

### Position Statement: Industrial Exoskeletons and Return to Work

Submitted by Rick Goggins on behalf of the Exoskeleton Advisory Committee\*

**Disclaimer:** The information provided is for general informational purposes only. All information is provided in good faith, however DOSH, Labor and Industries, and the Exoskeleton Advisory Committee make no representations or warranty, express or implied, on behalf of any manufacturer, including but not limited to any warranty of merchantability or fitness for a particular purpose of any item. DOSH, Labor and Industries, and the Exoskeleton Advisory Committee shall have no liability to you whatsoever for any loss or direct, indirect, incidental, or consequential damage incurred as a result, in whole or in part, in reliance on any information provided herein.

The purpose of this position statement is to discuss the potential benefits and risks of exoskeletons and to provide guidance to anyone considering their use in Return to Work. The primary objective of any exoskeleton used in a Return to Work (RTW) capacity is to prevent further injuries from developing. The exoskeleton must not aggravate the original injury, nor cause a secondary injury.

#### Potential benefits of exoskeletons

Industrial exoskeletons have many potential benefits for physically demanding jobs. Laboratory and field-testing of exoskeletons have found that they can:

- Reduce muscle loading
- Reduce compressive forces in the spine
- Improve posture
- Decrease discomfort and perceived exertion
- Reduce energy expenditure and fatigue
- Improve endurance
- Increase productivity and improve work quality

While these results are promising, many of these findings were based on studies with a small number of participants. Some of the studies were in the laboratory with controlled conditions, while others were in the field with real or simulated tasks. Some of the studies focused on a specific task for which the exoskeleton was well suited. Studies have also found negative effects from some exoskeletons, including discomfort, increased spinal loading, and increased energy expenditure. Not all benefits will be achieved with every exoskeleton; it is important to select an exoskeleton model that fits the worker, task, and work context.

## **A new technology with many unknowns**

Industrial exoskeletons are a rapidly evolving technology, with new manufacturers entering the market and **existing models** being modified frequently. It is only very recently that they have been available for industrial applications, so no one knows what the effects of long-term use will be on workers. Use of exoskeletons could have unintended consequences, such as deconditioning, or changes to movement patterns that could increase injury risk when not wearing the exoskeleton. All of the research on industrial exoskeletons has been with healthy participants, and to our knowledge, there are no studies investigating the effectiveness of exoskeletons as a RTW intervention. Right now, we have more questions about exoskeletons than we do answers.

## **Possible benefits specific to return to work**

We know that being off work after an injury has many negative effects on the worker, their family, and their employer. The goal of return to work programs is to bring the employee back to work as soon as it is safely possible to do so. Exoskeletons may be able to assist the individual in doing their job within their work restrictions during their recovery. Exoskeletons may also offer a feeling of security, helping to overcome fears of re-injury or of pain due to movement that might otherwise keep them off work.

## **Are they appropriate for return to work applications?**

This committee believes that it is still too early to recommend exoskeletons for return to work except under very **strictly controlled conditions**. Employers should use exoskeletons in conjunction with, or as a supplement to, a robust return to work program including transitional duty, modifying the job using engineering/administrative controls, and graduated return to work before considering exoskeletons. Given that the potential unintended consequences and contraindications for exoskeletons are not yet fully understood, exoskeleton use in RTW context should be undertaken with consistent follow-up and supervision by the RTW health care team. Exoskeletons are a promising technology, and the committee supports the idea of further research on their application for both injury prevention and return to work. The committee lists some of the **questions this research should seek to answer** in a separate document.

\*The Exoskeleton Advisory Committee is:

Stephen Bao, PhD, CPA, CCPE, Labor & Industries, SHARP

Kendra Betz, MSPT, ATP, National Center for Patient Safety, Veterans Affairs

William Billotte, PhD, National Institute of Standards and Technology, Vice Chairman ASTM F48 Committee on Exoskeletons and Exosuits

Rich Gardner, MS, PE, CPE, Boeing Research & Technology

Rick Goggins, CPE, Labor & Industries, DOSH

Pete Johnson, PhD, Occupational and Environmental Exposure Sciences, University of Washington

Jim Lin, PhD, CPE, Labor & Industries, SHARP

Matt Marino, PT, MSPT, CPE, CWcHP, CSCS, TSAC-F, CPT, SFMA, FMS, Briotix Health

Sarah Martin, OTR/L, Labor & Industries, Return to Work Partnerships

Keith Osborne, CEAS, CWS, Seattle City Light

Donald Peterson, PhD, College of Engineering and Engineering Technology, Northern Illinois University

June Spector, MD, MPH, Department of Environmental & Occupational Health Sciences and Medicine, University of Washington

Chris Reid, PhD, Boeing Environment Health & Safety

Ornwipa Thamsuwan, PhD, Canadian Centre for Health and Safety in Agriculture, University of Saskatchewan

Catherine Trask, PhD, Canadian Centre for Health and Safety in Agriculture, University of Saskatchewan

Delia Treaster, PhD, CPE, Ohio Bureau of Workers' Compensation