocks, I have been working with a masonry institute, and they have been working with the Army Corps of Engineers in Nebraska developing a light weight block too. I don't know if you are aware of it. If you give me your card, I will send you some information about it. So it is available. They are also working on a lot of other things like small hoists that they have available to be used on a scaffold, which could be adaptable to a mine situation where the hoist picks up a block and puts it in place and then the masonry uses their skill to make sure it is set properly but doesn't have to use their strength to lift it and put it in place. So there is a lot of stuff going on in the construction industry that may transfer over into the mines as well.

MR. SELAN: Any additional questions?

Q: My name is Ian Chong. Guys, I have to admit that your presentations have been one of the most entertaining that I have seen through the whole day, so kudos to you all.

My question is directed to Tim. I was very impressed when you placed your slide of the ergonomics committee. You had upper management. You had middle management, line supervisors, and, of course, the workers themselves. My question is: On an ergonomics committee is there a particular reason you omitted a board certified ergonomist?

MR. MARTIN: Not really. We approached this type of process from just common sense. We have worked with other agencies and other industries that have certified ergonomists that performs a lot of their studies and research, and we have seen in those other types of industries that particular problems would be studied to death. In the mining industry, as we mentioned, the conditions are so obvious that at times we didn't feel it was necessary.

Q: But not all ergonomists are placed in the area of analysis and data collection.

MR. MARTIN: Well, we have a contract with companies such as the Joyce Institute and the Bureau of Workmen's Comp., a division of Hygiene and Safety, that has worked with us in certain areas, as well as Mr. Gallagher with the U.S. Bureau of Mines. At this particular time, we do not employ or have we contracted on a regular basis professionals in that field.

Q: That feels to me that you don't look upon ergonomists as being able to design and build prototype specific tools for a specific applications. What I am hearing from you in your interpretation of your answer seems to be that the role of the ergonomist is to make an analysis of a job, do some of the biomechanics and then put a series of analysis and reports together detailing that this is a bad job. Well, it doesn't take a Ph.D. to figure out that someone hauling 100 pound bag of concrete is a tough things to do, and that is what I am hearing from you. Is that a correct

interpretation?

MR. MARTIN: Well, our success with the projects that we have identified and our approaches to make those improvements, that I have mentioned have produced results. We have the chairmen of our ergonomic committees meet at our corporate office and present each year what has accomplished. These committees are completing around 75 to 100 projects per year per site. So there is a lot of activity going on, and there are a lot of things that have been done that has resulted in ergonomic improvements. We just haven't seen in the past a need to employ someone in that particular field on a regular basis, since we have been so active.

Q: My contention is that if you are having a brain surgery committee it is good to have a pediatricist and an internist and maybe a hand specialist, but also it might be a good idea to bring a brain surgeon in. My whole point here is maybe some of the private sector may be hearing an ergonomist's role is limited where it really isn't. Maybe by opening up your mindset as to what some ergonomists can do, not just data collection and analyzing a job and assigning an inducible rate of 6.5 on a subjective scale of one to ten, whether it is good or bad or at risk, low risk or high risk, but rather whether they can actually help you make things to implement.

MR. SELAN: Just to give a few other people an opportunity since we are running short on time, Tim, would it be safe to say that your committee has received some training in ergonomics?

MR. MARTIN: Oh, yes.

MR. SELAN: So we are not talking about ergonomic naivete here. We are just talking about unfortunately they didn't hire a consultant. So I lost a little money on the deal there, but I don't think you necessarily need an ergonomics consultant. I think we are all in agreement that you need some ergonomics expertise. Ma'am.

Q: Good morning. I am Celeste Monforton with the Mine Safety and Health Administration, and I first want to thank Sean Gallagher for putting together such an interesting panel.

My question is directed to Tim and Dan. You both represent larger companies, and what is your response to other mine operators and small employers who get frightened by the term ergonomics?

MR. ANDERSON: Go ahead, Tim.

MR. MARTIN: Thanks, Dan. Actually, MSHA, as you know, has taken a very active role in small mine safety, and I have been seeing a lot of proactive things come out of the Mine Health and Safety Academy, along with the U.S. Bureau of Mines and technical support. There is a lot of help that is available to the small mine operator, and you are right that there is a scare with the term alone, especially in some of the fields of the professional people in ergonomics, the money that is charged for doing that type of work. In the mining industry it is still a new concept. It is

hard to believe. In other industries they have been talking ergonomics for 15 years. Our company, as large as we are, really started taking that issue serious in 1989, and it is kind of amazing that it has taken that long to be that serious.

Just to give you an idea of how sort of rare this is in the mining industry, I believe, Sean can back this up. I think he searched quite hard throughout the nation for some companies that were heavily involved in ergonomics. I think you are seeing them sitting up here right now today, and we are just a small representation of what is out there in this industry, as far as the number of companies, but it is still a new field within the mining industry. As Joe has mentioned, what is a shame is that we do not need to reinvent the wheel. What we have can easily be applied to these other mines, and it is people like Sean and your group where we can share this information out with the other coal companies that we can make some improvement.

Q: Yes, I certainly believe that you have an interesting story to tell from tremendous examples, like the ergo bus, and the more you can talk about those things and let other operators know that there are lots of possibilities out there and by getting your workers involved in solutions, they don't have to be afraid of the word ergonomics.

MR. MARTIN: We try to be positive in sharing what we do. We invite anyone in to our coal operations to take tours and work with our committees. I recently spoke at the National Homes Safety Association meeting in Columbus and presented some of our projects in ergonomics.

Q: I am Sean Gallagher with NIOSH, and we have tried to work with a number of different companies, getting ergonomic efforts together. One of the big problems that we have run into time and time again is this sort of merry-go-round that goes on at different mine sites with people that are in charge with different efforts. What we will find is that we will try and get an effort started with a company and will be three to six months into this process, getting some progress going, and all of the sudden the guy who is in charge of the program gets reassigned to a different place, and what happens is that the process just gets lost in the shuffle. How has your companies dealt with that type of issue? Do you have the problem of managers being moved around, and if so, how do you get continuity with your ergonomics program?

MR. ANDERSON: The one method that we use, I think, to make sure the program maintains its momentum is that every three months the mine site coordinators are required to send up to the regional coordinators the report as to the activities that are going on with their mine site in that particular period. It doesn't sound like much, but I will tell you it is a very bad career move for you to send a letter up to that guy and say oh, by the way, we forgot to do ergonomics this week. It is a bad career move. So that kind of keeps the program going, and I discussed a little bit about some things we need to do to get it fine tuned, so to speak. We are not getting the information out and about as well as we should. That is one method that we use.

As far as people getting transferred and stuff, it happens all the time. You reappoint, and physically we reappoint to the next guy that assumes that particular position. Like I said, it is

usually the assistant supers that are pulled. So the next guy that becomes the assistant superintendent, he automatically assumes the position of ergonomics coordinator.

Q: Hello, my name is Robert Smith. I am a district industrial hygienist for the Mine Safety and Health Administration in Western Kentucky. I have been in mining for about 26 years. I have a masters in industrial hygiene and environmental health and mine safety.

Ergonomics has been in mining for a long time. We call it material handling safety. They didn't even come up with the term, but when you look at the statistics and see that this is where you are getting a lot of injury and you start doing something about it, it is ergonomics. They bring in 50 and 100 pound bags of material on palettes that are four or five feet high. They send them underground, and it hits an area where it has to be lowered, and they manually start repalettizing this stuff. They get a hold of the company and say put these half height, and that eliminates that repalettization. They are using a 30 pound adjustable wrench to tighten up roof bolts, truss bolts, and they look ta the problem and look at that all this is done at shoulder height bent over, and they decided to go to an aluminum wrench in weight saving. This stuff has been going no for a long time.

We have got miles to go, for sure, and there is a lot of room for the specialist, the ergonomist, in mining for sure. So I just thought I would bring that about.

Q: Hi, my name is Mike Robotco. I am with the Mine Safety and Health Administration's Denver Technical Support. Dan, first of all, I think you really gave an enthusiastic presentation. As I look at your organizational chart, you said that one of the problems you have is communicating down to the three levels so that you don't duplicate the same things at each place. Have you done anything about communicating some of these engineering solutions to say the long haul company, say the zip mobile, for instance? Has anything been done about that or are you planning on doing anything like that?

MR. ANDERSON: The safety task group that works out at the corporate level, we deal with equipment manufacturers with that particular group. They have had equipment manufacturers modify machines specifically for our use that have ergonomic principles built into it. The thing such as the zip mobile, no, to tell you the truth we haven't gone out there and publicized it very much. Anybody that has been underground at our mines – and we are pretty much like Tim. We take a lot of people underground. We give a lot of tours. They see these kind of things, and they are welcomed to use them. But, we haven't gone out and done any publishing or sold those ideas to anybody, no.

Q: Hello, I am Marie Haring-Sweeney from NIOSH. I had a question for Joe relative to the physical ability testing. I don't know much about it, but do you know what the predictive value of the physical ability testing is five or ten years down the road? For example, you have a young man at age 25 can lift 100 pounds regularly on the day. What happens five years from then when he has been doing this job over and over again and the population ages? It would seem to me

that the predictive value is not very good.

MR. SELAN: Again, we have not done perspective validation studies in the underground mining industry. We have done them in other industries where we have looked at now a maximum length of about five years and still seen injury reductions of the orders that I spoke of after a five year period. Now, is there some period in time where the predictive value of these things does start to diminish? Probably you are right. There is going to be that point in time, but certainly it has at least robustness over a five year examination period.

Q: I guess my point would be something like what Dan Cimmino talked about yesterday. You might as well fix the problem, as opposed to trying to fix the individual and then you could have a lot more people working in that particular situation.

MR. SELAN: I hate to come across like I am heartless and we are looking for some mining super race out there. What we are looking at here is just saying this job requires you to lift a 50 pound bag. Demonstrate to me that you can lift a 50 pound bag, and the job is yours.

Q: Have you applied the NIOSH lifting equation to a lot of the current lifting jobs?

MR. SELAN: The NIOSH lifting equation-you would be hard pressed to find manual handling activities in underground mining that do not exceed the NIOSH recommended weight limit.

MR. MARTIN: I want to make one last comment to the gentleman who is before you. When we talk about sharing information with other companies, manufacturers, we noticed when the mining industry was healthier and there the production and sales of equipment were running extremely high, I made a remark that the mining equipment manufacturers seemed to have a personality of their own and acted very independent. I think one of the things that has helped is the fact that the mining industry has taken a little bit of a slump, and sales of these pieces of equipment has been a little bit lower. They really have to listen to the customer a lot closer now, and the little things, for example like the bag with the symbol on it that the manufacturers came right in and jumped on, we are seeing the same thing from the equipment manufacturers.

MR. SELAN: Additional questions from anyone in the audience? If not, on behalf of the three of us, we greatly appreciated all of your interaction with us.





## Employee Involvement

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Ron Gillespie, Farmland Foods, Inc.

DR. ORTA-ANES: Our first speaker is Ron Gillespie. Ron is a Director of the Safety and Employee Relations Department at Farmland Foods in Kansas City, Missouri. He is a professional member of the American Society of Safety Engineers, and I hope that you will join me in welcoming Ron.

MR. GILLESPIE: Good morning. I see so many familiar faces in the audience that I am beginning to believe that we are preaching to the choir. My role today is relatively quick and easy. I am Director of Safety and Employee Relations for Farmland Foods in Kansas City, Missouri. Farmland Foods is a division of Farmland Industries, the country's largest farmer owned agri-business cooperative. It consists of 11 plants in seven states and 7,000 employees, all engaged in the slaughter and further process of pork products.

I am curious, and I am going to pull away from my prepared notes. By show of hands, I would like to see in the audience how many of you have ergonomic programs presently in place in your company? (About 1/2 hands.) That is amazing. That is amazing and gratifying.

My role today is to identify the issues leading up to our company's decision to recognize the need to implement a successful ergonomics program and the positive results that have come from that program. The UFCW in the late 1980's consciously adopted a strategy of going to the public with tales of falling wages, increasing line speeds and an alarming increase in the frequency of in-plant accidents and disabilities. When a lengthy series of strikes failed to reverse their fortunes, the union sought out a sympathetic forum in the media lead by a local newspaper, The Chicago Tribune, the front page series charging red meat packers with allowing "thousands of workers to suffer crippling injuries as they process cattle at relentless speeds." Nationally, public attention was focused on the irresponsible and uncaring meat industry.

When that happened OSHA stepped in, and a way to guarantee to get most companies attention, they proposed a \$3.1 million fine against one large packer in May of 1987. It followed in approximately 18 months a proposed \$1.3 million fine against another large meat processing company. Finally, OSHA proposed what is known now as the Ergonomics Program Management Guidelines for Meatpacking Plants. OSHA stated in this document it is essential that workers or employees in Standard Industrial Classification (SIC) Code 2011, which is the meat packing industry, and related industries adopt an appropriately comprehensive program.

Why did Farmland adopt these guidelines? Basically, because the proposed guidelines should be made, not just for the meat packing industry but for all industries. They should not be made because of union or media pressure but because it is appropriate and morally correct. There is no profit, financial or otherwise, in maintaining a process that harms the health of both the work force and the bottom line. Working people outside their capabilities, like any other machine, will cause breakdown.

Those of you that have experienced the repetitive motion disorders, those of you in the audience that have worked in the meat and poultry industry recognize it is very difficult work. It would be nice if they produced hogs or cattle that would fit automation. They do not.

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Terry L. Stentz, University of Nebraska

MR. GILLESPIE: At this point I would like to introduce Mr. Terry Stentz. Terry is our ergonomist, working out of the University of Nebraska in Lincoln. They do things besides ergonomics there. I can't remember for the life of me what it is. It is something about a big red "N" on everybody's chest and an oath of allegiance when you enter the state to the University's football team. Terry is a consultant to Farmland and not an employee of Farmland, but works with our plants and the ergonomic work teams. At this point, I will turn this over to Terry.

MR. STENTZ: Thank you, Ron. I appreciate the introduction, and it took 4.3 minutes rather than two and a half.

MR. GILLESPIE: I did a good job, though.

MR. STENTZ: So I will try to zip through this. I am going to put an awful lot more on the screen than I have time to talk about and probably you have time to comprehend, but I would like to touch on the high points of each one of these topics. If at the end we have some extra time, I have some slides in the back and can show you some examples of some of the things that people have been involved with, e.g. line workers in creating ergonomic solutions. So I will describe the program, talk a little bit about employee involvement, talk a little bit about problem solving and then give you some impact information.

Ron talked about motivation, and David Alexander has spent some time speaking and writing about this. My mentor, David Cochran and I definitely agree with Mr. Alexander. We definitely see a fair regulation started this, but you know as time went along with an ergonomics program I have observed that love of profit also enters into this picture and that you can learn to make money with ergonomics. If you put ergonomic problems on the line, generally that means that there is also something to be gained by straightening out a process.

Finally, I think it has an awful lot to do with vision and values. It is my opinion from the outside looking in at Fastrand that this idea of ergonomic change and its benefits for everybody that is involved is so ingrained now in the culture that there is no going back. This is part of the vision for the future for this organization.

Dave Alexander and I have some counters to this. You might not want to do it because of your ignorance. You might think we are in business for charity and if you don't do this, no vision, no values, no future. That is yet to be played out.

Here is some motivation connected to dollars, and often times the ordinary employee doesn't know this information. We try to make this available to them. In 1991-92, the workers' compensation cost for the plants that were operating were 2.6 million. One way of looking at this is if you are at a five percent profit margin -- I don't know what profit margin they are at or you are at -- but to break even a \$2.6 million loss, that is \$52 million in sales you have to make back just to get back to where you were. So there is some motivation there.

But, I think even more important than that, as time has gone along, again, the environmental and employee philosophy in this organization to create substantial competitive advantage by having workers involved in changing and improving the workplace and process is a key motivator. If you take care of that, the money follows behind. I believe in an ergonomic change and involving the work force of this change is also constant with many other things that we are seeing happening in the marketplace, the business place and an organizational change. I have put dots by the things that I would like to emphasize.

Most organizations today have smaller management teams, and they are leaner. They are meaner. So without employee involvement, they don't get very far. We have to have that. Particularly in the Midwest, where we are at, there is low unemployment. We can't afford to lose one participant. We have got to keep them.

Thirdly, work force demographics is a key feature, and an employee involvement, my change, our chance of having a more diverse group of people involved with ergonomics and employee involvement is a lot greater. Today if the ladies stayed home from the workplace, the country would shut down. Much of what we deal with in making engineering changes was designed by men for men's strength and size profile. So we have lots to catch up on. Ron did mention automation technology. Many of these processes are very difficult to automate. So it very much depends on the individual worker.

We have a number of objectives in our program. Obviously, the first two you already know about. Those are very important, but I would like to focus on the last two: contributing to quality, fostering innovation and helping to add value to products. When we make ergonomic change we foster innovation. We want that innovation, in many cases, to be driven from the line up. Those people down the line spend all day thinking about this job, and there are lots of good ideas down that line that would take me months to figure out, if I had to go down and observe it

as an engineer. So I think that is an important feature of the program.

Finally, we wanted to improve morale and job satisfaction, which incidentally job satisfaction, from one group to another, whether they are management or non-management does vary, and you have to be aware of that, but to have some fun. It takes about a year to get used to this idea, used to hearing ergonomics, joke-onomics. Fifteen years down the road that is not what we hear now. These people have fun doing this. There is great satisfaction in changing your own work environment and being able to participate in that. So I think we have fun, and I think that should be part of your goal in an ergonomics program.

I only have time to touch on some of the major features of this program. There are differences from plant to plant. An ergonomics program with employee involvement isn't a carbon copy from one plant to the next. That is adjusted to the type of workers we have and the organizational and operating environment that they are in. That is a key feature of being successful with different work groups. All of our ergonomics teams are voluntary. You really leverage the motivation curve when you ask for volunteers. The military figured this out a long time ago. After the battle of Waterloo there were fewer volunteers, but still an effective method of getting people to participate.

I can't emphasize enough how important it is to have experienced, motivated, fabricator type maintenance people on these teams and to get employees to interface with them face-to-face. Ongoing team training, face-to-face plant safety and health manager participation are needed to form a team. Face-to-face plant manager support and participation also takes awhile for an ergonomics team made up of mostly line workers to get used to working with the plant manager. Usually they see this person as a bad person. I only see this person when I get in trouble, but as this team starts to work together and the plant manager assumes a role no different than anybody else on that team and as an occasional visitor -- he doesn't run things -- you will see lots of progress take place and lots of understanding developed. It is amazing how quickly plant managers who get involved from time to time with the ergonomics team and are aware of what it is doing can find money to do good projects that weren't in the budget.

Guest team members, we frequently ask people off the line to come up to the team meeting and help present a case or look at a series of problems or solutions. We frequently ask supervisors to do the same thing. Never let the plant employee group think that they are not a part of that team and that they can contribute from time to time. It certainly helps get better solutions.

Again, all of these things are very key: scheduled time off the line and making those prearrangements with the line supervisor first. We insist that team members let their supervisors know what they are doing, what projects they are working on, find a time when they can get off the line, which in the meat packing is crucial. That is really tough to go do your job, take exactly the amount of time you said you would take, come back, tell that supervisor quickly that you got it done or what happened and get back on the line. Boy, the last time that supervisor has bought right into that, and they are very interested in what you are doing as a team player.

Formal annual budgets, all of our teams are directly involved with budgeting. They get a certain amount of money to work with for a year, and it is up to them, the line worker group, to figure out how to prioritize all of the projects we have got. This is a story in itself. I wished we had time to talk more about this, but to see a line worker suddenly be faced with a budget and have all of these priorities is a very interesting process. They learn a lot, and they do very well at it. I am astute of the way that they make decisions.

Sharing and trade-off between budget starts out with a lot of arguments but eventually comes around where certain people on the team, if it is a manager, will say well, I can pay for that out of my budget or I will figure out how to do that and stretch the ergo budget. This is another kind of interesting process.

Problem finders on our team involve employees. If they find the program, they find a problem until it is finished. If you find it, you have to help put the bell on the cat, and they like it.

Biweekly meetings, direct input to management, people who have to make the decisions almost always agree with what the ergonomic team wants to do. Very seldom have I ever seen disagreement there.

Face-to-face involvement with medical personnel, at least once a year we will bring in all the medical people who serve that particular plant and the outside community, have lunch with them and the team face to face with the doctors, nurses and therapists, take them back in the plant and let the team show these people around and what the jobs are, what kinds of changes have been made, what kind of light duty decisions we are making. It has a great impact. It has a terrific impact on the way in which workers are taken care of, if they have a problem.

The bottom one says, "consult an ergonomist's regular participation." In employee involvement as in the case of a driver's ed instructor, an ergonomist comes up in the front seat just a little while. Then you switch positions. They go to the driver's seat. You are there, and touch the brake every now and then or the accelerator and then not too long after that, you jump in the back seat. I do not run their programs. They run the program, and one of these days, I am sure they are going to put me in the trunk. For the time being, I am satisfied with the back seat.

The first item with a bullet on it is very interesting. We have become in the last year and a half much more directly involved with vendors and solving ergonomics problems. We are trying very hard to get vendor representatives to understand that they are no longer order takers in this work environment. They are problem solvers, and in the case of knives, stainless steel mesh gloves, manual material handling, automated equipment and all kinds of other things, we are asking them to work directly with the ergonomics team, directly with the line workers who have to use this equipment and trying to find solutions, rather than just taking orders.

We have one project underway right now with a \$50,000 piece of handling machinery that the vendor has agreed to foot half the bill because of the way in which we can work with him and

give him feedback in terms of how this helps out the process and ergonomics problems. That is very attractive to organizations.

Formal year end program and project reporting to both management and non-management, give your committee members a chance to present. No, they are not generally used to management type things like that, but it certainly builds confidence to give a floor person a chance to explain what has happened for that year in his or her area to people that are interested.

I did a quick brush through the model. The source of identifying our problems, and obviously the individual ergo team member is the principle source of getting those things identified 60 percent. That may fluctuate and change as our program grows.

The problem solving process, standard ergonomics, is real hard to do with people. If they find a problem, they want to jump to it right away. My role in the back seat with employee involvement is to let them most often do those kind of things if they can point out the right root cause and I agree with the solution. I don't usually disagree, but there are certain times when you absolutely have to do this and you have to insist on that and make them do it.

A typical year's activity for a single plant is a basic budget of \$50,000 to \$100,000, and man can they stretch this. They get real good at this, how they can squeeze blood out of a turnip. Six to 20 major projects, those are things that require capital justification. Thirty to 100 ergonomic work orders. Those are usually maintenance work orders and 20 to 50 see a snake and you shoot it. We teach them to see a snake and shoot it. That is one doesn't mess with the bureaucracy, go to your supervisor and you and that supervisor change it right there. Just tell us what you did. Two to six plant demonstration projects, and there are lots of overlap in monies and cooperation.

Accident statistics, ergonomics and safety always overlap in our program. In 1992 it was 6.8. In 1996, 2.3 -- one-fifth of what it used to be. I didn't do this. Those employees did this. Workers' comp, in dollars for that year recorded \$2.6 million in 1992, was the high. In fiscal '96, \$530,000. I didn't do that. They did it. To satisfy my mentor, Dr. Cochran, I did consider the time value of money if I look at a three percent inflation rate. There is the adjusted value, thinking in '91 dollars rather than '96.

Here are some perceptions. Look at the words I have underlined. These are statements from people who have been on the teams. It is exciting to watch. It helps them get involved. We can discover problems before someone gets hurt. It is particularly helpful to new employees. These are good signs. These are signs from people that say that I have a good attitude about this and I believe that I am making a difference.

Here are some lessons learned. All of these are important. Again, stressing maintenance involvement, the teams are made up mostly of line workers. The facilitator is a line worker, and the facilitator is somebody we have to spend extra time with helping them to be a better leader, manager, coach and facilitator. They need it, and they help teams learn how slow some solutions

can take place. One more thing here, documentation, documentation, documentation. Employees don't like to do this. They are not used to paperwork, so we have to give them an extra hand there.

Finally, what do I think the future challenges are? Number one on my list is workplace demographics, work force demographics. The fastest growing segment of the U.S. population right now are those over 80. I am a boomer. I am 48. It seems like I am moving more rapidly into that category. In 1993 we looked at the average age of the worker in our plants. It was like 38 years old. Imagine in 10 years. I mean, there is no big baby boom coming. It is going to be my age. I can't do what I could do when I was 38. So we have got lots of changes to make.

Equipment training and retention is going to be a problem, vendor cooperation and risk sharing, and I think we need some more internal guidelines because we are getting to be a larger group and learning more about this process. We need to codify more of it, not standards but guidelines. Thank you.

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Mick Anderson, Eaton Corporation

DR. ORTA-ANES: The next speaker will be Mick Anderson. Mick is the Chairman of the Region Seven Voluntary Protection Participation Program Association, and this is a chapter covering Nebraska, Iowa and Kansas. He has been the Safety Director of the Eaton Corporation for 14 years. Mick is on the Advisory Board of the Great Plains Safety Council in Nebraska, and he has represented and coordinated several out reach programs throughout Region Seven. He also participated in OSHA's VPP Invention Meetings held in Washington, D.C., as well as participated in the Assistant Secretary of Labor Grassroots Meetings for the new OSHA effort. Please join me in welcoming Mick Anderson.

MR. ANDERSON: Thank you. Good morning. Take a couple of seconds, if you want to stand up and stretch. If we could get the lights turned back on to stretch. I know it feels better for me to get up, and you need that opportunity too.

As Lida said, I am the Safety Director for Eaton Corporation in Nebraska. Our company is a worldwide company. We are located in 270 sites across the world. So we have several locations. Our particular plant makes automotive valves. You may be familiar with them. They go in your car engine or your truck. We make the valves from the raw steel to the final product. We make approximately 350,000 every 24 hours. So you guys keep buying the cars and the trucks, and we will be happy. That is one of the products that we make.

The other product that we make at our facility is precision force gears, and they go in a range of products from farm implements to heavy duty construction to recreational vehicles. The range in



size is from a two pound gear that goes in golf carts and lawn mowers to a 38 pound gear that goes in some farm implements. So you can see we have a lot of opportunity for several ergonomic inventions.

Eaton Carney is a voluntary protection (VP) site, and this morning in the general session you may have heard David Carroll talk about VPP programs. The Voluntary Protection Program (VPP) is an OSHA sponsored program. What it does is it recognizes and encourages facilities across the country to promote good safety and health programs. There are certain criteria that you have to meet to be a VPP site, and then that is laid out in a program that they offer. If you are interested in the VPP program or if you have never heard about it before, there is some literature in the hallway on the table. The VPPPA, the association that helps promote the program, has a table set up, and they helped sponsor the workshop this week. So if you want to pick up more information on a VPP site, you can do that out in the hallway.

When we talk about ergonomics, I would like to look at two different levels of participation in ergonomics. The first level is probably the traditional ones where you call a meeting, everybody shows up, one person directs that meeting and they stand up there and pretty much carries through the meeting and all the employees are involved because they are sitting around the table.

The second one that I think everyone would agree upon that probably is more effective is when you empower the people to make the solutions, to come up with the best practices that are going to work in their operation. Here is a couple of examples or case studies of some ergonomics that we have done as far as team participation. The first one is how we have designed our teams. In order to come up with solutions on ergonomic problems we selected the ergonomics team. We read all the information and listened to people talk about having a wide variety of representation. So we have tried to take someone maybe from engineering, someone from maintenance, management, and that is good representation. Then we went out and looked for problems and tried to solve them.

We were somewhat successful in that method, but as opportunities arose, we suddenly found ourselves not having the key personnel to solve that problem. We may have an engineer that wasn't as familiar with this operation as they might be in our High Bay or Forging operations. So we looked back at our ergonomics team and said we need to maybe look at where the problems are at and then go out, select the people from that area and design our ergonomics team. It may not have looked as nice on paper. The flowchart says this is our ergonomics team and it will always be our ergonomics team, but it was more effective for us to get the right maintenance.

If we made adjustments to the workplace from the maintenance in a different department, and they had to come in and make improvements on that or fix that operation they weren't as familiar with it and maybe not as likely to work with those issues then when we look back and look at success stories by going out and finding the ergonomic opportunities, develop the team around there and maybe get the supervisor from that area, obviously the operators, but also the maintenance and engineers that may have a specialty in that area. How many would agree that

employees are probably your best resource on ergonomic problems, developing solutions? How many would agree that we always get the best information out of our employees to solve those problems? If we know that they are our best source of information for developing ergonomic solutions, we should always get that best information. I know from my own experience that looking back we maybe don't always get that information out of them. We didn't always get all the information that they had about that operation, how they could make that better.

Does anyone maybe notice, maybe in the back that we have some different bottles up here. What is different about these bottles? They are all different size and shapes, like every one of us in here, like everyone out on our work force. We are all different sizes and shapes. Not only are we differently made up in different size and shape of body mechanics, but probably something that is more important, we talk about effective employee involvement, as we are all different in personalities. As many different bottles and shapes are in here, we have as many different personalities in this room. That is a very key part of ergonomics, getting the information to solve the problem.

Let's take for example this bottle's personality and see that. This person comes to the meeting. We ask for information. Look at that. It probably flows out pretty easy. It is not restricted. Everything is pretty open. They don't have a problem communicating. They understand what we are trying to get, the information out. That is great. It is probably not that easy because at that same meeting we have this person. This person has a hard time explaining their ideas. They have some great ones because we can see they are full of great suggestions down here, but it takes them longer to communicate that. They have to channel those thoughts out. It is not that they don't want to participate. They may be intimidated by people in the room, and as much that we would like to believe that we are all neutral sitting in there, they know who is in management maybe, engineers, but they want to communicate. So we have to be very careful in our ergonomics program that we don't make things too complicated. We have to be careful that maybe we take them and get with them in smaller groups. They are more willing to share their information if they are not sitting in a large environment. It is very critical. Maybe one of the most important things that we have to do when this individual is on our ergonomics team is be patient. (Long pause) That was less than 30 seconds that I didn't communicate with you. Everybody was wanting to help me out there, like maybe I forgot what I was going to say. Maybe I did, but we have to be patient. They have got great suggestions. We just have to be patient with them and help get those suggestions out.

How about this one? Anybody ever have to deal with this one? That is the lid on it. Number one, we have got to figure out ways to get that lid off. We can't get information in, and they are not willing to give information out until we can come up with ways to get the lid off. They are resistant to change. They say things like, "Never going to work, no. We have done this for 20 years. It is not going to work that way." So we have got to come up with ways. How are we going to get them to change their thought process? What are we going to do to get them to get the lids off? Maybe set up some time frames. Let's try it today or let's try it for a week. If it doesn't work, we will take it off and we will redo it the way you used to do it. Give them some

outs that they are not totally committed because they are not a committed person because they don't even want to share information. So we set up some time frames that might work with them.

What do we have here? It might be something if the lid comes off. Someone sees the bottle half empty instead of half full. They find all the things that aren't going to work in this project instead of the things that might work. We probably have some of those. Maybe not, but what we do is try to focus on the things that are going to work. Let's focus on this part of the bottle. What do you like about this that we have changed? Then it is easier to expand instead of saying let's list all of the things we don't like, and pretty soon we are out of time. So let's look at the things that we do like, the things that we think will work, and then let's expand from those rather than focusing on the ones that won't. It is a lot easier.

I know this might be difficult to see, but right here is a little beaker with a little spout out here. You definitely want to have them in your core. They are not really willing to share information on their own operation, but they are willing to pour into other operations. Maybe they have a knack for that. If they like that kind of stuff, let's use these. They are willing to give input on an operation that doesn't affect them, but they see the benefit maybe for that individual or for the whole company.

What do we have here? A wide mouth mason jar. You probably don't have any of those in your groups, but we really need to be careful. You always have someone that really wants to carry the group. Saying things such as, "Well, I am speaking for the whole operation here" or "We really don't want to make those changes." Just because they are the loudest, maybe the next five in that operation really want to make the changes, but this puppy here is the one that we listen to because they are the loudest, the one with the big mouth. So we have to be careful not to allow someone to say yes and no.

On the same hand, we have to be careful not to say yes, that is what we want to do, we make those changes and then a week down the road those other four or five people aren't happy at all and it is not going to work. So we have to be very careful and selective that what we listen to is factual, we get the good information in. We use these wide mouthed mason jars. They are our best salesmen. When we have success stories we let these people be involved and tell everybody how great that is. So they are very useful too.

How about this little individual in here? You know it would be great to say we have 100 percent participation on teams, but you know, some people just don't want to be on a team. It doesn't matter what you do, how wonderful you make that team sound, they don't want to be on a team. Is that all bad? They probably still have great information, good suggestions for some ergonomics at their operation, but they don't want to participate in the team. They don't feel comfortable. For whatever reasons, they don't want to be on the team.

So what we have to do is come out to their environment. Don't just say they don't care about their operation because they didn't come to the meeting that was scheduled at 9:00. We will

come out to their operation. We will get in their environment. We will make it easy for them to give us input. Maybe we will take notes out there, make up some mock demonstrations of some changes that might be made. It is not that they don't want to participate as far as giving you information, they just don't like the team setting. So let's make sure we utilize those individuals.

My last one that I will share with you, if you can see that, that is a bottle with six sides, six sides. That is my ergonomics champ. He or she sees things from everybody's point of view. They can see it from management, the operators, engineers and maintenance. They can just have a way about them that they can see things, how things are going to work or how improvements can be made from several points of view, maybe even an accountant's point of view. I might be stretching it, but they can look at things a lot of different ways. Those are the people that may be the core of your employee involvement, people that have a knack for looking at things several different ways and at different levels also.

As you have seen, we have just touched on a handful of the bottles and sizes and shapes and personalities, and it is very critical that we include everyone of these to get good information. In closing, I guess I would like to stress that employee involvement can be your best resource for ergonomic solutions. As you have seen here today, it is tougher than just having meetings, saying we have employee involvement, we invite people there. Ergonomics is about people, and our challenge is to develop ways not only to implement solutions for problems that affect different sizes and shapes of people, but we really need to come up with methods to get good information out of people, to have effective employee involvement. Thank you.

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### Question and Answer Session

DR. ORTA-ANES: Can we get the lights, please? I guess we will open the floor now to question and answers.

Q : Lida, are we to assume that the recommendations generated from the participating team were exactly that of the non-participating employee team or were the same modifications, recommendations and changes exactly the same for both teams?

DR. ORTA-ANES: No, different. I didn't have enough time to describe the whole study, but they had different agendas. In the participatory plant, jobs that were going to be identified from the injury records. So it was kind of a plant-wide effort. In the non-participatory plant, the committee decided to target their efforts in just one area that the industrial engineer has been working with all along. So they have different agendas on both teams. They were able to get recommendations for implementations for their respective agendas though.

Q: Hi. My name is Greg Wynne. I am with Midas International. I wanted to get some input as to how we might inspire confidence among the workers to involve themselves in a medical management portion of an ergonomics program, as opposed to their own personal physicians maybe suggesting radical surgeries and things like that prior to conservative treatment directed by the program.

DR. ORTA-ANES: Anybody?

MR. STENTZ: I think you should. That is a corporate question.

MR. GILLESPIE: The buck stops here. It is a difficult question because I presume you are in a state where the employee has the right to select a physician. Is that correct? Terry indicated that we involve the plant, in the plant the community, medical people. I don't know how large a community you have or what the selections are or choices available. If you involve the medical community in your program and get their buy in to it, it is a natural, I think, following that the doctors will buy into and not be as interested in performing what I will call radical response to maybe a non-surgical intervention.

I hope I am making sense to you, but it is a tough one. You really need to go out and work with the medical community. Get them to recognize the programs you are developing. Also understand the type of work that the employee is being requested to do. Does the type of work match the physical symptoms or subjective complaints of the patient?

Q: Actually, that is more of the root of the problem a lot of times. It seems that the employees intentionally seek out medical professionals who may attribute their symptoms to work, whether or not it is work related, you know. So they are looking for professionals that would, by nature, conflict with ours.

MR. GILLESPIE: They are either looking for or being directed to by their friendly representative attorney.

Q: Exactly. Exactly.

MR. GILLESPIE: Under most state laws -- and I am not familiar with all 50 states, but under most state laws manufacturer employers have a right to a second surgical or a second opinion. Certainly where you can help may be to control the surgeries is by utilizing that service or that opportunity. That is not an easy answer. There is no easy answer. The work comp. clause has always been interpreted liberally. It is defined that way in the law in most states, and therefore, you have just got to do whatever you can do to manage in advance. Again, our success has been in involving the medical community.

Q: My name is Chico McGill. I am with the International Brotherhood of Electrical Workers (IBEW), and I represent electricians at Ingles Shipbuilding in Mississippi. Just in support of

what you just said, one of the things that we did at our facility was to get the doctors in the local area to actually come into the shipyard. We bus them in, and we let them actually tour the facility and see employees at work on the job and some of the problems that you have when those type of things exist. Basically, what it did was it gave them a lot better understanding of what shipbuilding is and that type of industry and some of the radical problems that you have, contorting, crawling through ships and doing what you have to do in the inner bottoms. So that proved to be very successful, and I agree with what you are saying there.

It still doesn't prevent employees for shopping for certain representatives that have another interest in mind, though. That is for sure. Something else I wanted to ask you about was in your leadership training in the last presentation, is any communication skills part of that leadership training, and are all team members put through that training?

DR. ORTA-ANES: The leadership training only included the subcommittee members and the key managers of the facility. This is intended to outline and make the action plan, and that is about the extent of that leadership training. We do that at the level of the job analysis training. This is a training that is specifically targeting the committee members. We want to make them fluent in the job analysis tools. We want to be able to perform a walk-through the facility and identify problems in the shop floor and know what to do about controlling those risk factors. So those skills are at the job training, job analysis training level.

Q: How easy was it to bring people up to the same level, as far as communicating the idea of ergonomics out in the field?

DR. ORTA-ANES: Well, we did awareness level training throughout all of the facilities, and because we wanted to control how much information employees had for this study, we did not go farther than that. In the real situations, day by day situations, what we do is we will do that awareness level throughout the facility, and it will be a more extended type of training and we will follow-up with committee member's other concerns that individuals may have because they see people looking at jobs. They see the videotaping camera. They ask questions. So we will encourage the committee members to actually go out and do the role of facilitators and talk to people and try to get their concerns out as well.

Q: Thank you.

DR. ORTA-ANES: Sure.

Q: I am Susan Moyer, the Director of the Construction Occupational Health Project which does ergonomics with building trades workers in Boston. I have two questions. One thing that I wanted to mention first off of the last question was -- I guess this is a comment on the whole panel. I came to ergonomics from employee involvement. I was a bus driver for 15 years, and that is how I got into this. I ran our ergonomics program.

What I think is not represented on the panel is the extent to which there are employee or worker run ergonomics programs. Our program was entirely run by the union members, and there was an open seat on the committee for management, which never came, unless we invited them for a specific purpose. We had our own meetings. We ran our own programs. We did our own job analysis. We write our own reports. We present them directly to the bus company and to the people who they contract with. So I just think the panel was unbalanced in that way. We have only seen one version of what employee involvement means. In many cases, employees are not being invited to participate as team members but are creating the entire program.

Additionally, I wanted to add from the management representatives from Farmland and Eaton, after your initial reference to the United Food and Commercial Workers, Mr. Gillespie, there is no mention of union. Now, I assume actually – am I right when I assume that the union selects the members, and then the psychological approach of how to work with people is selective. You don't get to select. Does the union select the representatives to your ergonomics program, Mr. Anderson?

MR. ANDERSON: We are a non-union site.

Q: How can you have teams in non-unions?

MR. ANDERSON: We have probably 75 percent of our teams that are operator led teams.

Q: Do they meet separately?

MR. ANDERSON: Yes.

Q: Isn't this in violation of collective bargaining? I don't know. I am not up to date on this. I think this is in violation of Labor Law. I mean, I don't understand how you can do that. Isn't that a company union?

MR. ANDERSON: No.

Q: What state are you in, again?

MR. ANDERSON: Nebraska.

Q: Well, in Massachusetts, you wouldn't be able to do your model. I think that it is a problem because this is a paternalistic model. Who has the power? You use terms like "using folks" and "making decisions and selecting" that really indicate that the power is on one side. The people commonly have input. They can give their opinions, but what happens when an operator led committee decides something that management doesn't want to do? Who makes the ultimate decision?

MR. ANDERSON: I think it is a mutual agreement, if it is the right decision to be made. I guess when those teams meet, if they choose to have management, engineers, whoever they want on the team, they can invite to that team. I mean, there can be a team made up of several different backgrounds.

Q: Well, I just raised this as a policy issue maybe more for OSHA and VPP and what it is going to mean when we have a standard that mandates employee involvement. I mean, I think it is a real problem if the employees do not have their own organization and if they are participating in another management structure. Finally, is that signatory to UFCW contracts?

MR. ANDERSON: Most plants are.

Q: Well, then I guess my next question then, differently, to go off to something else is: Ron, you indicated that you historically placed the roots of this in the concession battles in the early 80's and the dark ages of downsizing and then went on to talk about how many management responsibilities workers have taken on. Lean and mean management means that somebody has to take up some of the functions that are not being done and a lot of teamwork means that workers begin to pick up some of the responsibilities, extra work load.

I am not against this myself, and I am kind of a conservative on this issue because I think some of these employers make work which can be very tedious. I mean, I did a job that was extremely tedious, and part of the reason I got into ergonomics is it made my job much more interesting. I mean, you know, if you do something for 15 years it is pretty routine, you know. You get the kids. You pick them up. You take them to school. You pick the kids up. You take them home. So I think employee involvement -- and I am not against it -- I think it can make people's work much more interesting, but my question is: Are people being compensated for it? How much of the wage has gone up in the red meat industry to compensate people for picking up extra work load by picking up management functions? Have the wages gone up to reflect this extra work load?

MR. GILLESPIE: Obviously, I think you probably know the answer to that question.

Q: I don't really because I don't know anything about red meat.

MR. GILLESPIE: Unions, by their nature, are required to have contracts, right?

Q: Yes.

MR. GILLESPIE: And the wages are negotiated. So whatever wage increases have been made have been through the negotiation process.

Q: Is it on the table that people are picking up -- I mean, is this seen as extra work? Is it on the table so that people can negotiate added compensation?



MR. GILLESPIE: No, ma'am, it is not perceived as extra work.

Q: Well, that may be a problem with the UFCW. If anybody were here, I would say that to them. That should be on the table. This is more work to function on the teams and to do management work.

MR. GILLESPIE: I would like to propose to you that if you were to ask the majority of our employees whether they consider this as work, versus, I think, what as indicated as really fun, they enjoy the involvement.

Q: Management knows management is fun, and they call it work and get paid for it.

MR. GILLESPIE: Quite frankly, I enjoy my work. I look at it as fun.

Q: Yes, and you get paid for it, even though you think it is fun. So that is a red herring. Okay, thank you.

DR. ORTA-ANES: Any other question or comment?

Q: I have a comment and a question. My name is Roosevelt Broadnax. I am from United Union of Leader Trades Industrial and Textile Employees. Just to comment at the young lady, (woman comments that she is not so young) I would think we are young until you get so old so you can't do anything else. I am going to be young. I think the issue here is very important and it is not in contradiction to my union belief because if I had my way, I say every company should be unionized. I think the issue is far too great and too important for us to say not to formulate any committees simply because you don't have a union. I think the worker involvement should be utilized to its maximum potential whenever and wherever it can be utilized, and when we do that we can begin to resolve some of those problems about our health and safety and how do we manage what is happening in our work force.

Certainly, unions have played a very vital, a very important role when it comes down to health and safety. I have been directly involved in a lot of these things, and one of my coworkers, Angie Rogers, can attest to that as well. So I think we do ourselves a disservice if we say we cannot, should not and will not utilize worker involvement simply because there is not a union there.

The question I do have, though, for Mick Anderson is this, and I certainly looked at your bottle example and I certainly believe very strongly that there are different segments and different people that become involved. My question to you is then how do we get that input from those people who sometimes are bottled up or who are sometimes slow about coming forth. You always have that person, and sometimes I kind of think of myself as being that wide mouth who always has something to say. But, how do you get the others to participate and come forth and share their ideas from time to time?

MR. ANDERSON: One of the things that we try to do with all our teams is take them through as much of an ergonomics training, a team leadership training for everybody so that everyone knows how to deal with other individuals and respect their thoughts and input on that and make it easier for everyone to participate in the team. That is a big part of the area that maybe I didn't get into which is the training that goes on in those individuals.

MR. GILLESPIE: If I may, I know the question wasn't addressed to me, but I would echo the same thing. The team building training that goes on is as important probably as the understanding of the ergonomic principles and the role that the people in the team play. It is critical, and it does improve their ability to recognize the wide mouth, the big mouth or whatever you want to call them versus the small and to show respect for that difference.

Q: Chico MCGILL, again, with the IBEW. I just want to make a couple comments based on some of the questions that have come from the floor. Also on some of my personal experiences right now, I am a member of the Maritime Advisory Committee. We are drafting the standard right now on safety standard programs for shipbuilding as well as the general industries, working on those and construction.

One of the things in there certainly that we have looked at and from the union perspective, myself, I understand that I would like to see every shop unionized too. That is something that union members strongly believe in, but employee participation is absolutely essential in any safety program that is put together. The shop floor is where you find your experts. You know, you can have people that are trained and qualified and titled and have Ph.D.s or whatever you want and have all of the vocabulary you need to speak on it, but the person that actually does the function, that does the movements is the person that can tell you the best thing that you need to do to solve the problems. Okay?

Now, in our situation down in Ingles, what we are doing is we are having our team members put together a little resume on themselves and what they feel they can do for the team and where they want to see safety improvements. It is going to be composed of six people, and it will be mainly union driven type programs, as far as the fact that they will select a member of management who will participate with them to get things done because of the fact that there has to be good communication and people have to feel comfortable with who they are with. A lot of these communication skills that I talked about earlier are some of the things that we are trying to teach people. We are putting them through Corey training, which is the Seven Habits of Effective Leadership, simply because of the fact that people have to know how to deal with people to communicate issues in a responsible way that people will respond to them. I think that is something that everybody will agree with.

As far as the law and as far as programs go and who selects what, the National Labor Relations Act basically says that as long as it is not a situation where the employer dominates the program, selects the members themselves and doesn't allow employees to select them and is basically setting up another collective bargaining process, than it is illegal. Other than that, you need to

get your legal advice from your attorneys. Anyway, I appreciate the panel. Thank you.

DR. ORTA-ANES: I would like to make a comment before the next question. I want us to keep in perspective that we are talking about ergonomic processes here, and I think it is only fair to have the individual that is suffering for the bad design to participate in decisions about how to make improvements to that work station or to that job. Within that framework is what we want to discuss how we would like to use employee involvement. It is very important to have the information from that person as part of the decision making of what is going to happen with that job. That is mainly the issue that we are trying to stress in here, and hopefully that is what the panel has been trying to convey this morning.

Q: Hi, I am Jennifer Shishido with the State of Hawaii. I have one question. Ninety percent of our employers in this state are ten or less, of which four of them are family members. They are president and vice president, that type. So you have got six who are true employees. How do you get employee input and involvement when everyone of them is needed right there doing the job on a day to day basis or is the solution going to be formula driven? In other words, are the solutions going to be something that is found in the larger companies and then you just export it to the small? Does the small business have to just wait until these solutions come up? I am just kind of wondering what do you do about those type of businesses? Any ideas?

MR. STENTZ: I have some involvement with small business, and I know exactly the kinds of problems you describe. I think it isn't any different for small businesses, compared to big business, and it all boils down to leadership. Your leadership finds a way for that to happen, and in some respects with small business it is much easier to communicate. People are around more, and you have more personal contact with each other.

The problem in the small business that is family owned is that whoever leads that business has to convince the other family members that they are employees of that business and that their principle job is to perform as well or better than anybody else. Secondly, to help take care of the people that are in that small company. That is a leadership issue. I don't know if there is any cookbook method that I could give you, but it is back to leadership again.

Small companies face lots of research problems, and they have to be more creative in some respects compared to large companies. My view of small business, that is what is so great about it. It is very interesting to overcome these problems creatively.

Q: I wanted to ask a question. I thought it was very interesting in your presentation, Lida, about in the participatory process that you said there was equal participation of union members and the management members of the team. I was just wondering if the other panelists could comment on their numbers, in terms of the compositions of their committees.

MR. GILLESPIE: I will be happy to. It varies, but I guess if I were to sit and think of the 11 plants, probably we are averaging on an average of 80/20 union or operator, if you will,

participation. What Terry talked about before, though, is done on a regular basis, and that is as needed, if we have people that have a specific knowledge, we will ask them to step into the meeting. So the makeup of the committee varies, but as far as input, 80/20 on any given meeting, I think. Terry, is that about right?

MR. STENTZ: I guess I could echo Ron. It varies from each project, but as I said, we probably have 80 percent of our employees on a team, and over 65 percent of those are led by hourly employees. So it definitely depends on the makeup of the project, the distribution of it.

MR. GILLESPIE: Should we go out in the snow?

DR. ORTA-ANES: Any other questions? Well, we do appreciate your patience and willingness to share with us your experiences as well. I hope that you enjoy the rest of the afternoon. Drive safely or fly safely.



## Program Evaluation

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David Alexander, Auburn Engineers

MR. ALEXANDER: This workshop is on evaluating ergonomic programs. My name is Dave Alexander, and I will be moderator today as well as presenting some of the information. With me today, I have Mike Fleming from Sara Lee Knit Products and Bill Holt from DuPont, and they will be telling me some of their experiences as well.

As we get started, let me outline their particular backgrounds. Mike is a Division Ergonomics Manager for Sara Lee Knit Products. It is, of course, a part of Sara Lee Corporation. They are a diverse manufacturer branded underwear, print wear and casual wear apparel under the brand names of Hanes, Hanes Her Way, Team Hanes and so on. Mike will present the Sara Lee Knit Products approach to effective program management, particularly covering multiple sites and how to gain accountability in the process through goal setting and implementing a measurement system designed to achieve long term continuous improvement in the ergonomics process and culture. I want to emphasize that. Mike provides direction and coordination for roughly 50 sites, both in the U.S. and off shore, and coordinating that many is a common problem that ergonomists face. Mike has faced that challenge, has dealt with it with elegance and grace, and I want you to hear his approach to how he is doing that.

Bill Holt is, of course, with DuPont. He began his career with them in 1959, after receiving a degree in Chemistry from the Virginia Military Institute. He has worked with DuPont in both Texas and Virginia. He has held positions in manufacturing technical research and for the past 17 years safety and occupational health. In addition to the more traditional duties as a safety professional, consisting of injury illness investigation and compliance to safety standards, Bill is the site resource for hazardous materials shipping regulations. He is an NRC licensed radiation safety officer and he is a site ergonomics resource and has been for this is his 10th anniversary in that role. So he brings a very interesting perspective of longitudinally measuring ergonomic programs and evaluating them. You will be able to see the dynamics of how that changes over time. Again, it is a very important perspective as our ergonomic programs mature.

The Richmond plant currently has 23,000 employees. It produces five products. Some of the exotic things that you dealt with in your safety and health career Nomex, Kevlar, Tyvek, Teflon and Mylar. A new product, Zytel«, is expected to come on this year. The wide variety of product sizes and weights and the constant construction of new facilities has offered many challenges and opportunities to the ergonomics program all the way from initial design to retrofits. So these people will be covering some very useful information for you as ergonomics coordinators, ergonomic program managers.

What I would like to do is just spend a few minutes outlining the issue of ergonomics programs and then I would like to provide some background from Auburn Engineers and some of the clients we have worked with on different methodologies for evaluating ergonomics programs. If I may, I will step down to the overhead and work from there. Can you all hear this? Is this satisfactory? Good.

When we start looking at ergonomic programs, one of the keys is to recognize that ergonomics programs, the whole area of ergonomic program manager is a complicated area. There are a lot of different facets to it. What we intend to do today is simply focus on one, on the evaluation component, but clearly there are other pieces in planning evaluation or implementation, the design of the program and all of those things that are important as well.

What has always intrigued me is that ergonomics has had such an emphasis on measurement. Its very root is in measurement, how we measure people. Unfortunately, we haven't measured the business aspects of ergonomics very well, and that continues to come and haunt us. We hear people talking about cost benefit, cost justification, program effectiveness, when are we done, when have we started, why should we do it, and all of those issues come to the floor with the business measurement issues.

What we want to do today on the panel is to present and highlight the importance of ergonomic program evaluations. We want to look at measurement systems, methodologies, some feedback groups, some management systems, how do you interact with management, how do you get them on board, what are successful strategies and, frankly, what do they tell you and why should you do them.

Many people have come to me and I have been practicing for about 25 years now and have talked about -- we have a very successful program, and I am always asked how do you know. What is it that makes a program successful? The bottom line is I look for two things when someone is telling me the program is successful. If I see these two things, I believe them. If I see one or the other, I may be a little skeptical.

The first one is the change in performance. In fact, we have made a difference. The second one is systems that support that change, so I know it is not a Hawthorne affect, somebody tampering with numbers, somebody fiddling with things or something that is going to reverse itself in a few months or next year. Then we can even look at that in a little more detail if we want to because when we look at the step changes in performance what we find is there is a continual array of measures that will change over time. At first we may look at workers' compensation costs, and our first step change may be simply to drive those down. Then we may look at severity rates. We may look at OSHA log rates and try to drive them down.

Many people stop at that point, when, in fact, there are many additional gains to be made. We can look at discomfort rates, lower risk factors and even go into more and more leading indicators, but what we want to do is continue to make step changes in our performance side.

We also want to look at the systems which influence that, and there are many systems I will be talking about them as my presentation progresses. Certainly, we have systems for identification of problem. We have systems for creating corrective actions and implementing them, for developing preventive actions and so on.

It is interesting when I talk about operating systems sometimes people don't understand exactly what I am talking about. So let me give you an example. Let's say someone in your plant has a laceration on the operating floor. A couple of things happen automatically. First, you are going to get the person to medical. You are going to stabilize the injury. There is going to be treatment if you have an in-house clinic. Pre-approved is the ability to take the person out of the plant to a nearby hospital, if that is necessary for the injury, and almost from the minute the person arrives at the treating facility rehabilitation, return to work is being discussed and planned.

The supervisor may secure the area to perform an investigation and develop corrective action, and the next morning in the work managers' meeting, they are going to be talking about what was the injury, what did the investigation tell us, what are the corrective actions, what should we do to prevent that from happening again. If those are satisfactory corrective actions, the supervisor probably is assigned the responsibility of implementing those changes and there may be communications to other departments who have similar problems.

That is an operating system. It occurs whether the safety director is in the plant or not. It is driven down to the lowest levels in the organization. It occurs automatically. It is a work system.

What happens if somebody reports a similar level of injury or illness and it happens to be a shoulder problem? The first thing we say is that maybe you will feel better tomorrow. It may not be recorded. If it is treated, if somebody goes to medical they may receive some treatment. There is probably very little interaction with the operating department. There is not much of an investigation that occurs. Corrective actions are not developed by the line organization. We call the ergonomist, if we have one in the front end, and if not, we call headquarters and see when this person can come down. Very clearly, we have got an operating system in one case. We don't have it in the other, and that is what we need. So when we talk about the systems and how they should occur, those are the kinds of things that I am speaking of.

Ultimately, we want to define the ergonomics culture. I have got one definition of this. Bill has got another that he will be sharing later on, but we can look at contrasts. I don't want to go through all of these, but if we look at business as usual, it says ergonomics is an expense. What is the ergonomics culture? It says ergonomics is an investment. Business as usual says ergonomics is required. OSHA is going to get you. Workers' comp. is too high. The ergonomics culture says we use it because it is good business, and I have reported on these in other arenas and many people have seen these contrasts and say that describes a good ergonomics culture. But, I think that is what we want to do when we look at evaluations is how close are we getting to those kinds of things.



Let me provide an overview for you now of some evaluation methodologies that we have used, and I will describe some situations where we have used these with a variety of clients, and I have got some examples that I think will be helpful for you. There are three areas that I want to discuss. The first one is to create a distinction between project evaluation and program evaluation. They are very different, and they are commonly confused.

When we look at ergonomic projects -- that is a technical aspect of a work job analysis problem solving and preventing problems. When we look at ergonomics programs that is managerial skills, planning, coordination, evaluation, execution, those types of issues. We learn the first in college. We learn the second in the school of hard knocks, if we learn them at all.

When we look at project evaluation what we find is that there are many tools. In fact, there are many established measures and tools, and frequently as ergonomists we find ourselves debating which one is the best. We have such an abundance of these things. We find methodologies are there. There are plenty of examples. Typically, there is a finite boundary and scope. We look at before and after.

When you look at program evaluations, protocols are evolving. There are more protocols than most people think because they are still in the process of evolving. There is a very small experience base and not a lot of people are really doing this with any broad degree. It is much more global in scope. You can't put boundaries around it quite as easily, and that makes it a little more difficult. So first contrast is program versus project. Program is much broader.

Second is the difference between an operating site and a corporate evaluation. It was interesting yesterday. Brad Joseph was talking about his panel and how they had one person from an operating site and one from a division level and one from a corporate environment. They are very different evaluations when you start looking at ergonomic programs. One of the things that we can do -- and those of you who have followed my work for any period of time, know that I frequently talk about an ergonomics process. How do you implement it at an operating site? You use a six step methodology from initiating to exit the process and provide maintenance. There are certain time tables associated with this. They are fairly predictable kinds of things. We know what should happen and what the timing is and how to put these elements into place.

The parallel that I draw is this is like getting a college degree. It takes about four years. It cost a little bit more than a college degree, but it is the same kind of process. If one of your children is in college, you ask what kind of courses they are taking, and if they are still taking calculus one when they are supposed to be a junior, there is a problem there and you need to know about it and you need to take corrective action. It is not to say that this can't take longer than four years because frequently it does. It is like for some of us getting through college took more. I myself crammed four years of college into five years and had a great time doing it. My parents, on the other hand, weren't so pleased with that, but we could look at this.

What this affords us to do is an opportunity for evaluation. Where are we? We can see where

we are in those steps, just like you can check the number of credit hours and how much money you have spent. In fact, we can track this at multiple sites, which is an example of one thing I did with a particular client. We were interested in where the sites were, not from a comparison standpoint as much as what resources would be made in the coming year, and we can see where people are.

A couple of interesting opportunities when we look at it. These groups, obviously, need quite a bit of resource for a period of time. We are also seeing some people up here who need to transition out and stabilize. They need to back off on some of the ergonomics efforts because they are getting there and have got good programs in place and it is time to perhaps move on to other opportunities.

This was a model that we did for a distribution operation within the state of Alabama. By the way, I am from Alabama. Maybe you all picked that up with my accent. There is something about the snow storm out there makes me just want to get in the car and drive. I don't know what it is.

But, we look at the kind of corporate environment, if you will, and what you find is that I have got to tell you the processing centers, they have very different kinds of needs. They are going to be primarily VDT operations, very different from material handling centers, which are material handling, lugging, toting, pushing, pulling, these kinds of things. Programs don't fit all of those. We need customized programs from each of the different aspects of those. We looked at the retail centers, low opportunities. We have got to have a lot of solutions, low costs, and, in fact, we can put together a big picture. This is one that I did for another organization, but as you can see, we have got different kinds of site structures, large and small. In some cases they are staggered.

In some cases they happen all at once. We have got pilot plants. We have got North American. We have got international. We have got our prevention area, engineering construction and purchasing. You should see our time table. One is out from 1995 out passed 2000. From a corporate standpoint, we can put that together. What does this become? It becomes a very nice evaluation tool. We can check off and see where we are, and it is all based on being able to predict what is going to happen. So those are very helpful.

The last thing I want to talk about is what I call baseline versus mature, versus world class programs. Most of us are stuck doing baseline kinds of evaluations. There is a lot more that we can do and based on the time. It is interesting to go back and look at how quality was measured, and we learn a lot from the quality and quality measurement systems. What we find is that in the past we used to think that good quality programs looked at outgoing or product quality. We would inspect it, reject what was bad, fix it and send the other stuff on its way. That clearly was a lagging measure. In retrospect we know that is a very immature system.

What we now know is that you can look at internal or manufacturing qualities, basically doing

things real time, fixing problems real time before we create poor product, and ultimately for very mature systems, we can use leading measure. We can look -- we know we do such a good job in a manufacturing process if the only source of variability is our incoming or supplier materials. So what do we do? We begin to work with them to make sure they can provide us with a consistent product so that our process can work effectively.

What does this have to do with ergonomics? Frankly, everything because what we find ourselves stuck in is continuing to try and measure lagging indicators. We are constantly focused on ergonomics injuries and illnesses, clearly problems that the cow is out of the carrel at that point. We need to be looking at a minimum of our internal levels which is pain and discomfort, real time where we can make changes. Ultimately, we need to get over into the incoming area, looking at new jobs, looking at tools, equipment that is coming in, looking at new plants and processes, and that will be an indicator of mature systems.

We can overlay this. When I look at ergonomic programs and how we measure there is a nice little correlation between what we are measuring in the maturity of our system. I want to talk about these three levels. One is called the baseline audit, and one is assessing the ergonomics program, and the other is an ergonomic program audit.

The baseline compliance audit is basically two pages, 31 questions, a very simple kind of document. If you all were interested in this, I would be happy to send you some of these, if you leave me a business card when the session is over. But it is more activity based kinds of things. Do you have a committee in place? Is there a written program? Do you have a coordinator? Have you done a basic review? It is all activity based. Those things hopefully lead to good results, but they don't in and of themselves insure that good results occur.

We could do a scoring on this. It is very visual. We can look at the 31 questions in all seven different areas, and we can just see the green indicate affirmative and white would indicate a gap. So you could go through and see we are doing pretty good on medical management, reasonable good on corrective actions, job assessments are in good shape, got a couple of good opportunities, one here in corrective actions, a little low on employee involvement, but it is very clear. You either have it or you don't, and if you don't have it, it is very clear what you need to do to get that.

A little more detailed assessment is what I call what we developed as assessing ergonomics program. We have been using it for about six or seven years now, and basically it looks at scoring in eight different areas, how you recognize problems, how you assess them, corrective actions, preventive, preventing problems, medical management training, how you organize and finally demonstrated results. You get a score. The total score -- we use a zero, one, two, three and four on there. Again, it is very much like the white form because people understand that so well.

Some of the questions -- just an example of what these might look like. On the use of lagging

indicators, the OSHA 200 logs and workers' compensation data, we have got five descriptions. The OSHA 200 log problem only has errors. What is that an indicator of? A very poor program. We call that a bomb. You maintain the OSHA log correctly, it may have some unrecognized errors, but rarely, if ever, will you enter the workers' compensation data prepared. That is a fairly well planned program. It is easy to do that.

You maintain the OSHA log correctly and provide an annual summary, you have reviewed the workers' compensation records for patterns of ergonomic illness and injuries, it is a fair program and so on. You just simply match up the descriptor, provide a check off, and you can do the kind of scoring on this program. It takes about 45 minutes or an hour to walk through. This is what it looks like, and again, if you are interested in that, I would be happy to provide you with one of those if you want to leave me a business card.

When you get done you see a score that looks very much like this. When you look at the bar charts, it is fairly easy to see what are these folks doing well. Good organization. Reasonably good medical management. Good at correcting problems. We have got some gaps in a couple of areas. We're not doing so hot on preventing problems. Demonstrated results are a little bit of an issue. So it is very easy to see what is going on, and it is interesting that you can look at other patterns, very characteristic patterns of things that happened. This is an indicator of a fairly weak program. In this case there is some recognition in medical management due to high frequency of problems. There is an excessive focus on administrative controls, and probably only going to obtain marginal benefits. You can see the overall total scores and the full range.

Another interesting profile is what I call the technically strong ergonomists. They are really good at recognizing, assessing and collecting problems but misses the opportunity to involve medical people and engineering people. They may not be using the organization very well and doing fair on the demonstrated results. But clearly it is an opportunity to spread this out and build it into the operation.

The last type of program that I want to talk about is comparison to world class program. I am unaware of many people who are using this, but I think it is something that we will see more of in the future. When we look at a world class program, you need to think what are the best practices worldwide. We need to use tough auditing principles consistent with ISO 9000 where we don't just listen to somebody tell us what is going on, but we look at the paper trail, we see the documentation and we see the things that are going on. It is very much systems driven. There is a plan, performance, evaluate and there are feedback loops constantly built into every operating system. If we do a design, we go through and we create a new design. We provide feedback when it is over to make sure that it has been done well.

We have got one audit that we have developed around that. In fact, it was developed by a former OSHA compliance officer who was on our staff for awhile. There are 14 areas. We didn't just take those tools and substitute ergonomics for quality. We tried to look at what the intent was. There are some things that are quite different from most ergonomic evaluations. We look at

document and form control. Where do you keep your form? How are they maintained? Are they consistently used? We looked at record control. Are those maintained? Where? For what life period? We did a focus on design control, purchasing, construction, installation and audits, some things that you may not find in the typical ergonomics program evaluation.

What does the score look like on that? Again, this is an organization that scores very well on the other programs, on the other evaluations but has got some gaps in some of these areas. You can see the documented form control, real opportunity, records retention, a real opportunity. The scores of 600 roughly out of 1,000. You are doing okay, but 600 out of 1,000 is in the D range, if you are scoring in college. So there is a lot of opportunity there.

We can see how these things change from time to time. If we look at the metrics we can go from activity based, establishing the committee, having meetings and so on to intermediate metrics which are outcome and results based. Not how many people are in the training force, but what kind of skills have they got. What kind of changes result from the training course. Don't tell me how many training course you have. Don't tell me how many hours they work. Don't tell me how many people went to it. I want to know how many tasks you changed when you finished that. So it is an outcome based findings.

Ultimately, we go to systems, looking at our surveillance system, making sure people had skills, corrective actions are in place, early reporting, all of those kinds of system. Not only are they in place, but by gosh, we audit them. We look at them. We make sure that they are continuing to work. That is very important.

I have got a few closing thoughts that I want to highlight, and, again, it is hard for me to talk about ergonomics without talking about dollars. The language to business is dollars. Somebody said that yesterday. Many times we talk injury illness. They talk dollars. Somebody has got to translate. Whose job is it? I maintain that we have got to learn how to talk. We can use that to help evaluate programs sometimes. This is an operation we worked with, a wood working operation interestingly enough.

We can look and see what were the changes. The annual workers' compensation cost dropped dramatically. The incidents per year dropped dramatically. It is a good consolidating measure that we can look at, very helpful when we are talking with other organizations about this is possible and you can do that. The fact that this is continued for a couple of years tends to say there are some systems in place, although I haven't given you any information at all about what those might be.

We have also looked at some of the other longer programs for large organizations, and we can literally project what kind of expenses you might have. You can see this is an investment driven model, investment up front. We do some stabilizing and maintaining costs later on. We can look at the benefits, which is how many improvements and what might those be worth. We can look at information to do some projection around that. Look at the applications concluded.

Again, slow start, rising and steady state as more and more people become involved. All of these things are available, and we know enough to do projections around those.

One of the values of using the assessment is to determine your strengths and opportunities. As you do the evaluations you are really missing an opportunity if you are not doing that. You need to develop your vision. What the heck are you trying to accomplish? How do you share that with management so that they have got some idea of what is going on? You can open a dialogue with your management. You know what you want. What do they want? Do they want a world class ergonomics program or are they looking for something that is more compliance oriented? Do they want it in two years or do they want it in 10 years? Over what period of time? How should it dovetail with other safety and health systems?

This is a wonderful way to open a dialogue with, and what resources are available? Okay, you want this wonderful ergonomics program. You want it completed in two years, and you only want me working on it. Frankly, that dog didn't hunt. So you can talk about resources, outcomes, results all at the same time and get some consensus around that. It also helps with your strategic and tactical plans. We talked a little bit about that and how we can measure and track results.

What are the learnings? First, program evaluation is different than project evaluation. You can be measuring lots of projects and still not program evaluation. It is a different issue. It is critical that you manage what you measure. A lot of times we are not measuring things, so we don't manage them well. Management likes measurement and likes predicted measurement. If you can tell them what is going to happen ahead of time, they are your friends. There are a lot of tools available. We can learn a lot from quality. There are many tools available for ergonomics programs. I have two that I would be happy to share with you, if you would let me know you are interested in those.

You have got to use tools that are appropriate for the job that you are trying to measure. What is your maturity level? If you are just starting out, this simple, little baseline audit may be the best tool. As you become more mature, other tools are going to be more appropriate. Measures can insure change over time. If you are using the same set of measures for four or five years, you are doing something wrong. You need to design and use feedback loops and management systems. It is very important to have those put in place.

I am going to conclude and let the other folks tell you what they have been doing, and then we will come back at the end and have an opportunity for discussion and questions.

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Mike Fleming, Sara Lee Knit Products

MR. ALEXANDER: Mike, are you ready to share with us your story?

MR. FLEMING: I feel the power. Thank you, Dave.

I will be your ergo evangelist for the next 30 minutes. First of all, I would like to thank my mother and father for their small part in me being here today. I think everybody else has been thanked.

As a part of this presentation David asked me to speak a little bit to the point of effective program management and some things that I feel like have been very effective for me. So really about a third of my presentation is solely on the evaluation side. I think there is going to be some points that you will hear me make in the next 20 minutes or so that will help you overall in your ergonomic process implementation.

I want to give you a little brief overview of what we do, what Sara Lee Knit Products does, and go through a model for ergonomic program evaluation, at least in my opinion. It essentially consists of three step: planning, executing and evaluating. This first step I say moving from Polyanna to Project manager. Who is Polyanna? Well, I was the first year that I was implementing our program about six years ago. I didn't really realize that everybody wouldn't be as passionate as I was or want to go out and do the things as aggressively as I wanted them done. So we put a few measurements in place to help with that.

First of all, most of you, I am sure, have heard of Sara Lee Corporation, but we are down a couple of levels from that. The Sara Lee Corporation itself is a \$19 billion company, and has four major operating divisions. We package meats and bakery, coffee and grocery, household and personal care and then the personal products division.

The Personal Products Division, which I am part of, is based in Winston Salem, North Carolina. It is about a \$7 billion operation. Some of the divisions are Sara Lee Hosiery, Sara Lee Socks, Sara Lee Bodywear, Coach, Isotoner, Sara Lee Direct and Sara Lee Knit Products. SLKP, at the bottom, operates on a mission to clothe the Americas from head to toe. We are about a \$2 billion operation. Most of the products you have already heard mentioned. Hopefully, most of you are wearing those. We may have a waistband check at the end of the session. I don't know.

As David mentioned, I am responsible for coordinating and implementing our comprehensive program in about 50 sites in the U.S., Puerto Rico, Central America, Mexico, Latin America and the Caribbean, et cetera. The Sara Lee Corporation has a very decentralized approach to letting

their divisions operate. So whether it is in safety and health (which ergonomics is part of) engineering, facilities management, whatever, the corporation is decentralized enough to be allowed to do the things that we want to do and the way that we want to do them.

I think there is maybe an unspoken strategy here. You didn't hear this from me, but this came into my mind a couple days ago. Maybe we are trying to fatten everybody up with the cheesecake so that they will buy more underwear. I don't know. Maybe not.

I think my comments are related to any size organization, large or small. This concept or this model -- (and this is going to be the slide that I am going to work the most from) -- resulted from my sitting down to really figure out why do you evaluate. What do we really want to accomplish? Going back to the first part of this, we have got to do a lot of planning. We have got to plan for continuous improvement. Most of you, I am sure, work for companies that are advocates of continuous improvement. These can include quality, customer satisfaction or whatever.

I think as an ergonomist or ergonomics specialist, we have got to plan for continuous improvement in our programs. If we want to move to the level that is called an ergonomics culture, where people are wanting to do this, it is in the design stage, design phase (and I have 25,000 people participating) that we have got to do a lot of things to keep the initiative going from year to year.

I am going to show you a couple of tools in each of these sections that we use to help with each step. The second phase is the execute. That is where we are doing things, doing activities, doing job analysis, employee training, et cetera, and then finally out here on the right hand side, the evaluation. Measuring the program results. You can see both the middle and the last phase move back into that initial planning phase.

What I want to learn is what is going on in the center section, and in the evaluation phase to bring back to the front end of the process, continue the process from year to year, and keep the enthusiasm going. You see benchmarking, of course, here and a couple of tools similar to what David has mentioned.

With planning I like this quote from "Alice in Wonderland". Alice came to a crossroad, and Mr. Cheshire Cat was sitting there. Many of you have probably have seen this. I see some smiles out there. She asked: Which road should I take? Mr. Cheshire Cat said: Where are you going, Alice? Alice answered: I don't know. Mr. Cheshire Cat replied: Then it doesn't really matter what road you take.

So we have got to move away from the aspect of just doing ergonomics to figure out how to use it. Why is this essential? In my opinion, management is implementing an ergonomics process for a lot of reasons. Maybe it is injury and illness rates. Maybe it is to improve productivity, to improve product quality, customer satisfaction or whatever. It should only be apparent to everybody in the room that we should be doing a better job of



implementing continuous improvement back into the ergonomics program.

David is well known for his 10 reasons that ergonomic programs fail. In my experience, after being involved with ergonomics for about 10 years, I don't think companies, at least the companies that I talk to (and some of these are Sara Lee companies) don't plan enough for continuous improvement. Companies get to a point where they have done a lot of things and they hit a brick wall. They have lost the momentum. They have lost the enthusiasm, and they haven't linked ergonomics back to their other key company initiatives. You have got quality, diversity and others. There are lots of initiatives out there.

Let me go back to the planning process and finish up on that. This first process phrase is where we get the resources together. This is where we say what do we need, where do we want to go, what do we want to do. This is when we build ownership, and the resources that we establish can be industrial engineering, it could be safety and health, it could be medical. You have got to be up front. You have got to understand what needs to be done and who is going to do what when. You may have to stop that process from time to time and say wait a minute; we are not achieving what we need to achieve or we don't have engineering linked into the process. That happens to us frequently. You have got to stop and assess where you are.

With those as priorities what I found after, again, that first year of being Polyanna, is we need to build plans into standards of performance. How many of you work for companies that have standards of performance or some similar title that your management is measured on? Okay. How many of those plans have pay at risk? If I don't get this done -- okay, still some hands up. We wanted that pay at risk, and I found out the best way to get ergonomics implemented easily without too much pain (because I don't like pain), is to put it in people's standards of performance. That is what we have done.

This is an action plan chart for the division that I do on an annual basis. Now, each facility has their own chart. They have their own plan, and what I want you to drop down to is number seven and eight here. This is where we have implemented (about a year ago) assessing our ergonomics program. I want to talk a little bit about how we did that. What the facilities are working on, is putting together a two year plan to go back to their individual assessment, go back to their section scores that are under 2.5 and then under a 3.0, and build a two year plan to bring those sections up. Well, I hope you see that where I am getting to, is building this continuous improvement loop.

Now to the middle phase. Let's move right on over there. Executing, this is where we are, again, doing things, doing projects, getting things accomplished. Those again, come off the plan. One of the things that I do to help in accountability (and this was not really well received when I first started it) is any facility that has a job analysis underway for an individual job, has to send me one of these status reports every month.

So let's say it is a knitter or a cloth inspector or whatever. I require this. It comes from a team. It

is typically hand written. The facilities send them into the Safety and Ergonomics Department Office on a certain date each month. What is going on? What has been completed? Any problems? Down at the bottom any additional comments that they would like to put like please call me, or whatever and percent implemented.

Now, where that feeds into is the report that we have also monthly. This comes out with our safety management report. It covers all the recordable, lost time, and those kinds of things for this facility and the division. The location, of course, you see down on the left-hand side. Basically, I want to put a column on here, (going back to that action plan chart) of anything that they are supposed to accomplish each year and the date that it was supposed to be done and when it was done, et cetera.

Every job analysis has to come across my desk for review. I review it, send it back, make suggestions or approve it as is, and then they put together a plan to implement. So this really helps a lot with the accountability and the evaluation, because very easily each facility manager, each director, each vice president can see where they are on a monthly basis. That really takes a lot of heat off me, once everybody gets comfortable with the system. Again, I think the more you can do on the front end (in the planning stage) when you are laying out your program to help to make those expectations understood, the better of you are going to be.

I put this overhead together to typify my belief in what we should be doing as ergonomic program managers. We should be building bridges to take us from peak to peak to peak. This is the continuous improvement process. I want to go from here to here to here to here and on up. The ergonomics culture may be up here for me. It may be right here for somebody else. It may be here for another company, et cetera, but taking the evaluation processes that we have and building from the start -- you know, a new program, initial training, setting goals, building success and ownership, taking responsibility, et cetera.

I am sure you are no different from us in what happens sometimes when we move up this peak. Things happen, right? An unplanned event happens. Some key person leaves, (i.e., ergonomics program coordinator) a plant manager changes, conflicts with other competing activities, etc. What happens? We start to slide down the other side of the mountain. Now, it is my job to see this happening globally. This gets a little challenging sometimes, but what I do is to get on the phone, make some phone calls, pay a visit to the site and say hey, folks, what do we need to do to get back on track? Then, ultimately, we use our plan to move to the next peak -- peak to peak to peak. So a lot of things are going on right here, but ergonomics program success over time, again, building our culture, has got to rely on these bridges.

Going back to my key slide -- I am not as organized as you were, David, in flipping those over. That looked real good. I learned something today.

So let's get over here. Evaluating, let's measure where our program is so that we can come back and build continuous improvement. I am going to take you into a site and show you what they

have and where they are. This is a textile operation. These are hand written in most cases. This is in North Carolina with 750 people at the site. It is a t-shirt plant, and also it makes sport shirts. This scoresheet describes each of the eight sections, the sections score, the adjusted score, et cetera, and then how they scored out or fared out or in this case I just put "Xs" out here. We could use bar charts or something similar.

I think it is important, and David had asked me to share with you some ideas and some ways that we implemented this process. It was a little bit different, I think. The first thing that I did was to get all of the site coordinators together in one location, the ergonomic program coordinators. I had David actually train them in how to do an ergonomic assessment using this tool. That helped a lot to bring together the ownership for the process. The second thing that I did the same year (again, about a year ago) when we had all the plant managers and directors together, was to give them all an update on what an effective ergonomics process was. As part of that hour presentation, I had them assess one of the sections themselves. Again, that helped to buy some of that familiarity and some of that ownership.

Each facility then (in this case Forest City) went back and did a self-assessment of their own program with their team. They got their teams together and went through the 50 questions. That score was not shared with the plant manager at that particular time, and I will tell you why soon. The next step involved me visiting each site, sitting down with the team, going through the 50 questions and assessing their self-assessment. I found out, by and large, the facility team did a really excellent job in scoring themselves. They took a lot of pride and took a lot of ownership, and this really helped to make things a whole lot easier when I went in.

As well, they were in a much better grasp of where they were and where they maybe were not. We established our benchmarks, again, a 2.5 and a 3.0. The team then developed, and are now in the process of implementing this two year plan for improvement. The other thing that I did not do, was share the scores with anyone else, or any other plants. We didn't issue report cards to say this is what Forest City did, this is what Galax did, et cetera. I didn't want the thing to be misinterpreted. Sometimes people get numbers and make generalizations about them that sometimes aren't always correct.

What I want to show you really here, though, is what Ken and his team did. They focused on Section 6, the ergonomic training and skill development and also eight which had a score of 2.0, ergonomic program results. Let me show you the action plan that they put together. This is totally without any assistance from me at all, and I think it is excellent some of the things that they have come up with.

Question 6(a)(1), employee exposure to ergonomic information. The first activity they came up with was to intensify the ergonomics training in new employee orientation. He is going to increase the topic time on ergonomics from 40 minutes to an hour. He is going to have the supervisor, twice a year have an ergonomics contact with each of their employees. Twice a year he is going to put ergonomics articles in his plant newsletters. Now, what I want you to see here,

okay, is that these are specific, they are measurable, and we can come out here on the right-hand side, put completion dates and then come back and see when he actually did these.

This report comes in to me on a quarterly basis. Then when I got out to the facilities, I sit down with the team on their program assessment and on their action plans. I talk to them about where they are, what they have accomplished, any barriers, bottlenecks, et cetera. For Ken, the site ergo specialist, he said he is going to attend at least two ergo related training sessions a year. Again, I hope you see that this is going to come back and build continuous improvement in the process. Committee meetings, he is going to start to do a better job at documenting. They weren't doing a very good job in documenting what they were doing at the meetings. So you see, and I don't think I need to go into any other examples here. I think you see how the process has worked very well for us. I am very, very pleased with it.

I realized about two to two and a half years ago that I needed something like this. I didn't realize it was called an evaluation. I just knew that we had done a lot of things. I knew that I had what David called a baseline audit. I only had 22 questions in mine. So I want to get a copy of his. He has more questions. So we had done that kind of initial baseline assessment, but we didn't have any kind of numerical scoring system to work towards.

The final three points I want to leave with you is what I expect from a good evaluation system are really three things. First, giving us an accepted program benchmark. When the facility scores themselves and when I sit down and concur with their scores -- and it typically takes about an hour and a half to sit down and go through each of the 50 questions because some of them I said well, I am not sure that you guys are quite here. So there was a lot of good sharing there. When I left we all agreed that is where they were.

Secondly, it developed a lot of site ownership. The facility really knew where they wanted to go, and now they could measure from the finish line continuous improvement. Finally, any good evaluation system, whether you use this one or any other ones that are out there, it should give you specific measurable targets for improvement. That is really both at the site and back to the central person, which in our case is me, because I can see and I have learned a lot by using this methodology and approach to see where gaps are.

One of the things that we realized was that we had done a lot of great office ergonomics work at the division offices where I work. There are 1,200 people in that building, and I think I have a really adequate ergonomics process, but the plant offices didn't. We were out working on the industrial side. So that was one of the things that I built into our chart for this year. So it has really helped both. With that, those are the points that I wanted to make. Thank you very much.

MR. ALEXANDER: Thank you very much, Mike, again. It is an extensive effort. It is amazing to me when you put these tools in the hands of people who actually have to do the work and how

useful they can become and how they really make the tool work for them. I think Mike showed that.

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William M. Holt, Jr., DuPont Fibers

MR. ALEXANDER: Bill, we will let you talk about the work that you have done at DuPont over the last 10 years.

MR. HOLT: I am Bill Holt from DuPont, and I am a chemist. So the first thing is what in the world is a "test tube toting", beaker breaking chemist doing talking about ergonomics. So you are either up for a rough session or you may come out of here saying that there is hope for everybody. I started, of course, in chemistry, went into research and development and stayed there for awhile until DuPont found that their developments and their discoveries went down. Then I went into manufacturing, and the productivity went down. So they realized that I had some unique capabilities to put me in safety to see if we could get rid of the injuries and illnesses too.

A little background on our plant. The Richmond, Virginia plant is called the Spruance plant -- 2,300 people, soon to go to 2,400. We are bringing in a new product. We do make five products there. So really it is a site with five plants. It is very complex. They are all different.

We started in ergonomics back in 1987, and as Dave referred to, you can think of the ergonomics evolution taking about the same amount of time that it takes to get a college education.

I want to talk a little bit about culture, as well as systems and measurement and how all of these things progress from the beginning to the end. I am going to talk a little bit about managing and a little bit about the directions as we see the future. So you can refer to that first page in your handout. I will refer to it fairly often. You can see from the first graph, how well have we done. This is the number of occupational illnesses that have occurred. The number of occupational illnesses from 1991 to '96 are on the graph or the bar, and I have added to that the number of back injuries that we have had at our plant. We look at most all back injuries as ergonomic issues also.

In 1992 where we peaked, you will notice our exposure hours were almost six million for that year. We had a lot of people there then. We stopped nylon production at the end of '92, and we downsized. You have heard of that before. We lost a lot of people. We went from probably 3,400 or 3,500 people down to 2,200 still making the same production. We did lose the nylon facility. You will see that the total number of illness dropped by one in 1993, even though we lost a lot of people. It dropped a little more the following year, but in '95 we saw the big change.

Well, don't let that fool you because when you lose people, you lose also exposure hours. So what really happened in '93 was we went up because we had less people. I had almost as many occupational illnesses. So it took us awhile to get down to our frequency rate, which right now is running 0.12 last year we had a very good frequency rate. This year it is not bad. This represents total recordables. I am not going to give you workers' comp. dollars because they track right along with it. Less illnesses, less money.

I wanted to talk a little bit, too, about the organization of our company. Now, do you notice anything wrong with that chart? It is upside down. Fantastic. So many companies draw their organization charts that way. The plant manager or the president are at the top. Superintendents, middle managers, first line managers, foremen and then at the bottom; the operating personnel. We draw them different, and there is a reason for that. These people down here are support for these people up here because that is where the action is. That is where the ergonomics takes place. That is where your quality is, controlled by those people who can most effectively change the quality of the product or ergonomics.

If you had a complaint from a customer, who do you send to that customer to investigate that complaint? The president of the company? Very impressive, but who can most determine what I did on my machine last week when I sent that package to him, and make my change? The operator! Now, I will send an engineer with him to talk the technical "stuff" or whatever, but we frequently send the machine operator to that customer because he/she made the yarn.

Now, this person is the site resource, the ergonomist, "the wizard", and everyone of you are wizards in ergonomics. That is the person that drives the program, and helping him or her, would probably be for each of these businesses up here, another resource, directly attached to the business. It could be an engineer or another safety and health person, whoever. So if this is me -- and at our plant that is me -- my purpose is to work myself out of a job. Drive the ergonomics to this point, to the top. (Some people will say to the bottom.) Move your program up. We have done that with safety. Why not do it with ergonomics? Now, that is far reaching. That is a long way down the line, but I think it sort of sets the tone.

Now, let's move on down. Management support is something that works. We have all heard that. We won't spend a lot of time on it. If you don't have management support, it won't work.

Employee surveys, this is a way of measuring your ergonomics. Pain surveys is what I want to talk about. We only ask two questions -- "What hurts?" and "Where does it hurt?" We want to know those tasks that you find very disagreeable, and we want to know what part of the body is affected by it. If you ask 16 questions, you are not going to get very many answers back. Only two questions. So we go to an area and we say "Okay, operators, tell us the two tasks which you dislike the most." They will name them. If you put them through a computer, you come out with the percentage of the response. Most of them name this particular task, which happens to be operating chain valves on the roof, big chain valves. Some of the other things are cutting racks, connecting lines on a railroad car, walking on concrete, transporting with transporters and

so on, but what this boils down to is that, "If you have got \$10 to put on ergonomics, where are you going to spend it?"

Let's take a look at the second question. Operating chain valves on the roof is one. What hurts you? Lower back, wrists, shoulders and hands, in that order. Does it make sense? Does it correlate with the type of tasks that you see? Yes, it does. Don't spend money on eyes, heat stress, arms and elbows. These are the ones you want to kill first. So that is an example of a pain survey, two simple questions, but get your answers.

Task analysis, after the pain survey you may be asked to take a look at these tasks and let's analyze it. That is a task analysis. Notice something about that. What do you see? One page, only one page. Twenty-two pound bobbins are removed from cases and placed on buggies for further processing. We use the NIOSH lifting formula, and when I looked at that I said, "Gee whiz. Back to calculus 301 again". It looks terrible, but if you have used it -- and I am sure most of you have used it here -- it is pretty good, simple math. What we do is we determine the recommended weight limit for that task as it is done. We recorded the horizontal reach of 28 inches and you start six inches off the floor, and your lifting distance is 47 inches. You come up with a recommended weight limit of 13.8 pounds, but the bobbins weigh 22 pounds. Have you got a problem? Yes, you have got a problem.

The nice thing about this formula is you can go back and make some geometric changes in your lift and determine whether or not that puts you in the right range or not, but we don't want to cover that at this point. That is a task analysis. You can show that to a manager, as long as it is on one page and not a six inch thick book.

Here is another one. Frequently safety and ergonomics get in the way of each other. I work safety also, but before we had ergonomics or learned anything about it, we always put up guard rails in front of moving thread lines and things of this nature to keep people away from it. But then we asked them to bend over the guard rails to put the bobbins on the chucks, and that was another problem that we had to analyze. On the drawing you can see the problem. We call it task analysis.

Total involvement you saw from our organization chart. We wanted to get everybody involved. Self-sufficiency within the business units, I don't know how you organize, but, again, if you have a business unit like we have at our plant or an area, make them self-sufficient. Work towards that goal. Integrate with wellness and fitness programs, as opposed to trailing treatment. Now, I will talk a little about trailing and leading indicators in a minute.

We have wellness and fitness facility. We used to have two doctors on our plant, plus six nurses. We are now down to two nurses. We also have added other people who have expertise in dealing with employee personal and emotional problems. We have a wellness expert in wellness, and we have an exercise physiologist, along with a work out room or exercise facility. What we are trying to do is move medical from treating something after we know it is there, the disease, to

preventing the disease. So here we are going from the trailing treatment to the leading prevention. So that culture has changed as well.

Always attempt to capture the economic benefits of everything you do in ergonomics. We have an ergonomics program, a written document just like most all of you, and we spend a lot of time on that first purpose statement, the purpose statement. Now, this whole program is written out on six pages, so it is not that long either. What do you want to do? "You want to implement a proactive, ergonomics program in a way that enables us to identify, evaluate, prevent and control general workplace hazards in ergonomics, increase awareness, involve employees, reduce occupational injuries and illnesses and is cost effective in order to eliminate the exposure of people to ergonomic hazards that may lead to occupational illnesses while capturing the quality and efficiency benefits so that ergonomics becomes institutionalized." There are a lot of words there, but once you get that fixed in your mind and you know where you want to go. The goal is zero. We may not get there in my lifetime, but the goal is still zero.

We are in the middle of an NFL playoffs now. At the beginning of the year, one of the players of the San Francisco 49ers was asked by the announcer, "What is your goal for this year?" and he said, "To make the playoffs". The announcer went to the Green Bay Packers and asked them the same question, "What is your goal for this year?" and he said, "To win the Super Bowl". Who is still in the running? So our goal is zero. So the purpose statement says that; a bold, very bold look.

Now, that brings up things like culture. At DuPont we had a "Discovery team". For years we have been, what everybody said was, good in safety injury control. Yes, we were good, I guess, if you compare us with all the others or most of the others or whatever for our industry group, but we never could get down below this plateau that we leveled out on. We did real good for awhile, and then we got here and couldn't do any better. We were stuck, at my plant, at 10 injuries per year, total recordables. Most of them were medical treatment cases. Now, a lot of people would say now that is not too bad for 2,400 people. You are right. It is not, but we had the goal of zero. What do we need to do to break through?

Well, we looked at the best plants within the DuPont Company, and incidentally, on this team were wage role operating personnel, as well as managers and engineers, a broad spectrum. Culture can go through three changes. We started out years and years ago and said, "Okay, when you come to work I will tell you everything you need to do and I will keep you safe. I am the supervisor. So check in, leave your brain at the gate and do what I tell you". That will prevent some injuries, but we moved from that through to here where eventually we got every individual saying I can take care of myself, don't worry about me, I will work safety. Where do we want to go? We will always take care of ourselves, me and you, interdependency.

How does that translate? Well, when you are in a dependent mode down at the bottom, it is a management commitment, condition of employment, fear, discipline type of culture. You have got a lot of procedures, a lot of training, supervisor control, manager controls. It is the heritage of



the company to be safe with no questions asked, but it won't get you very far. It will get you the first notch down, but then you have got to move to here where the individual, the personal commitment gets thrown in here, personal values, personal goals, care for myself, I am a zero hero, I have not been hurt and I will not get hurt. However, We say that is not good enough. Here we want to drive it down further. We are going to have to have commitment dedication, team work. We are part of this whole thing. We need to drive ergonomics the same way.

I talked a little bit about how culture and ergonomics work together and how that needs to tie into how we assess our programs. So based on all of this, be persistent in your drive to a culture based program. Learn to attack leading indicators, not the trailing indicators. Now, let's talk about it. Does everybody know what a trailing indicator and a leading indicator is? Well, you need to think about that a little bit. Is an injury a leading or a trailing indicator? Trailing. How about a serious incident where nobody gets hurt. Is that a leading or a trailing indicator? It is cause for some thought, isn't it? The event already happened. It is over with, but we were lucky that nobody got hurt. If you were standing three feet this way, you would have gotten hurt. Therefore, it is a trailing indicator. The OSHA log, a leading or trailing indicator? Trailing! What are leading indicators? (Show List)

We talked about injury and illnesses that are on the OSHA log or trailing indicators, unsafe acts and unsafe conditions that you observe, trailing indicators. Believe it or not, it is a trailing indicator. A little bit ahead of some of the others, but it is a trailing indicator. The system is there to allow that to happen. I threw in Windows '95 for the computer lovers here -- a trailing indicator because Mac had it back in '85.

Let's take a look at the leading indicators: Behavior, assumptions, our beliefs, culture, the way things are. So we really have got to expand a little bit to get to some of these things. Where are we? We are moving right along here.

Ergonomics is now showing up in other areas. Have you ever heard of PSM, (process safety management)? Let's take a look at that one. This is a drawing of a PSM system. Here we have management, leadership, and commitment, then facilities, personnel and technology that make up the core of process safety management, so that your plant doesn't blow up and hurt you and the community on the other side of the fence. If you will look at these 14 elements that comprise process safety management, you will see buried in there, under process hazard analysis, human factors, or ergonomics.

One of the six basic human systems is cognition. I heard somebody say that ergonomics never killed anybody. Well, I will dispute that. If you find that human error resulted from poor cognition and somebody gets hurt, then ergonomics was involved. So ergonomics is a very broad field. It involves more than just repetitive or motion injuries or cumulative trauma disorder. We teach a lot of things about ergonomics, how to set up displays and controls. So don't forget those things.

Ergonomics should be an essential part of a comprehensive safety program. OSHA, are you listening? They did such a good job on process safety standard that I could visualize that this same drawing could be titled Safety and Health. Now, one of those things out here could be ergonomics; One could be lock out, tag out; One could be hazard communication, etc. This is fancy thinking, but it is a worthwhile goal.

There was a question brought up by a lady at one of the other meetings yesterday. Why do we isolate ergonomics from safety and health? Well, there was a reason. It is new. We are all trying to get it started, and so having a task group for ergonomics that is great. That is the way things get jump started; but somewhere down the line it ought to all come together. People shouldn't get hurt for any reason.

Finally, learn to audit the systems. If you have a simple system, you are going to do a simple audit or a simple assessment. It will be task oriented, but as your culture changes and this thing goes way on out here to the "zero" that we want to reach, and as you drive ergonomics to the people, you should be auditing the "system".

So what are those things in place? It is kind of like finding the root cause. You keep asking "why?". We have a rupture disk that blew out. We sprayed steam into an area, and nobody got hurt, but let's find out why that happened. "Why" did it happen? We put the wrong rupture disk in. "Why" did they put the wrong rupture disk in? Well, they didn't have the right one. "Why" didn't we have the right one? Well, we don't maintain an inventory of different style rupture disks. "Why"? Systems. Eventually, you get down to the point where the system failed. Make sure all the systems are in place.

It has been my pleasure. Thank you very much.

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### Question and Answer Session

MR. ALEXANDER: Okay, I appreciate your attending the session and listening and giving your attention to the speakers. We shared some ideas and thoughts with you. We have tried to share some things that have worked and worked well within the organizations that we worked with. Now, it is time for a dialogue. I would be happy to hear ideas and concepts that you have, as well as questions that you may have. If you would, please step to the microphone and identify yourself and your organization for the record.

Q: My name is Premlata Menon, and I am from the University of Hawaii. I have a question for Mr. William Holt here. I was quite impressed by the diagram about --- I think this also gives a view of empowerment. You go from a dependency to an interdependency. My question is can

we focus on interdependence right from the beginning. I am not going from this dependence to interdependency, especially for small business.

MR. HOLT: For small businesses it is much easier, much quicker. For a large company that has a lot of managers from top to bottom, it becomes more difficult, but managers hate to relinquish their responsibilities. We had to go through the painful downsizing to the point first where we had to become efficient and profitable and that meant that we had to reduce cost. When you lose the supervisor, who picks it up? We knew then that we had to pick it up by empowering the people to control these things. We had to move there. There was no way that we could compete in the world, unless we got to that point.

Q: I am Fran Javelin. I am a nurse practitioner with Pacific Gas and Electric Company in San Francisco. My question is regarding employee involvement operations, and you are saying that it comes from the bottom up, in terms of you reversing that chart. Do you give people that time away from jobs to do this because my experience has been we tried to do that, but what happens on the other side we don't see the employees given the time off to do that. Their work piles up on their desk. They often don't have a support staff like management might have. The managers too are getting caught because they have all this other stuff coming down, the changes and downsizing and up-sizing and adding and subtracting. How do you accomplish this?

MR. HOLT: You accomplish it by making the effort and putting some emphasis and feeling the value for the need of this. You will find the way. We did it during shutdowns where overhauls were made in areas. Instead of giving those people added days off and vacation, we went through the training process because you just can't pass on this responsibility without training.

MR. FLEMING: I could probably make a point here. We have had those same problems. They are typically site specific or industry specific. Sometimes we find out that we start out one way and it works great for awhile and then it sort of loses its emphasis or it doesn't work well. So I think recognizing that up front and trying to find creative solutions. We meet during regular work hours. Our employees are allowed time off, and typically there is a little effort. In a team environment typically many of the employees can pitch in and help out for other ones. Some jobs just don't lend themselves to that. So I don't know that there is really a correct answer to that.

The only point, again, that I would make is that be flexible to change your processes if they are not working well for you. One quick example of that, is that we used to -- in a team sewing plant, (there are team modules, if you will) take a person from various teams. We found out that we were disrupting the whole facility. So after about a year of doing that, we went to a single team being the ergonomics committee. So that may be of value.

MR. HOLT: Let me make an extra, additional comment about that. Lack of resources is one of the classic barriers in ergonomics, one of the four that we encounter routinely, and the message is that you have got to be very effective in your problem solving processes. Maybe you don't do as

much analysis as the text book might require. In fact, we normally say spend one-third of your time on analysis, two thirds on solutions, and go for the quick, fast, easy to implement solutions.

Q: My name is Brian Sherman. I am with Prince Corporation out of Holland, Michigan, and I very much agree on your thoughts on the interdependent culture.

MR. ALEXANDER: I was hanging some drapes at home. Instead of standing there with my arms overhead, I actually went to the trouble to get a small step stool so that I can bring my hands down. Those kind of stories come up, and that is telling you that you have gotten this culture that we are looking for. It is not too hard to see if you look at it from the other end of the perspective.

We have got time for one more question, and you are it.

Q: Allison Ray for Ford Motor Company. I am actually going to combine the two of you. I do a lot of auditing of all different plants, and I have to compare -- not necessarily have to compare, but the plants by themselves compare their scores with things. One of the things that we started with was very much the same type of approach, evaluating jobs and corrective action, things like that. Where we came up with a lot of problems is do you do it by numeric base? Do you give -- you know, they have got 700 operators in a plant or 3,000. If you have analyzed 50 percent of the jobs, then you get a good or do you accept that you have analyzed four jobs, and you have done a really good job. Do you get a good under evaluating. Under corrective actions, you have evaluated four jobs, you have got really good corrective action. Do you get an excellent or do you have to have 700 jobs evaluated to get a good?

Now, in answering that question -- I would like to know your viewpoint, Mike, how your evaluation is going because I think you are where we were. We are now trying, and we haven't quite got there, to go to the next step of the culture change and measuring the culture change of the system. Of the jobs that they have evaluated, the audit now, we are trying to say, let's go and ask did we correct the problem or also if somebody arrives in medical, what is the process that insures that you do have a evaluation.

A really top step for us is to have the right questions in an audit to measure the system. So I guess my question is: Mike, are you seeing that same evolution that we are, and, Bill, in terms of have you got questions that have gone that way?

MR. FLEMING: I am going to apologize because I just went on break. No, I am just kidding. You asked a lot of questions there, and they were all excellent.

Q: And these are ones that I am really dealing with and having some problems with.

MR. FLEMING: I am not sure we have recognized that internally yet, some of the things that you were speaking to, but what we try to do is address our worst jobs first, of course, like everyone, the priority jobs, and work on those one by one. We learned early on that if you try to

do more than one job at a time that you are not going to get anything accomplished. So we definitely have taken the approach, and I think I heard you say that thoroughness is better than trying to run through something.

We have not done any quantified percentage, you know, if you percent 50 percent of your high risk jobs, it is acceptable or it is good or very good or anything like that. Where I have taken our program is the first year we started doing job analysis, which was '92 and into '93, I told the facilities how many jobs they had to do each year. Where I have transitioned the thing to now is that I have said now you know the methodology, you know how to identify your problem jobs, it is your responsibility as jobs bubble up or if new jobs are created. I think the other point that you made that was really good was going back and evaluating have you corrected the job, the problems within that job.

We haven't done a really good job in that, but we do know that we have some jobs that we haven't solve the problems in. We are going back and reanalyzing those. In fact, I have a number of plants doing that right now.

Q: So, you did set some goals in terms of number of jobs to analyze?

MR. FLEMING: Correct, in the beginning, yes, one per quarter.

Q: Now, what if a plant had something like but we spent, you know, six months fixing this one, and we weren't able to attain that. Would there be some leeway?

MR. FLEMING: Yes, I give them some flexibility. Also in that cross area because we have had some difficult years, and some of the interventions were, frankly, pretty costly. So I have given them some leeway, in terms of shifting some of the capital expenditures from one fiscal year into the other. As long as the project is identified, they have a solution identified, they have an action plan to implement that, you know, I am not holding them to having it fully implemented. Fully implemented doesn't mean one work station. It means all 50 if there are 50 work stations.

Q: I think you kind of leaned exactly where we were. Quality is probably more important than the quantity.

MR. FLEMING: That is correct, and when I see a facility not doing a good quality job -- and that is why I review every single job analysis. I reviewed 150 that first year, and that takes a lot of time.

Q: I don't envy you there.

MR. FLEMING: If I don't see a good thorough job analysis, and that is why I am the clearing house, the gate keeper, it goes back. They don't get my signature on it, and I give them specific things that they need to go back and look at.

MR. ALEXANDER: William, have you got a few comments on that?

MR. HOLT: Just briefly, when you first start out the wizard carries the load. So you have got to carry the load and determine how many of these things you want to analyze. We did them all, but we broke down our plant by organization. Really Nomex had a finishing area, a spinning area and a shipping area. We put on the top where do you work, and we know that somebody in the shipping area does about four or five jobs and they are going to name those jobs. So when you go across the whole plant, that is fine. You get a lot of paper, but if you sort them out, and we let those wizards that work in those businesses sort them out for us so that when I get them they are already sorted. So get people involved because you want to cover them all.

Q: Did you do anything, in terms of the culture evaluations? We are getting into some audit questions such as not only do you have a mission statement, but in interviews do you know what the ergonomics committee does in this plant. Things like that is what we are going to try and direct our questions to versus do you have a missions statement. Frankly, all of our plants can whip up a mission statement really quickly.

MR. FLEMING: That is a good question, and I think the lady, the one in front of you also had a point to that too. One of the things that I do sometimes when I go out to sites is I take my badge off because most people won't recognize my face but they will maybe recognize my name. I will walk up to an operator and I will ask them what if we lowered your work surface four inches there or raised it four inches or whatever. If they give me an answer like gee, that wouldn't be very ergonomic, then I know we are there. That is part of that culture that is getting integrated, and it is happening. It really is. Some days it is just by good communication at the plant level by the program coordinator.

MR. ALEXANDER: Let me just add a couple comments to it. In terms of how many jobs should you look at, go right back to queuing from industrial engineering. How many jobs do you have to look at and is that list growing or shrinking. If you have got 1,000 jobs in your plant, you better be looking at 330 of those a year, if you are going to get done in three years. In fact, you probably need to be looking at about 400 the first couple of years because there are going to be some more coming on. If you don't have the resources to do it, maybe you have got the wrong process, but it is really simple math when you start looking at it from that standpoint.

The quality is, obviously, important, and to me quality is I can do super duper quality. On the other hand, I am trying to remember the definition of quality, but it is what the customer requires is the one we want to work at. Have I developed a workable solution? Not have a developed the best solution. Not have I satisfied this whiz bang engineer's idea of what solution is, but have I got the risk factor down to a reasonable level, at least a quality level. If I am not doing that, then my list is going to continue to grow. It is very predictable. I can tell management that. There is no real issue.

In terms of audit systems, it is really a matter of defining what that system is and operationalizing it. In terms of do you have a mission statement, that is nice. I could care less, frankly. What I

want to know is if an operator has pain what do they do. Do they report? What does the nurse do? Are there corrective actions? What do the supervisors do? Take some examples and follow those through. It doesn't take long to see that happening.

Okay, well, thank you all for your attention and your time. I appreciate it very much.

## Report Back General Session #2

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Dave LeGrande, CWA

MR. LeGRANDE: Good afternoon, after lunch, our concluding day. We're going to jump right into this session. I'm Dave LeGrande, Director of Occupational Safety and Health for the Communications Workers of America. I'm going to moderate the session. As you know, this will be a summary of the workshops that have been held thus far; dealing with Utilities, Mining, Warehousing, and Office.

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Ira Janowitz from UTILITIES

MR. LeGRANDE: Without further ado, I will introduce our first speaker who will present a summary of the Utilities workshop, that was chaired by Ira Janowitz at The University of California-San Francisco, Berkeley in the Ergonomics Program.

Ira.

MR. JANOWITZ: Thanks, David. I'll be showing some slides, it's kind of hard to capture what goes on in utilities without doing so. First I want to thank the participants in the Panel, Pam Deutsch from Puget Power and Light; Fran Devlin from The San Francisco Division of Pacific Gas and Electric; and Randy Nicholls from Montana Power Company. I'll be mixing in some slides from all of us.

While we're getting that settled, I should mention that I've had the pleasure of working with several utilities, and every time I take a drink of water, flip on an electric switch or flush a toilet, I thank the utility workers for doing their jobs.

Utility work requires very high physical demands, often exceeding the strength capabilities of 50 percent or even 95 percent of the male work force, and frequently exceeding the strength capabilities of 99 percent of the female work force. It involves work in awkward postures and all the usual ergonomics risk factors with which we're familiar; vibration, cold, and high force, for example.

Now this is a slide from the PG&E San Francisco Division program. The point here is that the focus in utilities has been primarily on avoiding acute injuries. We're talking about hazards, of course of electrocution and falls from great heights, confined spaces, et cetera. So there's a



tradition among these, in these utilities of looking at acute injury and not the issues of cumulative trauma.

But rising cumulative trauma rates has attracted their attention. The San Francisco PG&E program includes the usual elements that we've all come to expect of a good ergonomics program: Ongoing surveillance, developing a plan for implementation of strategies and for the pilot testing of interventions, and for following up after implementation to see if these are having the intended effect.

Now in addition to these elements, Fran Devlin of PG&E is a nurse-practitioner who works on site at the San Francisco Division. So that this gives her the ability not only to look at the usual OSHA log 200 and worker's comp claims rates, but also to get into more detail regarding office visit records, to interview people who come into the clinic whether or not they filed a comp claim; to go on site more easily, and to take a first-hand look at ergonomics issues. So having an on-site nurse-practitioner has yielded much more information and much more familiarity on the part of clinical personnel with the ergonomics issues involved.

Now a point to keep in mind is that there are very different ergonomics problems between underground and overhead utility work. One of the questions that came up at the end of our panel (by Sue Rogers) was about the historical trend towards putting utilities underground. For instance, electric power distribution in many localities is being put underground instead of up on poles; how does that change the ergonomics issues? I thought this was a very good question, of course, because it reminds us that ergonomics is an ongoing process, and that as the means of production changes, we need to look at the new issues that come up.

So the panel agreed, basically, that we need to look at the differences between underground and overhead work. These are some of the issues that have been looked at in the PG&E San Francisco Division, for instance. In the case of underground work: looking at different cutters, looking at manhole lifts, crimpers, and further ergonomics awareness training. And in the case of overhead work, to look at saws and alternative wrenches and other alternative tools to reduce risk factors.

Here's an example of one of those; it's a way to pull off a grate that increases the mechanical advantage on the part of the person doing the work, and makes it easier for him. This is not always possible because the area around the access may not be paved or very easily accessible, but it certainly can help in many situations.

There's a tendency in utilities to think that "the problems are very industry-specific," or "it's always been done this way, we can't change anything"; but in fact we can change things.

This is a program overview of the Montana Power Company program, and one of the points made here is that it's being carried out in a partnership with Montana State University, Department of Industrial Engineering. Bob Marley is a professor there, and so Montana Power

has developed a 3-point strategy in conjunction with the University, and that's proved to be a very productive relationship.

The 3-point strategy includes developing more internal expertise, increasing employee awareness, and conducting ongoing research and development. The internal ergonomics expertise has been developed by extensive training, which has been carried out to a great extent by staff from MSU and by internal people as well.

One of the things that came out of the panel is that, in the case of all three utilities, the ergonomics program is not being carried out through separate ergonomics committees, but rather through the existing safety committees. And we talked in some other sessions during these two days about the pros and cons of doing it that way. Right now in the utility industry, that seems to be the mode of action because many utilities are dispersed over wide geographic areas; if you're going to have a safety meeting, it makes sense to integrate ergonomics into that safety meeting, because you may be traveling quite a distance to set that up, and your employees may be traveling quite a distance to come to safety training.

One of the elements in the Puget Sound program is body mechanics training that's job and task specific. We all know the shortcomings of the usual body mechanics training; "bend your knees and your back will be saved," or something like that. However, body mechanics training that's carried out in a job-specific way, and with two-way communication with the workers involved, in general proves to be more effective, although we could use more data on that.

To tell people that it's not just a matter of bending your knees, and to show people that they can carry out their tasks in better body mechanics is a help, but it's also important to use these sessions as a means of gaining information from the workers. What about better ways to do it? What about alternative tools? There's no way to keep your back straight with this task? Well, let's rethink the task and redesign it.

So this is not carried out in a "blaming the victim way" in which you're telling people it's their responsibility to always keep their back straight, but it's a two-way discussion which actually proves to be edifying for the people like Pam Deutsch carrying out the ergonomics program, so they can hear more about what the issues are from the workers.

Stretching programs were also a component of the worker training in all three cases.

This is an outline of the research and development program at Montana Power, and the three issues that were discussed in our panel were a crimping tool study, a ground rod driver study, and a body map symptom survey.

To briefly summarize those, this is an example of crimping done off a pole. This is probably about 55 feet high, and high force is required; easily 100 pounds. And so this was tested in the Montana State University Industrial Engineering laboratory.

It scored very high in a physical stress index that they're using to evaluate this task, and therefore it deserves more attention.

This is an example of an electric crimper, a portable, battery-powered electric crimper, for instance, that might be a contender for substituting for a hand-powered crimper.

This is a slide from the PG&E San Francisco Division. They're looking at a hydraulic alternative to a hand crimper for heavy cable.

This is an example of ground rod driving. These ground rods are at least 10 feet long. Sometimes they are installed by a worker standing on the fender of a truck and holding a pneumatic tamper, and driving it down with the pneumatic tamper. It's extremely dangerous; it also got the attention of management because it ruins the tamper, and they have to pay \$350 to fix each one.

So looking at alternatives for ground rod driving is an important issue, and Montana has done so by using a Hilti electric-powered rammer to drive it down. PG&E is looking at the Irigoien, which is a pneumatic tool by Ingersoll-Rand to do the same kind of thing.

The body map survey is a typical symptom survey format, but what's interesting is that Montana Power has found that you can pretty much predict, based on the survey, who's going to end up filing comp claims as a result of worsening symptoms; and therefore it helps you do an early intervention program with those high risk people, or those people whose symptoms have advanced to a certain point.

They're also looking at equipment changes, and this is an example: instead of manhandling these spools of cable, the idea is to integrate the cable payout on a vehicle [Picture slide] in this case, a trailer; so that the spool itself doesn't have to be manually handled in the field at all. It can be placed on the trailer with a fork truck and then you can unroll the cable as you work.

Truck design was felt to be a problem by all three utilities in the panel; lack of handholds and steps.

Truck design has been modified in the case of PG&E, for example, by this storage arm which holds a gas-powered tamper, which weighs about 150 pounds.

Instead of lifting the tamper on and off, you can swing the storage arm away from the bumper and slide them off easily. This intervention was developed by a PG&E worker, and, the corporate newsletter was used as a way to proliferate this ergonomic intervention around the company.

There were some comments made about laboratory workers, because many waste treatment plants and other utilities have laboratories.

Here's an example of a modification for a shared microscope in which this 5'10" worker has to bend over. It was placed on a monitor list so she could keep her neck and back straight while using it; so can this 5 foot tall woman who uses the same microscope without having to bend.

Finally, Montana made some points about further research; this is a postural study done with luminescent markers at Montana State University on the work of linemen; this is an ongoing process. The money saved by Montana from its ergonomics interventions was then allocated the next year as a budget for the safety committee to do further ergonomics work. So the safety committee was kind of rewarded for its good work by getting a budget for the next year to do more of the same.

So I'll close by saying that if we can have "ergonomic dog dishes" like this device here, we can certainly improve the working conditions of human beings, and I think we had a lot of good information on how to do that at this panel.

Thank you very much.

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Joe Selan from MINING

MR. LeGRANDE: Moving right along, Joe Selan from Advanced Ergonomics will present the summary of the Mining Workshop. Joe.

MR. SELAN: Good afternoon to everybody.

First of all, I'm envious of Ira that he was able to put together a slide presentation in such short order. I was going to try to bluff my way through this, saying that we did have slides of underground mining; "it's just real dark down there."

In the Mining breakout session we had three speakers, Tim Martin described the ergonomics program at American Electric Power, AEP; Dan Anderson described the ergonomics program at Consol, Inc.; and I described two case studies from clients of mine, Island Creek Coal and Cypress AMAX.

Certainly the mining industry is a varied industry; there's surface mining, there's hard rock mining -- all of these ergonomic programs that we discussed in our session happened to be underground coal mining. So it was limited in scope, to a certain degree; but when we're talking about what are the physical stresses associated with underground mining, there was certainly agreement across all of the different speakers and all the different case studies that were brought out.



Underground mining is characterized by number one, extremely high strength requirements, ranging all the way from, at the low end, mind you, 50 pound bags of cement all the way up to high end, where you can be handling literally 200, 300 pound timbers, rails, sections of pipe, et cetera. So very high strength requirements.

Very intense endurance requirements, although these tend to be short duration. Shoveling activities, timber carrying activities. Very stressful postures. Low coal mines can have seam heights anywhere from -- the operational definition of low coal is 48 inches or lower. One of the analogies that was given, in order to get an appreciation of low coal mining, crawl underneath your kitchen table and try to lift a 50 pound bag. You get an appreciation of the postural issues associated with this environment.

Finally, the environmental issues, things ranging from extreme cold temperatures, extremely hot temperatures, and of course vibration, typically whole body vibration, associated with the vehicles that are being used underground.

So there was a commonality in terms of the identified ergonomic stressors in the underground mining industry. For three of the case studies, that being AEP, Consol and Island Creek, there was also significant commonality in terms of the approach taken to solve these problems. For all three of these particular companies, the approach was to develop ergonomic teams or ergonomic committees who would then be mandated or tasked to identify ergonomic issues and come up with control strategies for these ergonomic issues.

Some of the common bullets or some of the significant bullets that came out of this was, number one, the need for upper management support -- and I'm certain I'm preaching to the choir when I say that, but it was certainly going to be the doom of an ergonomics committee if there wasn't upper management support in terms of financial commitment, training commitment for the ergonomics committees, et cetera.

There is also an agreement that employee involvement was something that was critical for the success of any of these ergonomic programs.

Then finally there was a significant agreement with regard to the need for communication. Number one, there is a need to share ideas, and ergonomic committees represent a means whereby the sharing of ideas can occur so you're not having the wheel reinvented at each and every mine site. And also, the communication serves to avoid different committees floundering in terms of not being able to solve problems, being able to communicate with other sites which may be able to assist them in this area.

One of the very interesting things that we found for AEP, Consol, Island Creek -- for the engineering controls that were developed by these ergonomic committees at these different mining companies, they were virtually identical ergonomic controls that were developed by these companies, in terms of reducing bag weights, in terms of working with suppliers to provide

lighter weight materials, the installation of mechanical assists, the use of aluminum shovels to reduce the overall weights in terms of shoveling activities.

Really the interesting and I think the very potentially fortuitous thing is that one of the problems that we see with the underground mining industry is a mind set that each and every mine is so unique that there isn't a common set of solutions. I think the three papers that we had in our morning session really flies in the face of this mind set and shows that there are a common set of ergonomic solutions that are out there, or really the issue comes down to how do we communicate to all of these other mines the benefits associated with ergonomics and the common issues and the common solutions that we have out there.

For all three of the case studies that I've spoken of to date, all of them were able to demonstrate very, very impressive cost reductions in terms of injury reductions, productivity improvements, et cetera. I probably threw the one curve into the session that we had with the mining industry in speaking of Cypress AMAX, in that Cypress AMAX is taking a slightly different approach; they're emphasizing, at least short term, physical ability testing, if you will, the flip side of the classic definition of ergonomics rather than the designing the work environment to accommodate everybody, Cypress AMAX is taking a long, hard look at "let us select people based on the physical requirements of the work."

And I certainly don't want to start any arguments in terms of the philosophy associated with this, but once again in terms of the benefits associated with the program, even though it's very much at a pilot stage, it does appear to have benefits associated with employee selection, and making certain that the people that you're hiring to do the job are in fact physically qualified to perform the work.

So that's a brief summary of the underground mining environment and the three papers that were presented this morning, a very enthusiastic crowd; we all left there much happier than when we walked in. And I'll turn it back over to you, David.

MR. LeGRANDE: Okay, thank you, Joe.

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Mike Jenkins from WAREHOUSING

MR. LeGRANDE: Our next presentation will be by Mike Jenkins of the American Warehouse Association. He will present as chair of the Warehousing panel. Mike.

MR. JENKINS: Thank you, Dave.

It's my opportunity to report on the Warehouse ergonomics session. I am Mike Jenkins,

President and Chief Executive of the American and Canadian Warehouse Associations.

We started by setting the stage of the logistics industry, which in the United States today is a \$700 billion enterprise, representing 10.3 percent of the gross domestic product. Most people think of warehouses as being a cost center or an expense stream of their business, but in the last few years, warehousing and in particular all of logistics, have become a board room topic.

Also, we talked about warehousing being the heart opportunity today's logistics industry, and many warehouses being used not just as a storage facility but also as a product transformation center where the product reaches its final form. Whether it would be final assembly, pricing, bagging, crating, whatever final work might be done associated with the product before it's shipped to its ultimate destination.

Today's warehouses are bright, clean environments, and they are information technology driven. The three speakers shared different perspectives on ergonomics position in their businesses. Chuck Swanderski represented Lowe's, a large building materials retailer; David Forte represented J.C. Penny; and Richard Murphy, Jr. represented Murphy Warehouse, which is a public warehouse company that serves a variety of customers.

Having the three speakers offered the opportunity to contrast the large company, which has the opportunity to influence the size and characteristics of the products they handle. For instance, having impact on manufacturers to reduce the size of a case or unit of a product. While the small company, the public warehouse company who serves multiple customers is really required to adapt to the product that the customer offers, and has relatively little influence over the size, weight or shape of the product.

I would summarize the observations into six general areas. First and foremost, from all three speakers, people are the most valuable assets in their businesses today. They also agreed that ergonomics is money, and that translated not only to lost productivity of those valuable resources, their people, but also expense. Next, they all want to do the right thing; and that translated to a variety of reasons for wanting to do the right thing. They all agreed that it was essential to have employee involvement at all levels of the program. There was an observation by two of the three that swift and decisive corrective action was required. I'll cite one example of a reason for that in a moment.

They all indicated that they had improved not only their safety performance but had reduced their costs associated with their performance, or with their programs.

Dave Forte of J.C. Penny operates six large warehouse distribution centers, totaling 12 million square feet of space and 5500 employees. They started their program in 1991 with a phased approach, with a systematic time line. They broke even on the program in 1994, and now after five years of implementation they have reached a point where they are experiencing a \$1 million annual savings after the cost of the ergonomics program.



They're using a standard four-point program based on training, work site analysis, medical management and communications. One of the differences in their program is the corrective action is used typically through the state of the art materials handling equipment; and as they replace materials handling equipment, they always tried to upgrade to the most current state-of-the-art capability based on employee input, and not only what is the most ergonomically correct but also what the employees are the most comfortable with.

Chuck Swanderski of Lowe's represents 380 retail stores in four major distribution centers of roughly a million square feet each. Since they started their program, their accidents are down 20 percent annually, while they've added one new 100,000 square foot retail store every five days. So accident rate is down by 20 percent annually, but their employee volume and space volume is increasing dramatically.

Chuck talked about swift and decisive action to remedy problems not just because of the impact on employees, but when you have a new store coming out of the ground every 3.2 days, by the time you implement a change, 15 stores have been started or built. So they have to make corrective action very quickly to make sure that it's implemented in the stores as they're brought on line.

A little bit different than the J.C. Penny example, Lowe's utilizes many in-house fixes, many in-house job AIDS. He cited a couple of examples with people on pick lines where they're selecting product for customer orders. They have narrowed the aisles so people are turning rather than carrying the product; they've placed box racks at a waist to chest level instead on the floor.

And a 45 cent fix turned out to be one of great note; they had a problem with people tripping over brooms that are used in cleanup of various work areas. They added a 45 cent clip to hang the brooms on the wall, got them off the floor. Not only did they reduce the accidents, which is obvious, but they also extended the life of brooms measurably so they could count the cost that way.

Both were large companies. Both cited great examples, both clearly have effective programs.

The third speaker, Richard Murphy, Jr. of Murphy Warehouse, again represents a public or contract warehouse company. They operate about 1.3 million square feet of distribution space in Minneapolis, and they have roughly 200 employees. They are different in that instead of being a private warehouse like Penny's or Lowe's, serving their internal needs, Murphy warehouse serves the needs of literally hundreds of customers, and may have as many as 150,000 to 200,000 different product items in their warehouses at any given time.

They started their ergonomics program in 1986, 11 years ago, probably long before many companies even heard the term. They did it because it was the right thing to do for their employees. They talked about the program being not just for their employees but for their friends and neighbors as well, because they're a fourth generation business. Many of the employees have

been with them for many years, and so they're really trying to protect their friends and neighbors who happen to be employees.

The results for their company are also significant; they have done things like add mechanical clamps to their lift trucks to reduce manual intervention on product activity; they've replaced the seats in most of their lift trucks to be ergonomically designed seats; they've replaced office chairs, keyboard trays and all of their activity is employee-driven.

In measuring the results, they measured one item, principally; the cost of worker's compensation insurance. They drove the cost of worker's compensation insurance down from \$2.35 per employee per hour down to \$1.00 an hour, and their accident rate is currently 50 percent below the industry norm.

Again, if I were to summarize, employee-driven, employee-motivated, focusing on people, their most valuable asset and they're trying to do the right thing. Thank you.

MR. LeGRANDE: Thank you.

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Tom Albin from OFFICE

MR. LeGRANDE: Our last presenter, Tom Albin from 3M, cochaired along with myself the Office Ergonomics Workshop.

Tom.

MR. ALBIN: I'd like to recognize the participants, Dave LeGrande, who was the cochair of the Office Ergonomics session; Nancy Larson of American Express, Bob Morency of L.L. Bean, and Chris Plott of US West, and Nance Ballman of US West and the Communication Workers of America.

What I thought I'd do is just briefly hit some of the highlights of each one of those presentations, and then make a quick summary at the end of that.

The American Express experience was remarkable in it's a multiple site program, so the office program, there needed to be flexible and portable and adaptable to several different sites. Initially that program was driven by the occurrence of musculoskeletal disorders; but it moved to a more macro ergonomic approach, which emphasized all factors or the enhancement of all factors of human performance in the workplace.

Some things that experience taught them was that a coordinator was necessary for day-to-day

bird-dogging of the program, to keep things moving, to keep it from losing momentum. They developed standards for their offices for furniture, accessories, computer monitors, et cetera, that were then, as the term implies, standard across the whole company.

Training was mandatory for all employees in office ergonomics. This training addressed such issues as symptoms of cumulative trauma disorders or musculoskeletal disorders, whichever term you prefer; where to get help if they were experiencing these symptoms. Guidelines for how to use your computer workstation: How should you sit? How should you position your hands? How should you position your monitor? Et cetera.

An interesting thing that was done was an individual profile of heights, such as heights of monitor, heights of the keyboard tray were established for each individual; and that this profile then moved whenever the person moved. It was said that the people moved once about every six months, so this profile gave the facilities people setting up the workstations a good idea of how to set the workstation up. This movement also was the cue for training, that people would be trained when they moved.

The outcomes of this type of effort: increased comfort reported through comfort surveys, decrease and worker's comp data in worker's comp costs, a caution that some extraneous variables may influence these. Life in the real world, we're not able to factor out as many of the, and control for as many of the factors as we might like, so some other things may have caused some effect.

Moving on to L.L. Bean, this is an interesting situation in that 60 percent of their business occurs during the holiday period. Their process was to develop first an idea of what kind of risk factors were associated with the work that they were doing, and then to develop an action plan for those facilities. And some of the things that they came up with were setup guidelines, how should a work station be arranged, what kind of arrangements were necessary, as well as development of what was referred to as a toolbox of accessory items for people to use.

I really liked the analogy that was given of a carpenter and a hammer, that if you take the carpenter's hammer away, they can't work; and if you take a computer user's tools away, they can't work very effectively, either.

Emphasis was given on sit/stand work positions as providing more comfort. The employees are also tracked at L.L. Bean, and the profiles for heights and such also move with them. They use Ergo-reps, which in my terminology would be ergo-lead users; these are line workers trained in ergonomics techniques. Products that go into the toolbox are available for demonstration use as well as being immediately available when they're requested and required.

The results again, increased comfort and reduction in cumulative trauma injuries.

Finally, looking at US West, a large company encouraged a lot of early reporting of symptoms,

all across different work groups, and found that in terms of results that they saw a decrease in the number of cases and I believe also in costs.

A quick summary of these; I'll try to go in order here. What seemed to me to be consistent about these three reports was that the program started as initially being driven by worker's comp cost data and comfort surveys. The second common theme tended to be that these programs needed to be flexible and portable; that you need to tailor the program to your individual setting, and we might expect this because as ergonomists we always say "one size doesn't fit all, it needs to be tailored to fit."

A third common theme was the establishment of guidelines for offices. That is, what should an office setup look like? What should your workstation setup look like? To make the equipment available for demonstration use, so that people can actually touch and try out the items that you encourage them to use. And certainly you need to train them in the appropriate use.

Now another theme that came up in these presentations was that when you set up these guidelines for offices, you need to allow for and I would say encourage movement and posture in the workstation. As we heard earlier, sit/stand workstation seems to be the way to go.

If you do that, what kind of results would you expect to see, based on the experience of these three programs? First of all, you would expect to see lower incidence of musculoskeletal disorder, you would expect to see lowered cost and you would expect to see enhanced productivity.

I would encourage you all to go out and replicate these kinds of programs in your own settings. Thank you.

MR. LeGRANDE: Thanks, Tom. I think we can see that clearly, regardless of which industry was represented and which occupations were represented, clearly the development of a comprehensive ergonomics program including a component involving workers in the process works. That is, we see not only will there be worker involvement, but there will also be a reduction in the occurrence of ergonomic-related injuries in illnesses.

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### Question and Answer Session

MR. LeGRANDE: We have several minutes for questions. If we have any, if you could please go to the mike and ask the specific question of the specific or more than one panelist.

Q: I'm Nick Warren from the Ergonomic Technology Center in Connecticut. I'm intrigued,

actually through the entire set of presentations yesterday and today about the issue of psychosocial and organizational exposures. I brought up this question once in the Manufacturing 1, didn't seem to have that much relevance, and I'm wanting to expand it a little bit to the people who were talking today.

In general what seems to happen is that we're focusing, at least explicitly, in most of the work that most of the manufacturers and organizations have done on biomechanical exposures and on the reduction of biomechanical exposures.

It occurs to me that what's implicitly happened in the types of interventions that you're talking about are really significant and major psychosocial in the workplace, particularly around the issues of autonomy and social support; and the process that all of you are reporting is helpful, which is the establishment of ergonomics committees which have their own input involving workers. One individual talked yesterday, Dan Cimmino, I believe, about being clear that you not only involve workers but empower workers.

So that the changes that are happening, a lot of the reductions, which we've seen major and very impressive reductions in all of your programs that are reported here, certainly can be attributed in part to the changes in the engineering issues in the company. But I'm also interested in how the changes in the organizational climate, structure, culture that are also occurring, we haven't really dealt with them or talked about them here in an explicit way; and I'm wondering if your committees, the specific question that comes from this to me: Do your committees in any way explicitly deal with issues of changing work organization within your plants? Which is actually happening. There are changes in worker involvement and worker autonomy. It would appear to be changes, in some cases anyway, in levels of skill. The social support networks both coworkers and supervisors and management, which also appear to be changing.

So I'm wondering if any of you could address whether these issues come up explicitly in your ergonomics committees, or if they just kind of happen without anybody thinking about them?

MR. LeGRANDE: As the chair, I can offer a few comments. A major element in the ergonomics program of the Communication Workers of America is the component of work organization. Indeed, there have been a number of studies, two of which conducted by NIOSH, major studies involving not only US West, but also the L.A. Times would show the significant associations between musculoskeletal disorders and work organization of psychosocial factors.

A number of other studies conducted in the U.S. and other parts of the world, particularly Europe, have shown much more dramatic results than the NIOSH studies have shown, that is regarding the relationship or association depending on the study between work-related musculoskeletal disorders and work organization factors.

Indeed, I think most ergonomists, all the practitioners in general, take the viewpoint that the initial point of action is to deal with the physical ergonomic factors and then move into the area of work organization.

From a practical viewpoint, I don't represent a company and actually never have; but from a corporate viewpoint relating to the companies that our union does represent, like US West, they will look initially, as most companies would, at physical ergonomic factors, and then as they

continue to see problems identified, health problems identified, they will begin to look at the work organization factors.

But it's somewhat a matter of practicality; where do you start first? I'm not suggesting that you should not include work organization among those components, but definitely that you should.

MR. JANOWITZ: Yes, taking off from that, you know everybody talks about management commitment as a prerequisite for a successful ergonomics program. To me, management commitment includes the commitment to look at organizational issues; to have an ergonomics process that really does empower workers and doesn't just give them responsibility to use good body mechanics, let's say, but actually empowers them to make suggestions and test prototypes and make choices about the tools they'll use or the arrangement of their work area whenever possible.

Therefore, I like to use focus groups of workers in which the whole range of issues, both physical and psychosocial issues, are brought up. If the psychosocial issues are severely negative, as happened in the case of one utility that was not represented on this panel, we have to deal with those first. In fact, there were some great tools that some workers had in mind that I thought were very good innovations, but management refused to purchase any of them because they were worried the workers would just steal the tools. Well, that right there is a red flag saying Wait a second. Let's talk about this and see if we can come up with a way that management will be satisfied that these tools will be secure and the workers are willing to help figure out a way to make this work, then we can proceed. If not, forget researching or testing any tools; we need to deal with these organizational issues first. There was a lot of mistrust and anger expressed in the focus groups at that utility, so I didn't proceed looking at the physical issues until six months later when I was somewhat satisfied that we had addressed these organizational issues.

Q: I'm Prema Menon from the University of Hawaii. My question is going back to the gentleman's question about psychosocial. I had attended an earlier discussion in the work evaluation, program evaluation, where Mr. William Holt mentioned how the culture is changing from dependent to independent, and independent going back to interdependence, and how in that interdependent mode, it works out the best in terms of reducing the injuries.

So if that is the best, then can we also include the human factor about status, alertness, because accidents and the state of mind – does that come into the picture of ergonomics at all?

MR. ALBIN: I think that we tend to look at ergonomics and say that that's MSD-driven only. But I think if we looked again a little broader, we'd see that a lot of what we refer to generally is accidents or injuries also have an ergonomic basis. The design of a knife handle, for example, may not be particularly good so people tend to slip and cut themselves with it. So I think in that way, ergonomics does have more, again to offer than just dealing with MSDs.

MR. JANOWITZ: Of course, your question raises the issue of shift work in general; the length

of a shift, the patterns of work, working four 10-hour shifts --

Q: Mental fatigue.

MR. JANOWITZ: -- and then three days off, et cetera. And those are all important in utility work and in the health care industry, et cetera. That's been studied and there's a fair amount of literature on shift work and the effects of fatigue, and those should be taken into consideration. I think Three Mile Island and Chernobyl are examples of that.

Q: And I'm from Bhopal.

MR. LeGRANDE: Any additional questions from the floor? If so, please ask.

Hearing no question and not able to see anyone at a mike, I'd like to thank the panel and suggest we give them a round of appreciation.



## Report Back General Session #3

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Dave Alexander, Auburn Engineers

MR. ALEXANDER: Why don't we go ahead and get started on the final session on the program, and certainly it's my pleasure to thank OSHA and NIOSH for sponsoring the two-day program. From my standpoint it's been a tremendous success and it's been a pleasure to be part of it. And frankly, I'd like to take an opportunity to thank the other speakers and moderators who've been part of the program for the last couple of days. With ease and grace, they've made their jobs look easy, but frankly there's been a lot of planning going on behind the scene, and they certainly have worked to make that happen.

Finally, I'd like to thank the participants, because frankly a conference like this is a lot more exciting and fun with 1,000 people present than with 50 people present. And I have been there when 50 people were present, and it's neat to see the excitement and energy around ergonomics and feel the movement coming.

As far as the protocol this afternoon, we're going to follow a standard format that you've seen before; we have seven moderators who will be wrapping up on ergonomic program management issues, and we're going to just take those in order. Each moderator will have five minutes to run through their session, then we'll have an opportunity for dialogue and discussion and questions and so on.

So why don't we go ahead and get started, and our first presenter is going to be Bradley Evanoff from Washington University, talking about Health Aspects.

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Bradley Evanoff from HEALTH ASPECTS

MR. ALEXANDER: Our first presenter is going to be Bradley Evanoff from Washington University, talking about Health Aspects.

DR. EVANOFF: Thank you. I'd like to acknowledge the other panelists in the Health Aspects session; Dr. Rebecca Moreland from Chesapeake Occupational Health Services, and Dr. Kurt Hegman, from Medical College of Wisconsin.

Our topic was Health Aspects, also known as medical treatment programs or medical management. Although ergonomics programs should place the highest priority on prevention of injury among employees, there's still a necessity for programs to treat those employees who do become symptomatic in order to reduce impairment and disability.

There was widespread agreement among the panelists about the essential elements of a comprehensive medical management program. One is health surveillance, which has two major foci. One is to define the extent and the nature of the problem; the other is to enable early recognition and treatment of work-related musculoskeletal disorders. Many health surveillance programs will start using passive surveillance by using data that have already been collected; however, to move into a truly effective surveillance program and one which enables early recognition and treatment, it's usually necessary to do active surveillance through symptom surveys or other ways of finding symptomatic employees before they show up on your OSHA 200 log. Treating physicians also agree that the earlier you can send your employees to see us, the less you have to pay us in the long run.

An effect of surveillance programs is that if you start doing a better job counting injuries, then we typically see an initial rise in the number of reported injuries. This has been our experience at Barnes Hospital in St. Louis. As a medical management program was started, we saw a rise in our OSHA reportables initially, and this has been the experience at many other hospitals and many other employers. As you're doing a better job counting, you'll find more cases. Note, however, that there was a large drop in the number of lost days; and there was a concomitant fall in costs as well.

So if your record keeping and bonuses are based on OSHA reportables, you're going to be unhappy; but if you're looking at costs and lost days, you're going to be considerably happier. Costs and lost days are probably better measures of success than OSHA reportables.

Other elements that are important include access to appropriate health care providers. That's physicians that have specialized training and experience, a willingness to use information about job duties in diagnosis and treatment, and health care providers who are willing to use conservative treatment instead of shuffling your workers off to a "mack the knife."

Job evaluation and modification is a critical part of treating injuries that are related to job duties. If you were treating a sports injury, you couldn't think of doing that without finding out about the sport and making some modifications in the equipment, in the technique or the intensity of the sporting activity. You similarly can't treat work-related injuries without making some changes in the work that's done.

Finally, long follow-up is crucial to the success of these programs: many case management programs have been doing a good job at keeping your employees from getting lost in the specialist physician wilderness, but you can't stop follow-up at the day they return to work, because many injuries recur. Medical management efforts should also be coordinated with

primary prevention, to prevent injuries in co-workers doing similar jobs.

Three important points were brought up by the audience, who participated very actively in the discussion; the first is that there is considerable controversy and confusion over many of the diagnoses of cumulative trauma disorders, particularly the role of nerve conduction studies in defining carpal tunnel syndrome. Second is that it is often difficult to differentiate work-related and non-work-related injuries. This will continue to be a problem, both for clinicians and for employers. One approach, which Dr. Hegman discussed, is that Master Lock provides accommodations both for non-work-related and work-related problems.

The overriding problem that our discussions brought to our attention is the fact that many health care providers are woefully unprepared to deal with the problems of work-related injuries; and there is a widespread feeling that there are health care providers that are not doing good service and obtaining information about work-related problems, not using information about job duties and suggesting provisions for modified duty. There were a number of people from the audience who asked us when we were going to do a better job in educating health care providers how to provide service to workers and their employers. Our reply was that employers and workers should demand medical providers who have some training specific to work-related disorders. Those of us in the academic community can provide this training, but you must help create the demand. Thank you.

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Suzanne Rodgers from WORKSITE ANALYSIS

MR. ALEXANDER: Our next wrap-up moderator will be Suzanne Rodgers, a consultant from Rochester, New York, who will overview the worksite analysis section.

DR. RODGERS: Thank you.

Our session on Worksite Analysis was made up of four speakers. Four different programs were presented; a few of them were more across programs, and there were a couple of specific ones.

Paula Bohr was nice enough to be very user-friendly and give me a summary of what she said, so I'm going to start with that.

Her primary points were about participatory ergonomics teams chosen to perform worksite analysis. This project was funded through a cooperative agreement with NIOSH, and involved three teams of health care workers: a group of orderlies, who are responsible for lifting and moving patients, and are in the dispatch group; a group of ICU nurses; and a group of clinical laboratory workers.

The teams were trained in ergonomics and were able to identify problems, make observations and take measurements. The first slide shows some of these measurements.

There is a lot of observational measurement and some specific measurements. One thing we liked very much was the kit they provided with the tools for the people to do the measurements. It included very high tech things like a tape measure. They also had some sound and lighting measurement equipment available. They also had the equipment needed to measure force and to measure out some distances and the workplace.

One thing I want to mention that's outside of her text was that she said "We provided a lot of forms to collect data on. And what did they do? They changed the forms, and they made them their forms." I just love that, because that's the ownership. That shows you that they weren't just doing this by rote; that they were saying "Hey, you know, this is what we think we need to gather." And what was interesting is that she found that whichever way they collected the data, whether it was more rigidly or less rigidly, they came to the same conclusions.

Methods used to define the problems varied with the teams, and some of the methods used by the dispatch orderlies are shown on the next slide. They interviewed, they looked at their accident incident data, observed (I'm sure they listened too), reviewed and documented all the procedures very neatly and identified what equipment was being used, how it was being used. The equipment considered for use in solving the problem was also evaluated.

This is very much an on-the-floor, participatory type of project. One particular team has implemented these solutions, and they have had a 42% reduction in their low back injuries and lost work days. This is a very nice study in the health care industry.

The second presentation was by Tom Jacobs of Frito-Lay. Basically, Tom presented a very nice ergonomics model that Frito-Lay is using in Texas, and that he is looking towards implementing at corporate level. His program is also using natural workgroups or teams. He gave us a lot of good tips, and many of these have been repeated in other presentations, but I want to just give him credit for these two:

1. "Don't rely on consultants, get in-house expertise" was one of his suggestions. And I thought that was good advice in terms of not only bringing people like us in from outside. He said "You need to have somebody inside who keeps up with the field, who can help the teams and use the teams as your focus."

2. He emphasized the importance of starting an ergonomics program with small bites, not trying to do it all at once. He also stressed the importance of management commitment in his presentation. For anybody who is looking at a corporate model for worksite analysis, his is a very nice one to look at.

Mark Johnson was our third speaker, and he talked about some of the things that they've done at Eastman Kodak in Rochester, particularly. The basic model is, again, making sure the workers are heavily involved, evaluating the data. I picked this part because it utilizes the checklists. They've developed a number of checklists themselves and with teams. Here are some of the ones that Mark has and are being used in Kodak facilities, if you're interested in more of those.

One of the questioners asked about a maintenance checklist, since we know that maintenance is very different from assembly line work. I don't know if those are available, but there's no harm in writing him in Rochester and asking about them.

Finally, Don talked about the ergonomic process that he uses; again, you'll see a lot of similarities here: the use of an ergonomic steering committee which is mainly management created to help facilitate the teams; then the floor teams and the departmental sub-teams, in some cases; and the existing safety, quality, production teams coordinating with them; the coordinator, called a driver in my technology; and a consultant who is there to help fill in the last part of the triangle.

This is the basic flow chart that he has developed in terms of what's being done. You can work into the ergonomic workplace analysis through any of those upper issues: the quality, the human error or some sort of complaint, safety, injury-illness. The data collections survey are done followed by, depending on what the problem is, either a fatigue analysis or use of the lifting guidelines. Once the problem is solved, the important part is the reality check. Having solved the problem, go back out on the floor and find out if the people who hadn't been involved in it really think the solution is worth the cent. Don has some nice cost-benefit data too. After implementation of the plan or the controls, it is important to reevaluate it, and then use it as a case study. Monitoring and follow-up are essential in a good ergonomics process.

I have to finish there and just want to add that there were a lot of themes in common in these presentations. The primary ones related to employee involvement, in-house expertise, starting

small and making sure your managers are up to date on what you're doing and are committed to it. Thank you.

MR. ALEXANDER: Thank you very much. That was very enlightening.

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Sheree Gibson from RESOURCES

MR. ALEXANDER: Our next presenter will be Sheree Gibson, from AIHA and also an ergonomics consultant, and she will be talking about resources.

MS. GIBSON: Good afternoon. I'm really encouraged to see all these people out there -- at least you pale glimmers of people. I assume you're either diehard ergonomics fans or your flights have been canceled, one or the other.

We had a really good session yesterday on Resources, which was subtitled: Where to Go for Help. Even if most of you missed it by going to Suzanne's session on Worksite Analysis. That was where the rest of us would have been if we hadn't been giving a session, too.

Our first speaker was George Gruetzmacher, who's an ergonomist with the Wisconsin Consultation Program. George described the joint federal-state consultation program, which is a little-known secret. It's a program which is available virtually in all 50 states. It's geared towards small business, but is available in limited degrees to everyone.

The consultants that the Wisconsin program have help companies get started in ergonomics by providing assistance in solving problems. The great thing about it is, it's free. Not many times you hear that, other than this conference. The only restriction is that before you call them, you'd better decide you're going to do something, because you have to fix the problem if you're going to get them involved.

The second speaker was Leslie Nichols, who is program director for the Great Lakes Center for Occupational and Environmental Safety and Health. Leslie described another great resource: the regional Educational Resource Centers and the work that they do. The ERCs -- there was a display on one of them outside -- primarily provide training services as well as some research and other services; but probably the thing they're most known for is several excellent ergonomic short courses. If you aren't familiar with the ERC in your area, you need to find out about them. NIOSH has a list of all of them. Every area of the country is covered by them, so everybody has access.

Our next speaker was Angie Waldorf, who is the Assistant Deputy Commissioner for Occupational Safety and Health of the North Carolina Department of Labor. She's also the chair of the North Carolina Ergonomics Resource Center (another ERC) and their advisory board.

You may have heard Jim McCauley of Perdue talk about their ERC, the Ergonomics Resource Center yesterday in their summary. What they were talking about is the carrot-and-stick approach that North Carolina has taken. Instead of relying solely on citations to get people to

implement ergonomics, what they're doing is also giving them something, not quite for nothing but a little bit of assistance in terms of ergonomics and where to get started. They've assembled a cadre of consultants in the North Carolina area to give people ergonomic assistance in the form of training, analysis, solution development, as well as having access to a state-of-the-art ergonomic laboratory, an extensive library, and a place to try the latest ergonomic products, kind of play around with them.

This service is provided on a fee basis for their client companies. Before all of you go out and check out your Department of Labor, I should warn that North Carolina is unique in this; this is the first ergonomics resource center in the country as far as I know, and they've won several awards.

To illustrate the success of the center, Angie brought along Walter Burlington, the H.R. Manager for Rocco Quality Foods, a poultry processing plant. Now if you're not familiar with poultry, this is a real ergonomic challenge. And these people have decided to get proactive; and before they were cited, they came along and developed, in conjunction with the ergonomics resource center, an ergonomic program or process.

After working with the center for two years, he showed us their injury statistics; and literally, they've plummeted, exponentially.

I was the final speaker. I was describing guidelines which could be used when selecting a consultant. No, I didn't say "call me," although it was tempting. First what I would advise you to do, if you haven't been the last two days, is take advantage of networking opportunities like this. This is a great way to talk to ergonomists, to talk to different people about the ergonomists that they have used.

There are a lot of other opportunities: AIHA, ASSE, the Human Factors and Ergonomics Society, all have consultant listings and they can get you started in terms of consultants that may be in your area. Also, when you have a short list of consultants compiled, the thing to do is do a little bit of homework. Set up a visit for them at your plant, or at least a protracted phone call to determine if you're going to be interested in hiring them.

Explain your goals for the project and the resources you can allocate to it. You have to think about this ahead of time. Ask them their academic backgrounds, their certifications, their experience. You're interested in all this.

This is a big decision for most people. Check their references; call those people that they say are former clients and see if they were happy. At this point, ask them for a proposal and then finally pick somebody that you feel comfortable with, because that's really one of the most important things; the right chemistry between your company and the consultant. Your choice of the right ergonomics consultant can make a tremendous difference to your efforts. He or she can be an asset to your safety and health team, even if what they're providing is just a little bit of ongoing



service with training or other small problems when you get in something that technically is over your head. A lot of teams work very well with a consultant on a very intermittent basis. They don't have one on staff.

Now as Dave Alexander said, I'm chair of the Ergonomics Committee for the American Industrial Hygiene Association. Finally, I want to thank NIOSH and OSHA. We at AIHA were very happy to cosponsor this event; we've been very pleased, and I hope all of you have as well. Thanks.

MR. ALEXANDER: Thank you very much, Sheree. And again our thanks to AIHA for their support in this area.

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Laura Stock from TRAINING

MR. ALEXANDER: Our next speaker is going to be Laura Stock from the University of California, and she will be reporting now on the training area.

DR. STOCK: Good afternoon. I was moderator of the Training session and I'm going to begin by talking about some general principles that virtually everyone on our panel has agreed with and then go on to some specific points that each panelist made. While there's been a lot of controversy (and many of us have been involved in different sides of that controversy) about ergonomics in general, there has been almost a universal agreement that training is an important element of any comprehensive ergonomics program. But despite that agreement there are differences in people's views about what training should accomplish.

Our panelists contrasted what one panelist called the "traditional" approach with more comprehensive and action-oriented approaches. In the traditional model, the assumption is that workers have a very limited role to play in ergonomic programs, and that training, therefore, is intended merely to just deliver information about the company health and safety policies and encourage compliance with existing health and safety rules.

In contrast, others like those on our panel, recognize that workers have a critical role to play in any comprehensive program; that workers are in fact the experts when it comes to identifying hazards and solutions. This sentiment has been echoed by almost every speaker at this conference. What our panel contributes to this discussion is that training is the tool that can unleash the enormous expertise that workers have.

Such training, must have the goal of empowering workers to be active participants in all elements of the health and safety program. And to achieve this goal you must use a certain training methodology. It involves not only setting action-oriented objectives, but also using participatory

training methods that incorporate an understanding of how adults learn.

Adult education is based on the following principles: that trainers must draw on the expertise and experience of the learners; that people learn better by doing, by actively participating rather than through more passive techniques like lectures or reading; that training has to be based on the specific needs of the workers as they define them, and must also take into account their special characteristics like their language, their literacy level and their culture and community.

Also, a general point that everybody made is that training, while necessary, is not sufficient and cannot be the only hazard control strategy. Unfortunately, probably many of us are familiar with instances where people say they have a comprehensive ergonomic program and really all they have is a training program and often just a video-based program. That's not enough. There must also be a commitment to concrete changes, not just in worker behavior but in hazardous working conditions.

The points above were made by almost all of our panelists. The following are some of the additional, specific topics that people covered.

One of our speakers was Paula Coleman of the Carpenters Union; and she discussed a "train the trainer" program which uses participatory methods and has as its goal to train carpenters to play an active role in making changes in their workplace.

One of the interesting elements of her program is that the program is taught by skilled journeymen, most of whom now suffer from CTDs. These trainers know everything about the work and about the job site culture. They've also had time to figure out safer work practices. This is in line with some of the principles of adult education, that members of the target population are often the best educators because they understand most completely what the needs and concerns are.

Ms. Coleman also concurred that training is essential but it's only a tiny first step. She talked some about how the nature of the industry mitigates against carpenters controlling their work environment and in implementing long term changes; and stated that therefore the commitment for training and for change must come from owners and management as well.

Our next speaker was Steve Guttman from 3M. He discussed the need for training at all levels of the organization, training that would be designed specifically for managers, supervisors, engineers, safety and health committees, and hourly employees. Their training program has had some very impressive results. Since they implemented their training programs they've had a 58 percent reduction in the number of lost time ergonomic cases, and a 22 percent reduction in OSHA-recordable cases between 1990 and 1996.

Then Kay Stewart, who's a training consultant, talked about the importance of needs assessment, and the fact that you need to ask what the audience needs to know, where they are coming from,

what they want to learn, what they believe the real issues are, and what are some of the barriers they face in getting where they want to go. She gave us some insight into training style and using humor and other kinds of techniques to break the ice.

Our last speaker was Susan Moir, the director of the Construction Occupational Safety and Health Project at University of Massachusetts, Lowell. She provided an introduction to popular education methods, which are methods that originated in Brazil and are now used all over the world. These methods are interactive and learner-centered and well-suited to accessing workers ergonomic expertise.

There was a tremendous amount of interest in these participatory and popular education techniques. In fact at the end of the day, we convened an informal follow-up session at 5 o'clock that evening, where we spent about two hours with over 60 participants discussing different training techniques and sharing people's experiences using them.

And in fact, the interest that we all felt in training and its important role led many of us to believe that the next OSHA/NIOSH joint conference should be on Training, and how to use training effectively in dealing with health and safety problems. So I'd like to publicly ask OSHA and NIOSH to follow up this successful conference with another one, preferably on the West Coast where I'm located, on training.

Thank you very much.

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Brian Peacock from PRODUCT DESIGN

MR. ALEXANDER: Our next moderator will be Brian Peacock from General Motors, who will be talking about the Product Design Breakout.

DR. PEACOCK: I was asked by Jim McGlothlin from NIOSH to talk about product design. On the panel with myself -- I'm from General Motors -- was Rob Radwin from the University of Wisconsin, and Bill Marras from Ohio State University.

First of all I'm going to let you have Bill Marras' major points. He stated that product design in manufacturing process is more than common sense. Bill's next point was that quantitative tools are necessary for bench marking the manufacturing design. Bill mostly focuses on the analysis phase of the design cycle using quantitative analysis tools. We can all use Boggs scales for saying how much does it hurt and where does it hurt, but we feel that we need more quantitative tools, such as the lumbar motion monitor and electromyography and better predictive models.

It was argued that these quantitative measures often result in unexpected findings that lead to optimal design.

Another point that Bill made was that quantitative measures are even more important when there is a high cost of being wrong in the design process.

I followed Bill and discussed the engineering design process. An important thing to realize in the design process of something that's going to happen three, four, five years out, is that we, the ergonomists, don't own the process, the engineers do. So our job is not to impose our process on them, but to infiltrate their processes.

The next thing that I discussed was the level of analysis, that is, the level of quantification should somehow reflect the importance of the cost of being wrong in the analysis cycle.

I also emphasized that engineers need quantitative rules. It's no good telling them that it's a 5 on a Boggs scale or a 15 or whatever it is; they need to know something about 10 pounds or 50 pounds or 8 Newtons or 15 inches or something like that. Engineers need numbers; we need to communicate in their language.

The other point that I discussed was that often, in the design process, we use a surrogate for the operator. This may be an anthropometric table an anthropomorphic computer model, it may be the NIOSH lift equation or the Snook tables -- we don't necessarily have an operator there to analyze.

I also would like to address some of the constraints on the decisions that are made. Generally speaking, policy decisions are made by management, not by engineers; and they have to decide which population to accommodate, whether we accommodate 50 percent or 75 percent or 95 percent of the population. What are the constraints in terms of time to implement a suggested design, and the resources available to implement these designs. All ergonomics decisions or engineering design decisions have to be dealt with in the context of the constraints of those decisions.

Rob Radwin discussed some of the mechanisms of increasing the level of sophistication of this design cycle by interaction between universities and industry, given that there is less government sponsorship of research now. He also suggested that he wanted to remove the ivory tower image of universities and get involved. The advantages of university involvement with industry is the level of expertise that exists within universities; there's an infinite supply of graduate students to do these jobs. They constitute enormous resources in terms of time, knowledge, and facilities, and you have an intelligent and enthusiastic cohort of people to help industry in this design process.

Often industry understands the problem but does not have the time for in-depth studies, and this is where universities can help. Rob has developed two consortia, one for hand tools and fastening in which 12 companies take part, a little bit from a lot of companies helps these kind of consortia.

There are of course problems of publication and proprietary nature of information, but these usually can be overcome. I think Bill and Rob and I all agreed that the solution to ergonomics problems in the long run is to educate the engineers, to put ergonomics in the engineering and the business curriculum. Generally speaking the engineers cause the problems and they are the people that have got to solve the problems. Thank you.

MR. ALEXANDER: Notice how we're starting to get our plugs wrapped on top of plugs up here. Now we're training engineers, so we're getting all these things coming together.

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Tolle Graham from EMPLOYEE INVOLVEMENT

MR. ALEXANDER: Tolle Graham is going to report out on the Employee Involvement Session, and she is with Massachusetts Coalition on Occupational Safety and Health.

MS. GRAHAM: First I wanted to thank NIOSH and OSHA for inviting me here to this conference to be able to present on this panel; but my secondary agenda was to be able to get together with those diehards last night for two hours from 5 to 7 while we were starving for

dinner to talk about popular education and ergonomics training. And I think that, since there won't be any written evaluation about it, you have to keep hearing about it from us; that it was great and people loved it, and have been coming up to us all day saying "Boy, that was fun, and it was really important."

Employee involvement. First I want to recognize and thank the panelists, our chair and presenter, Lida Orta-Anes, who's from the International United Auto Workers. We had a presenter, Ron Gillespie from Farmlands Foods, and Terry Stentz, who's an ergonomist from University of Nebraska who worked at Farmlands Foods on their ergonomics project; and Mick Andersen from Eaton Corporation; they were our presenters.

A theme of this conference that we've heard again and again is that employee involvement is one of the cornerstones of effective health and safety programs at the worksite. However, employee involvement means different things to different people, so I'd just like to touch on a couple of important issues related to employee involvement that I culled from our presenters, and from audience participation.

One of them is, who participates on ergonomics teams or committees? There seemed to be pretty strong general agreement that where it was most effective is where workers were in equal numbers to management, or even in greater numbers to management.

Lida presented a UAW study where they compared what they called participatory and non-participatory task forces where union members were in equal numbers and another one where it was mostly the technical management people, and one union member, and there were many ways in which they felt that their programs were much more effective with the participatory model.

It was also brought up by someone in our audience that we missed presenting another model that's not uncommon in many workplaces, where unions have taken the lead and actually run some ergonomics programs themselves. An example of that is the United Steelworkers Local actually in Massachusetts that I've been involved with, of local school bus drivers who run ergonomics training on a monthly basis as part of their licensing procedure.

Another issue that was discussed was, how do we give power to these committees in our organizations? Some of the issues related to that was, making sure that there's time off to do the work. Workers need to know that if they're on a committee, they aren't going to be constantly told "Oh, we're too busy now, you can't get time off to go to that committee."

There were issues around respect and communication skills to be able to work well on the committees, and training to bring everybody up to speed and understand all the language that we talk about, the technical stuff.

The committees need to be able to work on a large enough scope to work at the tough issues

associated with work organization. Things like production quotas and staffing; it's not just work design and getting new chairs. And then for many unionized workers, in order to be a more effective employee involved in this process, they have their own independent rights to set an ergonomics agenda. Some of the programs that were presented like the UAW, the UAW came in with some of their trainers and they had a real labor-management cooperative program.

Finally, the most challenging moment in our session was during the question and answer period where a question came up regarding labor laws in the area of employee involvement. This relates to the legal frame work for employee involvement, which is Section 882 of the National Labor Relations Act, which defines what company-dominated formations are, in which employees and management interact on issues of wages, hours and working conditions, which includes health and safety.

NIOSH and OSHA need to give greater attention to what this means in regards to really effective employee involvement, where workers will have some independent protections and authorities as they participate in committees or teams to solve ergonomic problems; and as an aside, an ergonomic standard wouldn't be bad, too.

So thank you very much.

MR. ALEXANDER: Tolle, thank you very much.

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Dave Alexander from PROGRAM EVALUATION

MR. ALEXANDER: First, there were three people on the program; myself, Bill Holt from DuPont, and Mike Fleming from Sara Lee Knit Products.

It's very interesting, when you look at ergonomics one of the fundamentals is the science of measurement; we measure everything we can about humans and very little about the business aspects of ergonomics, and I think it's important to do that.

Interestingly enough, if you look at science "Quality", you'll find that they would say "we've been there and done that." For many years quality was unsuccessful simply measuring the product, and became successful by looking at business issues. I think ergonomics has a similar opportunity.

You can evaluate a number of different ways; this is one method of evaluation that is simply based on stages of implementation of an ergonomics program. After you've seen a lot of these programs be implemented, you realize it's not that much different than building a house or raising a child. There are certain predictable stages that occur; you can measure those and monitor

those, and you can see where you are. In fact, it becomes a useful way of monitoring programs, multiple plants within a corporation.

Another effective way of looking at programs is to look at the costs. These are annual workers compensation costs on your left and total incidents per year on your right. They correlate; you see a drop in both of them. Cost is a very good integrative measure; it's not a very good detail measure. If your costs aren't in line, you don't know what to do. On the other hand, they tell a compelling, a very short compelling story if they're going in the right direction.

There are other ways to evaluate; and several examples were provided. In fact, you can look at the maturing of an ergonomics program and find that initially you may measure activities, eventually moving to outcomes or results based – which is a healthy place to be; many programs are moving to that. Ultimately you move to a systems base for very mature programs. We would measure or monitor a mature quality program on ISO 9000-type management systems principles.

This is a slide that Mike Flemming of Sara Lee Knit Products provided. Mike has the unenviable challenge of providing guidance for ergonomics program implementation to approximately 50 plants. I've heard many people say they have trouble figuring out what's going on at one plant, or five plants or ten plants; so you can imagine the chore, we're trying to track fifty. Yet Mike has done this with ease and grace.

One of the ways he does this is by simply using Gantt charts and good management tools. In this case, he has a line, Annual Activities; he's got the activities listed on a time schedule, and is able to track these and follow this very good system.

One of the things Mike does, he uses a tool assessing the ergonomics program. He asks the individual sites to fill out so it becomes their score, not his. He serves as a calibrator or an accuracy gauge to make sure that they've done it correctly. In fact, he reports that many plants will provide lower scores than they actually earn, and part of his job is to help them say "you're doing better than you may think."

But by having them score and score in different areas, things can be tracked and improvement objectives can be established; and again this is done with ownership at the local plant level.

Finally, he asked each plant to create a targeted action plan, based on their assessment, and as you can see there are a number of activities. There are descriptions of those, there are deadlines, timetables reporting and accountability things, all built in. So Mike's job becomes one of monitoring, reinforcing, praising, and following up, which is the role that a modern program manager should be following.

Bill Holt of DuPont has been managing his ergonomics program for a decade now; he started in 1987. So he's approaching a long anniversary. You might think back, what were you doing in



1987 and were you familiar with ergonomics or not.

In this case, you can see a substantial decline in the incident rate. It's kind of interesting, because if you look at this you may think, "Well, I also see the familiar hump that occurs with an ergonomics program." Actually, that is not due to the awareness training; that occurred much earlier in their program. This was due to a downsizing and people moving to new jobs, and also having more people working more overtime and perhaps being overworked just a bit.

But it's interesting, when you look at this, it's relatively easy to make a 5 or 10 percent change in your numbers. It's difficult to make an 80 or 90 percent change in your numbers, and that's what Bill was able to do and was able to report on. And it's interesting because there's a fundamental change in activities that occur in order to get those major step changes in performance.

Bill described this, it's been discussed I think in the earlier session, about how they changed from a being taken care of approach, which was a dependent environment: "You do what I say, I'll take care of you" to "I'll take care of myself" an independent approach; and now going to a "caring for others, an interdependence; we're in this together, let's help each other." I describe that as a culture change, a significant culture change, and I think it's one of the only ways that you can get these major changes in numbers, really getting down into the fractional levels and incident rate.

There is an ergonomics culture; each of the presenters talked about this. This is one version that I have of it, others have similar things but not identical; but in this it's easy to describe business as usual, where ergonomics is an expense, ergonomics culture where ergonomics is an investment. Business as usual, where we do it because OSHA says to do it. Ergonomics culture where we do it because it's simply good business. You can see the other contrasts and these will be reported out in the proceedings.

Finally, what is an effective ergonomics program? There are two points that are important; the first is that you do need to demonstrate a step change in performance; you must show that in fact these things work, and that may be comp rates, ultimately incident rates, ultimately lowering of risk factors, and in addition there must be systems which influence changes in performance. That's what separates it from a Hawthorne effect or simply trying, or simply getting lucky, simply manipulating the numbers of those other kinds of activities.

So relative to ergonomics program evaluation there are a lot of tools, there are ways to do it, it's something that's important. So I'll conclude on that.

What I would like to do now, and I think this is the most fun from my standpoint is, open the floor for discussion questions, and those kinds of things. I would ask, given the lateness of the day, that perhaps we keep our questions short. I think most of the presenters will be available for a few minutes afterwards if you want to discuss any topics at length.

If there are questions or comments, we can have those.

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### Question and Answer Session

Q: I think over the past few days you've answered all the questions; I have a comment. You know, before you gear down to -- I'm John Geralt, I'm a physician at Troy Industrial Medical Center in Troy, which is a suburb of Detroit, which has a high number of plants that serve the auto industry.

I just want to make a comment backing up the comment of a physiotherapist yesterday who said that in his experience, most of the employees that he treats are either overweight or in some way physically not in very good shape. And what I've been hearing for the last couple days is, there's a similar comment to the education system in the United States; gearing down to the mentally incompetent so that there's an outcome of more graduation in high school -- let's not gear down to the physically incompetent worker.

Very few companies have made the comment that we have an exercise program. Several of them have said before the worker starts they have a warm-up session, which is a very logical thing. If you've ever been in industry and seen people working -- now I don't know about the plants that you all are in, but I've worked at the Ford Rouge plant in the '50's, and that was horrible working conditions.

Now in Troy, these plants are like your home, really; and yet these people have these injuries, backs, carpal tunnel -- most of them think they have carpal tunnel; what they really have is neck and shoulder problems with referred pain into the fingers. These people are not physically competent, and I think the companies that promote exercise programs, the one said warm-up before they start on company time, and then later on during their breaks, one in the morning, one in the afternoon, they do stretching exercises.

I think this will do more for reducing these injuries, and I just want to refer to the statement, the KISS principle: "Keep It Simple, Stupid." Before you gear down industry, let's gear up employees.

MR. ALEXANDER: Thank you. Any comments from the panel?

DR. RODGERS: I'd like to comment, let's say "I resemble this remark." I have had surgery recently on two carpal tunnels, and the major reason for that was personal risk factors, as you indicate, and a little bit of genetics.

What I'd like to suggest, though, is something I feel strongly about as an exercise physiologist.

The kind of fitness is a level of fitness you can only get with a fairly active exercise program and a fitness program.

As you know, you don't get the fitness on the job because the level of exercise that you can sustain on the job would not be adequate for training, either cardiovascular or even much strength training. So what I have always suggested to people, and I think Don Day said it yesterday in our panel, is to be sure that these other aspects of workplace fitness, health counseling, things of that sort, are included in your overall wellness, ergonomics and safety program.

We work with several companies that have done this; they have actually contracted exercise physiologists and fitness groups to come in, on site, and have provided a full facility with all the equipment and oversight. It's voluntary, but it's also now being integrated into the medical management aspects of our program. The exercise physiologists come to the ergonomics training and actually get our people up and march them around the room and get them some exercise during the course.

So I agree with you 100 percent that it's an important part of the program, and it will help reduce some of these injuries. We have stretching in many plants; I first saw them at General Motors plants back in the early 1980's. They have been effective, but you need the buy-in, and I think some of them are a little too heavy for what they really need. While I agree with your point, I think, that to try to make people as fit as some of the job demands require is essentially saying that you're trying to have some people become Olympic athletes. You would have to be an Olympic athlete to be able to sustain that work over 8 to 12 hours. And that probably isn't reasonable.

MR. ALEXANDER: Thank you, Sue.

Q: Well, I agree, except that --

MR. ALEXANDER: Let our panelists go ahead and finish. Sheree?

MS. GIBSON: If I might comment; having worked for both companies and worked with companies who have wellness programs that are quite active, while they consider that a part of a solution, an ergonomic solution or a health and safety solution, that certainly wasn't their whole emphasis, and the reason was very simple: They had weight lifters who had bilateral carpal tunnel and hands in splints. It's a sad thing to say, but there are some jobs out there that are just so difficult to do and so demanding that no matter what kind of shape you're in, you're going to get hurt.

MR. ALEXANDER: Thank you. I've got another question in the back?

Q: Marvin Dainoff, Miami University, Ohio. There are a couple of comments that have been

made throughout the course of this conference. Bill Marras said it's not necessarily common sense; he also said that ergonomics is situation-specific; and I think it was Sue said "get rid of the consultants."

DR. RODGERS: No, no, I didn't say get rid of them; I just said just don't depend totally on them.

Q: Don't depend -- yes, just don't hire them. I would remind that you that's --

DR. RODGERS: Please don't get rid of them, thank you.

Q: Well, the issue is, we have a technical area of ergonomics as an applied science, but we also have participatory groups; and I wonder if people would comment on the relationship. You know, at what point -- the practical concern for me, I've done both research and trained participatory groups. The question is at what point do the groups, will they know to ask for help?

MR. ALEXANDER: Comments from a panelist? Sheree or Sue.

DR. RODGERS: I don't want to dominate this; I'm sure the rest of you have things to say, maybe you want to talk about it from the educational basis, but let me give you my simplest thoughts.

When I'm trying to look at a problem job in a business, I want all of the experts there. What do I offer as a consultant? I offer a knowledge of physiology, of human factors/ergonomics that will help me understand what the real experts, the people who are doing the jobs, can tell me they think is a problem. And, I can help educate them to understand how much of a problem it is.

I've never, ever had somebody tell me there's a problem, "It hurts when I do this," and have to say there's nothing wrong with the job. Usually there's something that I can point to that might aggravate that situation; not necessarily cause it, but, at least, might aggravate it.

So I try to participate as one of the members of that team. I think that's the thing we maybe haven't said, that the whole process of ergonomics involves many experts, which is multidisciplinary. It's not just an ergonomist; it's the medical professional, if they're there, it is the engineer. It takes all the people working together to come up with the best solutions.

I underplay the technical side for the work teams on the floor, because all it does is turn them off. I actually can tell you that when I was teaching a class how to use the first NIOSH lifting guidelines, at one point they just say: "We don't want to use the equation." And it was to the point where they almost got up and walked out on me. They didn't like imaginary numbers. It's this kind of issue that I think we have to recognize. And what your training group was coming up with may be the fact that you've got to speak the language of the people that you're working with, and you've got to make ergonomics as practical as possible on the floor.

Where the science comes in, and I think it's absolutely critical, is to help understand where those points are, or where there is a problem, when we need to restrict a job demand. We need to either set a standard or we need to give a guideline to say "You can't go beyond here."

MR. ALEXANDER: Laura.

DR. STOCK: I think one of the issues is, who's driving the process, who's setting the agenda, who's coming up with a list of issues? And it seems to me that that's where, you know from the point of view of worker involvement from the issues that were discussed in my panel, that really it's the people who were doing the job, who had the expertise, who have the day-to-day experience with the job who can understand what problems you're trying to address.

I see consultants, and even in-house experts as tools to them. Once they've already set the agenda, and I think, you know, many of us who go in and do -- I've done a lot of office worksite evaluations, and I'll go in and I'll give advice and I'll say "Use such and such piece of equipment," because I've read a lot about it and I've been to lots of conferences and I know that's the right solution. I come back three months later, and they're not using it, and I could react like "Well, what's the matter with them? Don't they know that I know what I'm talking about?"

And if you actually talk to people, there's almost always a good reason. They're not using it because it doesn't work because I didn't take into account, for example, that they don't use, you know, single pieces of paper so that document holder isn't going to work; but they use huge binders and they have to change them every two hours. That's the kind of thing that people who do the work know, and I feel the problem is that a lot of times people call in consultants or again their in-house technical experts, and think that they know the answers -- they know what the questions are, and as long as they come after, that they are not the ones setting the agenda, they have a critical role to play.

MR. ALEXANDER: Great, thank you. Tolle, you've been nodding down there. Did you have a comment?

MS. GRAHAM: No.

MR. ALEXANDER: Sheree?

MS. GIBSON: I think one of the things that I've found is the most effective is working with -- as well as doing training, but probably working with ergonomic teams and helping them come to the solution. It's literally a dialogue between the team and me, and we make suggestions back and forth and we show each other products, and do you think this will work and try things? And sometimes it is trial and error to get to there; but that's what it's all about; I mean, it's not an exact science. I like to think of it as an art form.

MR. ALEXANDER: Just a follow-up comment from my own experience; it's fun to watch

ergonomics change, being with it for about a quarter of a century. It's gone from being a technical art to a change agent issue, and you've got to involve people and let them have their say. Wonderful to see.

We've got time for one more question, I believe.

Q: It was just a follow-up. This is Scott Schneider from the Center to Protect Workers' Rights.

In my experience, I think there's a lot of ergonomic issues or problems that are coming up that really, it's fairly obvious to the workers and to the people that look at these issues, that if you were going to be handling 80 pound bags of concrete mix all day, you don't really need an ergonomic expert to come in and tell you that's a problem.

I think the problem comes when maybe there are things that might be a problem if you're doing them say, all day; but if you're only doing them for a couple of hours, maybe it's okay, where there's things in this gray area where you may need a consultant to come in and maybe quantify some of the stresses and look at these issues where, you know, it may be bad for some people but not for others, or it may be bad if you do it too long. But I think there are so many obvious problems out there to work on.

So to a certain extent I disagree with Bill Marras, that it's not -- I think a lot of it is common sense, because the people that are working there, they know what the problems are, at least the large problems; and I think there's a lot of those to work on.

MR. ALEXANDER: Thank you for your comments.

## Conference Adjournment

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Closing Remarks by Larry Fine, NIOSH

MR. ALEXANDER: It's my pleasure to introduce Larry Fine from NIOSH, who will handle the conference adjournment and make some final comments.

DR. FINE: Let's give a big hand to the last panel. Thank you all very much.

I want to thank all of the presenters and the audience; you've asked the presenters great questions. The presenters worked hard; many of them worked over Christmas. Many of them were not invited until Thanksgiving to come to the conference, and it's really been an amazing effort. We've received a lot of congratulations for the conference; but I think this is one of those conferences or activities where everything went right. I mean, for a serious accident to happen, a lot of things have to go wrong; but here a lot of things just happened to go right, so it's been a great conference.

I want to expressly thank my colleagues from NIOSH and OSHA. I want to give special thanks to Margo Daniel and Chris Gjessing who were the team leaders, and really who worked night and day over the last four months to put the conference together.

They were assisted by a team of people; Cheryl Estill, Sean Gallagher, Sandy Kasper, Mark Kitzmiller, Jim McGlothlin, Brian Moyer, Gary Orr, Vern Putz-Anderson and Jennifer Silk who all did a great job, too. Thank you all very much.

And last I want to thank our colleagues from Visions U.S.A, which is a great small company who helped put this conference together.

From my perspective the goal of this conference has been achieved in that many very successful programs have been described. One expected and welcome observation that I have made is that we all share a common commitment to make workplaces safer, each in our own way. At times this is obviously a daunting task, but I think it's an important one. We must persist each in our own way, to have faith that we have made a difference, and that we will continue to make a difference in the future.

Have a good and safe trip home. Thank you all very much.

[Whereupon the conference concluded]

