How to Implement an Ergo-Team Approach to Participatory Ergonomics

User's Guide

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We developed the "Ergo-Team" approach outlined in this User's Guide after a review of the literature on participatory ergonomics and based on the experience developed at the ***centre de recherche sur les interactions biologique entre la sante et l'environnement (CINBIOSE), L'université de Quebéc à Montréal***. We pilot-tested the approach with workers and management in the ***Beothic Fish Processors*** processing plant in New-Wes-Valley, Newfoundland and Labrador, Canada. The draft approach developed at Beothic was reviewed at a workshop composed of experts in participatory ergonomics in Boston in August 2007. The approach was then adapted for transfer to a second, smaller seafood processing plant in rural Newfoundland, Canada. After further developing the approach within a rural and remote context it was adapted for use within two urban food processing plants: 1) a poultry processing facility in St. John`s, Newfoundland and Labrador, and 2) a snack bar processing facility in Montréal, Québec, Canada. We would like to take this opportunity to thank these employers for substantial in-kind contributions to the project and the Ergo-Teams and other workers and management in these plants for their collaboration with, and strong support for this project. It would not have been possible without their help.

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As ergonomists, we hope that access to the User's Guide, video ("A Team Approach: Participatory Ergonomics and Your Workplace"), training workbook, and tools can help you improve the quality, effectiveness, and sustainability of the workplace ergonomic interventions you facilitate. Any errors or omissions are our own. We see these resources as 'works-in-progress' and we encourage you to be innovative, adapt and try different tools and offer us your feedback on the resources as well as on your experiences with working with them in different workplaces. For this reason, we have included a *Feedback Form* with the kit and encourage you to complete that form and return it to us at your leisure. We look forward to hearing from you

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1.0 Introduction

Employers are often unfamiliar with ergonomics and hesitant to invest in ergonomics programs without assurances of positive and fast economic returns on their investment. As a result, they tend to bring in ergonomists after an injury or cluster of injuries has developed, expecting them to "fix" the problem. Consulting ergonomists can provide, after a short period of consultation and observation, professional advice on ways to reduce the risk of injury. But the benefits of this kind of short-term, post-injury intervention are limited, particularly in dynamic workplaces where frequent changes to production are normal and where opportunities for follow-up and further investigation are limited and costly. Other shortcomings with this approach include the fact that there are often too few qualified ergonomists to maintain consistent contact with jobs requiring interventions. Furthermore, expert approaches that don't engage workers and management are often not implemented or effective (Toernstroem et al., 2008).

1.1 What is participatory ergonomics (PE)?

As defined by the International Ergonomics Association (IEA) ergonomics is:

> *The scientific discipline concerned with the fundamental understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods of design in order to optimize human well-being and overall system performance* (*International Ergonomics Association, 2008* ***What is Ergonomics*** *section*).

A **Participatory Ergonomics** (PE) intervention is an approach to practicing ergonomics that helps to meet the multidisciplinary perspectives outlined in the IEA's definition. A PE intervention starts from the assumption that employees (workers *and* management) who are involved in efforts to identify and reduce risk bring essential knowledge for understanding the work situation. It is assumed that they are more likely to accept the changes proposed (Saleem et al., 2003), as well as to ensure they are implemented in a way that is realistic and consistent with employer and employee needs (St. Vincent et al., 1997) if they and their knowledge are included in the design of an ergonomic intervention. PE harnesses employee (worker and management) knowledge of organizational, physical, social, and psychological factors associated with injury by promoting their engagement within the design and implementation of ergonomics interventions.

PE has been successfully applied in many sectors and types of workplaces including: health care (Udo et al., 2006; Evanoff, Bohr & Wolf, 1999; Bohr et al., 1997), home care (Pohjonen et al., 1998), office work (Vink et al., 1995), construction (Hess et al., 2004), manufacturing (Vézina et al., 1998; 2003), and food processing (Vézina et al., 2000; Moore & Garg, 1998).

1.2 The Ergo-Team approach

A PE approach can be used in any ergonomic intervention but can take different forms. It can be used to guide the identification of problem areas and development of appropriate interventions by an ergonomist, as described in Guerin et al. (2006). Alternatively, it can be used by an ergonomist to train an "Ergonomics-Team (Ergo-Team)" in how to use a PE approach. In this guide and associated tools, our focus is on the **Ergo-Team approach**, particularly as it is described by St. Vincent et al. (2000):

1. the intervention follows a series of steps that involve gathering knowledge from operators (workers) and technical specialists;
2. the intervention seeks to enhance the ability of the workers to understand, describe, and review the components of their work and the factors critical to it;
3. training related to ergonomics concepts and methods of analysis is provided to worker, supervisor, and technical specialists, who form an Ergonomics Team;
4. the members of the team take an active role in selecting sites for intervention and analysing the work activities in selected intervention areas; and,
5. the team and also the workers at the intervention sites are involved in the development of solutions.

In an Ergo-Team approach to PE, the ergonomist facilitates the establishment of an Ergo-Team consisting of employee and managerial representatives, oversees their efforts to identify areas of the workplace associated with a risk of Work-related Musculoskeletal Disorders (WMSDs), and trains the team to analyze the work activities associated with these areas and to devise ways to reduce the risk of injuries on these jobs. The ergonomist then facilitates the efforts of the team to generate a report based on their work for: 1) *the Joint Occupational Health and Safety Committee (JHSC)* in workplaces where appropriate; or 2) the appropriate decision makers related to company occupational health and safety. If approved by the JHSC, or other appropriate representative, the report is presented to management. The ergonomist also encourages the Ergo-Team to monitor and evaluate the effectiveness of interventions resulting from their work and to undertake new job analyses and interventions on an on-going basis.

As is typical of PE approaches, the Ergo-Team potential requires substantial upfront investment of resources and planning but its benefits are numerous. Benefits of the Ergo-Team approach include the possibility of a more proactive and informed approach to injury prevention. In addition, by involving employees in the change process, PE can also improve the quality of their work life by giving them a more active role to play within the company. Involving management and supervisors can improve support for the project, show employees the project is being taken seriously, and ensure management's concerns are taken into account, thereby increasing the likelihood of action and success (Laitinen et al., 1998).

1.3 The "How to Implement an Ergo-Team Approach to Participatory Ergonomics" User's Guide

This User's Guide is designed to help an ergonomist or other professional with ergonomics training to implement an Ergo-Team Approach to PE. It should be used in conjunction with the enclosed DVD entitled ***A Team Effort: Participatory Ergonomics and Your Workplace***. The video is intended to help

the ergonomist introduce the Ergo-Team approach to PE to a prospective employer or worker representatives. The full package also includes a training workbook entitled ***Implementing an Ergo-Team Approach to Participatory Ergonomics: Training Workbook and Tools for Ergo-Team Members***. The training workbook contains sample training exercises and tools for use by the ergonomist and the Ergo-Team.

This User's Guide and related package of tools were developed by an interdisciplinary team of researchers and community partners in Newfoundland and Labrador in eastern Canada with funding from the Knowledge to Action Program of the Canadian Institutes for Health Research. The project was coordinated through SafetyNet, Memorial University of Newfoundland's Centre for Occupational Health and Safety Research. The team worked in collaboration with Dr. Nicole Vézina, a PE specialist at CINBIOSE at the University of Québec in Montreal. We received valuable feedback during the development and pilot testing of the approach outlined here from discussions held during an international workshop with a group of participatory ergonomics experts in Boston (August 2007) and from reviews of draft documents and tools by ergonomists.

Although initially designed and tested in collaboration with workers and management in the seasonal, rural, and remote seafood processing industry, the Ergo-Team approach to PE outlined in this guide has been adapted from research on PE carried out in diverse workplaces, rural and urban. From 2008 to 2011 the approach was implemented at two urban, year-round food processing plants (Antle, 2008; 2011), a poultry plant in St. John`s, Newfoundland and Labrador (Boone, in preparation*)*; Boone & MacKinnon, 2010), and a snack bar processing facility in Montréal, Québec. Overall, these experiences included family-owned small enterprises as well as corporate-owned enterprises made up of several subsidiary plants. We therefore think the User's Guide and related video, training workbook, and tools will be of interest to ergonomists, unions, and employers in a variety of workplace contexts including both urban and rural environments and in multiple industrial sectors.

Those interested in using this guide and associated materials should, however, be aware that each workplace is unique. It is therefore necessary to evaluate the approach and tools outlined here carefully in terms of their relevance and appropriateness for your workplace and to adapt them, where appropriate, to the unique environment in that workplace. In addition, the overall Ergo-Team package should be used in conjunction with other ergonomics resources such as workshops and general ergonomics guides available to ergonomists, compensation commissions, and other agencies in your province or country.

2.0 The User's Guide

In this section of the User's Guide, we describe who might benefit from using this Guide and the associated video (***A Team Approach: Participatory Ergonomics and Your Workplace***) and training workbook/tools for Ergo-Team members (***Implementing an Ergo-Team Program for Participatory Ergonomics: Training Workbook and Tools for Ergo-Team Members***). We provide a somewhat more detailed explanation of PE and discuss the role of the facilitating ergonomist within an Ergo-Team approach to PE.

2.1 Who might benefit from this guide?

This is a resource tool for use by ergonomists or other professionals with training in ergonomics who are interested in working in close collaboration with workplace parties to reduce the risk of WMSDs, and in targeting human factors issues and reducing the risk of accidents. It is worth noting that the original objectives of this project and development of these tools related specifically to reduction and prevention of WMSD issues, rather than cognitive and psychological symptoms, such as information processing or work-related stress. Therefore, the focus of these resources is the reduction of WMSDs. This User's Guide and associated materials would also be useful teaching tools for universities which train professional ergonomists, as well as in ergonomics workshops with sector associations and industry, worker, government, and compensation commission representatives.

The risk of WMSDs is affected by **physical**, **psychosocial**, and **psychophysical** factors in the workplace. These factors include elements in the surrounding workspace, work organizations, as well as the personal needs of the employees and production constraints. They also include decision-making and communications processes within the company or plant that can contribute to, or reduce risk, and can influence the likelihood that the changes suggested through the ergonomic intervention will actually be implemented and effective.

Any ergonomics program should attempt to address each of these levels but understanding how they operate and how best to address these factors in a particular workplace can be very challenging (Theberge et al., 2006). When done well, PE can help to overcome some of these challenges.

2.2 Why take a participatory ergonomics approach?

PE seeks to use participation and collaboration to maximize the information and resources available for ergonomic improvement in the workplace in the short and longer-terms. Expert guidance and broad engagement with an organized, step-by-step, informed and systematic approach to hazard identification and improvement has the potential to generate a better, more effective and more sustained program with buy-in at all levels and from all key groups within the workplace. More specifically, three basic reasons are frequently identified for adopting a PE approach to ergonomics:

1) Workers and floor-level management know about their work. Workers can describe their symptoms and identify many of the things that determine how they do their job.
2) Often the best way to reduce the longer-term risk of WMSDs in workplaces is by increasing the capacity within the organization to identify jobs, work set-ups and

organizational practices that are likely to contribute to injuries as well as the capacity to systematically and collectively eliminate or reduce these contributing factors.

3) Occupational health and safety (OHS) is based on the exchange of knowledge (Sherehiy & Karwowski, 2006) and a participatory approach can help to bring employees and managers together to facilitate knowledge exchange. Enhanced change effectiveness and improved communication can be an outcome of a PE approach (Laing et al., 2005) ensuring increased buy-in at all levels of a company and helping to ensure required changes in equipment, job organization, policy and training are enacted.

A much broader goal of PE is to create an environment where ergonomic thinking starts to permeate the organization so that the need to minimize risks is taken into account when introducing new technologies, new production lines, or changes to the organization of production and the layout of the workplace. This kind of approach also, of course, can help the employer and employees demonstrate appropriate due diligence in the area of ergonomics or, where these exist, meet regulatory ergonomics requirements.

2.3 The Ergo-Team approach to participatory ergonomics

In the Ergo-Team approach to PE, the Ergo-Team is the workhorse that builds ergonomic capacity within a workplace and, ideally, plays a lead role in moving the workplace from reactive, post-injury responses to proactive ergonomic thinking ideally guided by an ergonomics program. The Ergo-Team is trained by the ergonomist and then works collaboratively with the ergonomist, workers, and supervisors to identify problematic work situations and then to study those situations. The Ergo-Team then develops a report and recommendations based on its work and submits this report to an occupational health and safety manager or supervisor at the worksite, or in some cases the joint occupational health and safety committee (JHSC), for review. The OHS representative and/or the JHSC uses this report to develop recommendations for changes to work and submits these to upper level management.

With this approach, a new team of trained representatives from management and workers, supported by an ergonomist, becomes the main vehicle for achieving PE objectives. The Ergo-Team approach to PE can help shift a workplace from *reactive responses* to WMSDs to *operating proactively* by developing stronger, workplace-based capacity to identify and reduce risks and ideally, by laying the foundation for the development of a strong ergonomics program within the plant.

Developing buy-in at the employee and lower management levels is critical to the success of any PE program. Using the employee members of the Ergo-Team to analyze and collect data helps to foster buy-in from other employees. Having peer employees complete the job assessments can mean employees from the intervention site are less likely to view the assessment process and potential changes as threatening, which might be the case if this was done by an outsider or by management.

Employees often feel more fulfilled and happy with their job when they have greater responsibility in the workplace, a role in decision-making, and greater interaction with management (Laitinen et al., 1998). By having Ergo-Team members engage their peers the potential benefits of PE are not limited to employee representatives on the Ergo-Team.

3.0 Is an Ergo-Team Approach to PE the Right Approach for You and Your Enterprise?

The success of any PE program depends heavily on whether the company and its stakeholders are ready for change. The company should show an interest by going and looking for new knowledge, rather than having an ergonomist or safety officer having to push them towards such knowledge and provide prevention. A PE program may require a shift in corporate culture because it requires management some leadership and to give some decision-making latitude to middle managers and employees who are involved with the Ergo-Team.

The Ergo-Team approach is fairly resource intensive in the first instance but has the potential to build substantial in-house capacity to achieve ongoing ergonomic improvements in the workplace over time. Input and periodic guidance from outside ergonomics experts is required up front and will still be needed in the future. However, the presence of the Ergo-Team in the workplace should improve the capacity of the organization to anticipate problems, identify when they need outside input, maintain interventions between visits of an ergonomist, and allow the workplace to work more effectively with outside experts when they are brought in.

While the Ergo-Team approach has many potential benefits, there are important prerequisites for this approach to work effectively in a given enterprise. The Ergo-Team approach also entails particular roles and responsibilities for many different groups. This section discusses the prerequisites for an effective Ergo-Team approach to PE and these roles and responsibilities.

3.1 Assets and prerequisites for a successful ergo-team approach to PE

Existing research on PE has identified some assets and essential prerequisites for the successful implementation of any kind of PE approach, including an Ergo-Team approach. These include:

1. active and sustained involvement by an ergonomist or someone with adequate and appropriate ergonomics training;
2. substantial buy-in from employers and upper level management;
3. access to regular paid time away from production for Ergo-Team members to train, do job assessments and to develop reports to the JHSC;
4. access to a laptop computer, a digital camera, some software, office space for meetings and a lockable filing cabinet for storage of confidential information;
5. direct employee participation giving the employees (workers and supervisors) in the area under study including:
    - a role in identifying and analysing hazardous situations,
    - a role in helping to identify solutions; and, where appropriate, and
    - a role in helping to implement those solutions and assess their effectiveness;
6. substantial buy-in by shop stewards and unions in unionized environments;

7. where applicable, a functioning and engaged Joint Health and Safety Committee (JHSC). If the company is not large enough to have a JHSC, engagement of the appropriate OHS representative is suggested;
8. strong and open lines of communication within the Ergo-Team as well as project champions at different levels in the organization;
9. a step-by-step, systematic approach to training and to implementation of the PE approach;
10. a focus on generating solutions that are practical, cost effective and that have health benefits; and,
11. systematic evaluation of the effectiveness of the interventions including of the changes implemented. Attention should be paid to the direct effects and any potential indirect effects (i.e. effects upstream and downstream from the changes made and effects on the organization as a whole in terms of safety culture, organizational ergonomics capacity, etc.).

    (Adapted from de Looze et al., 2001; de Jong & Vink, 2000; Haines et al., 2002; Hignett et al., 2005; Koningsveld et al., 2005; Zalk, 2001; Kramer & Cole, 2003; Kramer & Wells, 2005)

The following subsections discuss many of these assets and prerequisites in greater depth along with the roles and responsibilities of the workplace parties involved in a successful Ergo-Team approach to PE.

3.2 The facilitating ergonomist

Ergo-Team PE approaches require the ergonomist to play the role of a facilitator as well as a consultant. Facilitators require strong communication skills and are concerned with helping enhance ergonomics capacity; they essentially work with people (workers and management) to achieve behaviour change (Thompson et al., 2006).

Facilitators are sometimes referred to as knowledge brokers and are often identified as playing a critical role in transferring knowledge within occupational health interventions (Kramer & Cole, 2003). The following is a list of skills/training useful to a facilitating ergonomist:

- understanding of physical, cognitive and organizational ergonomic factors;
- training in workplace intervention theory and practice;
- understanding of the requirements for successful participatory ergonomic intervention;
- ability to evaluate organizational/workplace culture to ensure the proper elements are in place;
- strong communication skills;
- experience as a facilitator/teacher/train-the-trainer; and,
- understanding of the challenges associated with successful knowledge transfer and exchange.

Understanding the theory behind these items is important, but there is no substitute for experience in applying them in an industrial setting.

The ergonomist is responsible for providing information to key stakeholder groups within the plant in order to lay the foundations for the project and for Ergo-Team training and expert support. This includes presenting information to owners, management and others on the type of personnel who should be involved, methods to select Ergo-Team members, and clearly indicating required support for the Ergo-Team from union/management levels.

Explaining the PE process and intended strategy to management are important. This kit contains a video, "A Team Approach: Participatory Ergonomics and Your Workplace," to help with this part of the process. This will help management and the Ergo-Team correctly estimate the overall cost of the intervention and to budget appropriately for replacement workers and other direct and indirect costs.

The facilitating ergonomist must also provide ergonomics and participatory-research training to the Ergo-Team, and provide ongoing support for the Ergo-Team members and feedback on their work. The ergonomist should have some background training in intervention theory and PE and can use this guide and the tools included with the User's Guide as a resource for themselves, as well as for training and communications.

The ergonomist should encourage the development of networked communication based on strong interaction and interactive engagement by key personnel with the Ergo-Team process (Kramer & Wells, 2005). Kramer & Cole (2003) suggest that a knowledge transfer process needs to be **sustained** and **intensive** to bridge the knowledge-to-application gap, while **interactive** engagements lead to **effective communication**.

Overall, the facilitating ergonomist's role includes:

1. introducing ergonomics, PE, and the Ergo-Team approach to the organization (owners, management, JHSC, Union) and outlining the potential benefits of this kind of approach and its relevance for their organization;
2. highlighting the prerequisites for a successful Ergo-Team approach and some of the potential challenges with this approach;
3. helping management develop an estimate of the related costs and a realistic budget as well as explicit goals and objectives for the initiative;
4. overseeing the establishment of the worker-management Ergo-Team, training the Ergo-Team members, and guiding, at a minimum, the first round of PE activities including the area or work task selection process, work task ergonomic evaluation, report development, implementation, and evaluation of the resulting recommendations;
5. ensuring that a step-by-step approach is followed and expectations, goals, and timelines are understood at both employee and management levels;
6. monitoring lines of communication related to the project and initiating contact with upper level management, the JHSC, and union representatives at key points in the process;
7. providing on-going support to the workplace after the Ergo-Team is established and has carried one or more full cycles of activities. This support would include returning at regular intervals to assess what is happening, assessing the functioning of the Ergo-

Team, training new members where turnover has occurred, and monitoring the evaluation and change process; and,

8. being available to the organization to help with more complex problems that are beyond the skill-level of the Ergo-Team.

Although these 8 items are critical to achieving the goal of developing and Ergo-Team and achieving desirable workplace intervention, the facilitating ergonomist must also remain aware of ethical obligations. Most ergonomists in Canada are aware of the ***Professional Code of Ethics of the Association of Canadian Ergonomists and Canadian College for the Certification of Professional Ergonomists***. However, there is an expanded set of ethical considerations related to participatory interventions (Cargo & Mercer, 2008; Minkler, 2004):

Project selection – the issues identified and projects selected should be important to the enterprises stakeholders, and the ergonomist should not select projects based on his/her interests alone.

Developing trust – the ergonomist should recognize that as an external researcher/professional some stakeholders may not be comfortable with their presence in the early phases of the project. You should refrain from insisting that certain industrial partners participate when they do not wish to and let trust and acceptance develop naturally.

Avoiding prejudice - it is often the case that an external researcher/ergonomist is not familiar with the culture of the workplace or the community they are working with, and care must be taken to ensure that prejudices that exist about certain groups or work operations are not going to have a negative impact on the project.

Understand the limits of participation– participation should not interfere with the normal "flux" and activities of the workplace. The ergonomist must recognize there are financial and logistical realities that need to be taken into account. The researcher/professional must be flexible to ensure minimal disruption to the participants.

Agreeing on ownership and sharing of project information – ergonomics researchers/professionals are often interested in sharing/publishing findings and/or using findings for future projects. However, some findings might be damaging to the workplace, or at least be viewed as damaging by stakeholders. It is important to have memorandums of understanding and upfront agreements about who has ownership over various categories of information and agreements on what can and cannot be reported within the workplace and in outside publications, conferences, reports, etc..

3.3 The role of owners and upper level management

A prerequisite for successful PE programs is strong support for the program among owners and management (Laing et al., 2005; Haines et al., 2002; de Looze et al., 2001; Koningsveld et al., 2005; Maciel, 1998). Such support is essential to obtain and sustain employee buy-in to the project, ensure financial and logistical supports are in place for the project, and ensure that the program produces results and maintains momentum over the longer-term thus maximizing its potential for prevention.

It signals to the organization as a whole that the company is committed to taking a proactive and participatory approach to ergonomics.

Engagement by owners and particularly upper level management with the Ergo-Team PE approach is also necessary to ensure that adequate financial and human resources and access to key documents are allotted for the initiative.

Worker representatives of the Ergo-Team will need to spend time away from their normal work while completing the training, doing the assessments and writing up the reports. Management members of the Ergo-Team will also require time away from their day-to-day duties. Employee volunteers from the areas being investigated will need to spend a small amount of time away from their work. Other resources required for the effective functioning of the Ergo-Team will include a small office or workspace, a locked filing cabinet, some printing and photocopying resources, access to a computer with appropriate software, and access to a digital camera. More details about equipment and software requirements are available in the accompanying training workbook.

A variety of tools can be used to identify parts of the plant in need of ergonomic interventions. These tools can include the minutes of JHSC meetings, results of JHSC workplace inspections and a review of absenteeism records or workers' compensation claims. With the exception of JHSC Minutes, access to information of this kind will need to be mediated by management and will require the involvement of management personnel.

In short, owners and upper level management will need to:

1. help develop and maintain open and strong lines of communication;
2. develop a budget for and monitor the progress of the initiative;
3. review reports and recommended changes forwarded from the Ergo-Team to the OHS representative and/or JHSC and, once approved, to management. This should be done in a timely fashion; and,
4. have a system in place to allocate resources to the projects, both logistical and financial, and be willing to give serious review and consideration to suggested changes and, where appropriate, move implementation forward.

In addition, owners and upper level management should:

5. collaboratively assess, with the ergonomist, OHS representative and/or JHSC, Ergo-Team members and others, the status of the initiative after the first cycle of training and intervention to assess whether and how to sustain the Ergo-Team in the longer term and the resources required for this.

In multi-plant organizations, owners and upper level managers might also:

6. assess the potential benefits to the organization as a whole of trying to transfer the approach from the pilot plant to other parts of the organization.

Management must understand that a certain level of organizational flexibility is required for an Ergo-Team initiative to succeed and that adjustments in the outlined plan will be required to account for unforeseen issues.

3.4 Engagement of relevant workers and supervisors

The engagement of employees (supervisors, worker representatives, and affected workers) from the area under study is critical because they:

- know their jobs and their areas well;
- have some understanding of work-related risk;
- can often suggest changes; and,
- must live and work with the results.

Employees, as the end-users of any designed intervention, must be able to support the intended changes to a workstation. If they are not comfortable with the changes, the intervention will not be effective. In addition, participation can help ensure their issues are heard and their information can play a critical role in the development of effective workplace changes.

Once an Ergo-Team is established, plant employees should be given some role in identifying key areas requiring interventions. Those who work in selected intervention areas should then be given an opportunity to become involved in the Ergo-Team investigation. Engagement in the Ergo-Team approach gives these groups the opportunity to learn about ergonomics, WMSDs, and about how to identify risks that can be controlled by implementing effective ergonomics. This will also help the workplace achieve the regulatory requirement in most OHS legislation and the basic occupational health and safety principle of the "*right to know"* about workplace hazards.

Ideally, maintenance and engineering personnel (where these exist), should be intimately involved with the Ergo-Team process because it is often their responsibility to make recommended changes. In addition, they will have useful knowledge about what is feasible and some awareness of potential upstream and downstream consequences of changes that might affect worker health and productivity.

3.5 Ergo-Team PE in unionized environments

Unionized workplaces have many features that make them particularly appropriate for an Ergo-Team approach to PE. They are likely to have strong worker representation on the JHSC, more active committees, and unionized workers are often better informed about OHS including their rights and responsibilities.

In unionized environments, general union and shop steward support can be an essential prerequisite for a successful Ergo-Team approach to PE. Having union executive members involved in the project can help ensure the employee representatives are offered the same background information as management. Engagement of union representatives can also help to ensure the best possible and most appropriate employee members of the Ergo-Team are selected and help to reduce potential tensions between workers related to seniority and other issues.

For example, as members of the Ergo-Team or employee volunteers in a particular intervention, the involvement of employees in PE projects may require removing them from their normal jobs and thus necessitate finding replacements. Some union agreements state that training and program involvement must first be offered to the more senior employees. The most senior employees may or may not be the best recruits for an Ergo-Team initiative because of the basic skills required for this

work among other reasons. Similarly, because employees who are involved with the Ergo-Team are often removed from the production line, other employees will have to fill in for them opening up the possibility of tensions related to the collective agreement.

In multi-plant firms where there is interest in transferring the initiative across plants with support from the pilot plant, representatives from the unions representing those other workplaces should be part of these larger discussions. They can play a role in communicating with their members about the initiative, thereby enhancing the knowledge transfer process.

3.6 Open and strong lines of communication and project champions

The success of an Ergo-Team PE initiative requires open and strong lines of communication between each of the following:

- ergonomist, management and, where appropriate, union leadership
- ergonomist and the Ergo-Team members
- Ergo-Team members, supervisors and employees
- Ergo-Team members, ergonomist and members of the JHSC
- members of the JHSC and management

Project champions within the Ergo-Team and across the different levels of the organization can contribute to communication and to the success of a PE initiative. According to Markham & Aiman-Smith (2001), projects are less likely to continue and/or succeed without champions. Project champions take responsibility for the advancement of the PE initiative. They recognize the potential of new technologies, have an underlying belief in the benefits of the project, adopt the project as a personal interest, commit to the project, and attempt to generate support within the company. They work within the social-political structure of an organization to increase the chance of project success by playing critical roles in transferring knowledge and supporting communications related to PE initiatives (Kramer & Wells, 2005; Markham & Aiman-Smith, 2001). While it is certainly true that the facilitating ergonomist is a champion of the PE program, internal champions at the company are also required.

A champion at the **employee level**, often termed an opinion leader, may be a member of the Ergo-Team who builds support for the initiative by explaining its importance to co-workers.

A champion at the **union level** helps to sustain union support for the initiative by explaining the on-going activities of the Ergo-Team and keeping them up to date on the progress made within the plant.

At the **management level**, supervisors must champion the project as they hold influence over work organization and production processes within the intervention sites. If the enterprise has an OHS manager or representative on staff, this individual may prove to be a very valuable champion.

A champion at the **upper management** level is also very important. This champion should know about the initiative, monitor progress, and act as a conduit for information between the Ergo-Team and upper-management. This champion would not necessarily be active in daily Ergo-Team activities

but would, instead, reinforce support for the initiative across all levels of the company and help to disseminate results to key decision-makers.

Ideally, these different champions would work together to move the project forward.

4.0 The Main Elements of our Ergo-Team Approach to Participatory Ergonomics

Once you have verified that the Ergo-Team approach to PE is the approach for you, introduced the Ergo-Team concept to your workplace, discussed it with multiple stakeholder groups, and have shown that the assets and prerequisites for a successful Ergo-Team approach to PE exist in the organization, it is time to begin the process of establishing the Ergo-Team and to identify project champions if they have not already emerged.

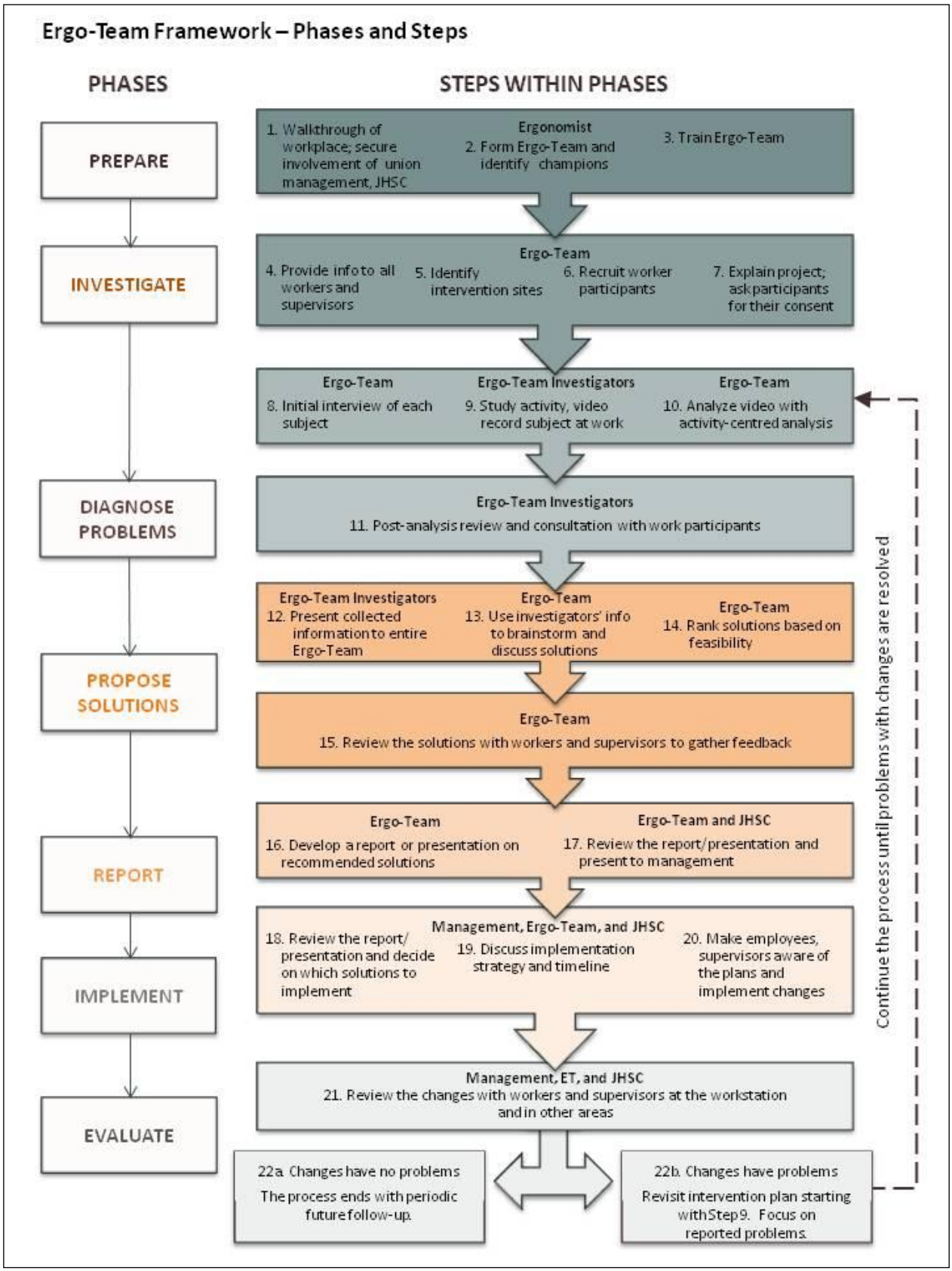
In the following framework we present the steps required for an intervention when applying the Ergo-Team program. The subsequent sections of the manual expand on each of the steps outlined in this schematic.

There are a total of 22 steps within the Ergo-Team approach, with each of the steps occurring within 1 of the following 6 phases (Figure 1):

1. **Prepare** –includes steps on partnering with an enterprise, understanding the work at that enterprise and putting plans in place to develop and train an Ergo-Team.
2. **Investigate** –includes steps related to promoting the work of the team, selecting intervention sites and gathering information and analyzing it.
3. **Diagnose problems** –includes steps related to reviewing the information and identifying some key issues and some potential changes.
4. **Propose solutions** –includes steps related to reviewing the analysis and solutions with the larger Ergo-Team and adapting these solutions to improve their applicability.
5. **Implement** –includes steps to move these ideas forward with the JHSC and management and ultimately make the changes at the workstation.
6. **Evaluate** –includes steps to review the positive and negative outcomes related to the changes. It outlines a return to the "investigate" phase, should further changes be required.

The next two sections of this guide offer additional information to help progress through the phases and steps outlined in the Ergo-Team framework. We will describe:

1) how to establish your Ergo-Team;
2) the job of the Ergo-Team;
3) ergo-Team training;
4) how to select an initial intervention site for the Ergo-Team;
5) intervention start-up;
6) job analysis;
7) post-job analysis worker consultation;
8) developing the Ergo-Team report / recommendations for submission to the JOHS; and,
9) follow-up and evaluation.


Ergo-Team Framework – Phases and Steps
PHASES
STEPS WITHIN PHASES
PREPARE
INVESTIGATE
DIAGNOSE PROBLEMS
PROPOSE SOLUTIONS
REPORT
IMPLEMENT
EVALUATE
1. Walkthrough of workplace; secure involvement of union management, JHSC
Ergonomist
2. Form Ergo-Team and identify champions
3. Train Ergo-Team
Ergo-Team
4. Provide info to all workers and supervisors
5. Identify intervention sites
6. Recruit worker participants
7. Explain project; ask participants for their consent
Ergo-Team
8. Initial interview of each subject
Ergo-Team Investigators
9. Study activity, video record subject at work
Ergo-Team
10. Analyze video with activity-centred analysis
Ergo-Team Investigators
11. Post-analysis review and consultation with work participants
Ergo-Team Investigators
12. Present collected information to entire Ergo-Team
Ergo-Team
13. Use investigators' info to brainstorm and discuss solutions
Ergo-Team
14. Rank solutions based on feasibility
Ergo-Team
15. Review the solutions with workers and supervisors to gather feedback
Ergo-Team
16. Develop a report or presentation on recommended solutions
Ergo-Team and JHSC
17. Review the report/presentation and present to management
Management, Ergo-Team, and JHSC
18. Review the report/ presentation and decide on which solutions to implement
19. Discuss implementation strategy and timeline
20. Make employees, supervisors aware of the plans and implement changes
Management, ET, and JHSC
21. Review the changes with workers and supervisors at the workstation and in other areas
22a. Changes have no problems
The process ends with periodic future follow-up.
22b. Changes have problems
Revisit intervention plan starting with Step 9. Focus on reported problems.
Continue the process until problems with changes are resolved

The process described in this manual is intended to ensure all factors, not just physical factors, are accounted for and that an approach is adopted where employees (workers and management) have significant input.

4.1 Moving forward: establishing your ergo-team

There is no ideal size for an Ergo-Team; size and composition will vary depending on the size of the workplace, the resources available, and the scale of the initiative. Larger teams are more costly to sustain but teams that are too small may be particularly vulnerable to membership turnover. For this reason, some consideration should be given to selecting and training an extra person from each group to reduce the risk that turn-over and attrition will undermine the longer term effectiveness of the Ergo-Team.

It is essential to build a team composed of relatively equal numbers of appropriately motivated, skilled, and placed representatives from management and workers. Joint participation and appropriate representation can help to ensure that the Ergo-Team's priorities and approach reflect the concerns and mandates of each group.

Smaller teams are desirable at many workplaces because of the difficulty and cost associated with releasing a larger number of managerial and employee representatives from production duties. As an example, one recent Ergo-Team project had only one employee and one management representative available to complete the training program. However, more diverse opinions from supervisors, employees, and managers are important to developing a quality project. As a compromise, the Ergo-Team structure was adapted so that there would be two fully-trained Ergo-Team members, but for each project an additional employee and supervisor from the area under investigation would become temporary members of the team. While the temporary members would not complete analysis requiring training, they would be available to offer their knowledge and ideas for change, and to help recruit volunteers for interviews and job analysis within that particular department.

The size of a team and deciding which members undergo more frequent training and interaction with the ergonomist will depend largely on the context of the work (seasonal, urban or rural, political climate, production designs, etc.).

4.1.1 Ergo-team representative selection – who and what to look for

Management representatives on the Ergo-Team should, ideally, include individuals who are familiar with all levels of the company, including both production and managerial processes. Supervisors, production managers, and other similar personnel would fit this description and are good candidates for an Ergo-Team. Other management representatives appropriate and probably essential to effective functioning of the Ergo-Team would include the company OHS Officer or representative (if one exists), and personnel from the engineering/maintenance division of the plant (where this exists). The OHS officer is well positioned to champion the Ergo-Team and likely (one hopes) to have access to funds to help finance the work of the Team. The engineering/maintenance personnel are well positioned to: 1) assess how proposed interventions or changes might affect machinery and production flows; 2) assess the feasibility of proposed changes; and in some cases, 3) to design and implement changes suggested by the Ergo-Team. This combination of managerial representatives

will enhance the likelihood that the Ergo-Team will have some profile and higher level support and that its proposed changes will be cost-effective and implemented (de Looze et al., 2003).

In workplaces where managerial structures are more elaborate there may be a strong Human Resources department. Recent experience has shown that managerial representatives from this level can be a tremendous asset to the project. These individuals are normally charged with co-chairing and organizing occupational health and safety committee meetings, talking with supervisors and employees regularly, and reporting directly to upper level managers. If they are involved with the Ergo-Team, it facilitates knowledge dissemination around key groups at the plant. Human resources personnel also have strong relationships with production floor employees because they usually are responsible for hiring, distributing information, and reviewing employee/union suggestions. This can allow for better exchange between management and employee/union levels because there may be less friction than is usually seen between supervisors and employees, for example. The engagement of Human Resources departments on your Ergo-Team may only work in urbanized and/or corporate-owned enterprises. In rural and remote contexts, human resources tasks are often completed by other managerial personnel; it may not be possible to formally involve the Human Resources department as part of the Ergo-Team.

The **employee representatives** represent the larger work force on the Ergo-Team. The employee members are used to collect data from their peers because: 1) it is easier for these individuals to be released from regular work operations than for most management personnel; and, 2) employees are likely to feel more comfortable discussing their work and occupational health issues with their peers on the Ergo-Team. Employee representatives should therefore come from the core departments where ergonomic challenges are likely to be found and, where relevant, from different shifts. Since employee representatives work in pairs for the work station assessments, the Ergo-Team will need to have a minimum of two worker representatives and, in the case of a workplace that has more than one shift, ideally there should be representatives from each shift. In unionized plants, there may be some benefit to having one or two members of the union executive on the Ergo-Team because this can help to ensure union concerns are part of the team's deliberations thereby helping to solidify union support for the Ergo-Team initiative.

While an active JHSC can be a prerequisite for a successful Ergo-Team approach to PE, under normal circumstances, except in very small workplaces, the Ergo-Team should not have the same membership as the JHSC. However, some overlap in membership can be helpful. Carrying out a PE initiative and sustaining it for the longer term requires a significant investment of time and resources. The JHSC has a broader mandate than ergonomics and needs to avoid becoming captive of the narrower ergonomics initiative. Some arms-length relationship between the Ergo-Team membership and that of the JHSC broadens engagement with ergonomics in the workplace and allows the Ergo-Team to report to the JHSC whose role it is to look at the report and recommendations in light of the overall OHS priorities and challenges in the workplace. Ergo-Team members are potential future members of the JHSC whose training can help to enhance the long term sustainability and strength of the JHSC.

Looking for some key personal characteristics during the selection process for both management and employee representatives can help to increase the overall strength of the team and likelihood of success of the whole initiative. Ergo-Team members require strong leadership skills, good listening and organizational skills, and good oral and written communication skills. They should work well within a group setting and be open to others' viewpoints and ideas. More generally, they should be

forward-looking and committed to the project (Thompson et al., 2006) in that they want to improve the knowledge and capacity within the facility in the linked areas of ergonomics and occupational health and safety. In addition, ideal Ergo-Team members should:

- be permanent employees;
- have a broad range of experience;
- have the respect of their peers;
- be supportive of change;
- be seen as fair and reliable;
- be able to make a longer-term commitment to the Ergo-Team; and,
- not have too many additional roles and responsibilities that would be disrupted by the team, or force them to forego team activities.

4.1.2 The selection process for ergo-team members

There is no single, failsafe way to select appropriate Ergo-Team members. In general, however, management and union personnel (or worker representatives in nonunionized workplaces), as well as the ergonomist, should participate in the selection process keeping in mind the characteristics and organizational considerations outlined above.

Possible first steps might include meeting with management and union representatives to go over the Ergo-Team process, explaining the skills and type of representation you are looking for and inviting their suggestions for potential Ergo-Team members. An information meeting with workers might also identify potential participants (remembering the qualities you are looking for and the need to cover off a range of departments, etc.). If there is a project champion in each group, they may volunteer to join the Ergo-Team. However, it is worthwhile remembering that an Ergo-Team needs champions who are external to the Team as well as those on the Team itself. The external champions can help to sustain buy-in among other employees and managers and provide a conduit for information between the team and other groups.

Once a list of potential Ergo-Team members (volunteers or nominees) has been developed, meetings should be held with management and union or worker representatives (in the case of nonunionized workplaces) to finalize the Ergo-Team membership. Potential issues related to the collective agreement, seniority and the need for temporary replacements should be discussed in this meeting to ensure any potential problems are dealt with prior to finalizing the Ergo-Team membership.

Some consideration should be given to who will chair/lead the Ergo-Team. Given that the employee members will have greater contact with plant employees, one of the employee representatives of the Ergo-Team should hold a leadership role. A co-chair system with one representative from management and one from the employee level can be an effective approach to leadership.

5.0 The Job of the Ergo-Team

The job of the Ergo-Team is multifaceted. An effective facilitator ergonomist is essential to not only forming the Team but also guiding the Team and larger organization through the process of training, communications, investigation, intervention design, and intervention evaluation.

The job of the Ergo-Team involves nine main components:

1. appropriately, ethically, collaboratively (working with supervisors and workers) and systematically identifying areas of the workplace where there is clear evidence of risk for WMSDs;
2. selecting areas for first and subsequent interventions;
3. acquiring an understanding of basic ergonomics principles and tools for job analysis;
4. obtaining voluntary and informed consent from employee volunteers from the area who are willing to participate in an analysis of their jobs;
5. carrying out a structured analysis of those jobs with a focus on movements and repetitions;
6. presenting the results of their job and work area analysis to workers and supervisors in the intervention area and exploring with them the best ways to reduce risk;
7. developing a report on their work and recommendations for ergonomic improvements in those areas for submission to the JHSC;
8. keeping employees informed, on an ongoing basis, about who the members of the Ergo-Team are, what their mandate is, about their activities, and the results of those activities; and,
9. following up with employees on changes that are made and evaluating those changes.

It is the job of the ergonomist to provide essential training and to guide the Ergo-Team through each of the main components of at least one, but ideally several interventions. The ergonomist will also need to train team members to evaluate, on an ongoing basis, their progress, lessons learned and the overall results of their intervention. This continuous learning approach will help the Ergo-Team lay the foundations for effective and more autonomous future job analyses and interventions.

In the following sections, we walk through each of the steps involved in designing and completing the Ergo-Team's training, as well as their first ergonomic intervention. This first intervention is critical and will lay the groundwork for the effective, longer-term operation of the Ergo-Team.

We have compiled and included in this package a ***training workbook (Implementing an Ergo-Team Approach to Participatory Ergonomics: Training Workbook and Tools for Ergo-Team Members)*** and set of tools to supplement the information provided here. These can be used in designing the Ergo-Team training curriculum and adapted for use at various points in the intervention outlined below. The tools include:

- ***The Ergo-Team Framework - Handout*** (pdf)
- ***Ethics for Workplace Interventions by Ergo-Team Personnel*** (pdf)
- ***Ergo-Team Confidentiality Agreement*** (pdf)
- ***Consent to Take Part in a Participatory Ergonomics Project*** (Word)
- **Ethics Discussion Scenarios:**
  - ***Ethics Scenario 1: Full Disclosure*** (pdf)
    Scenario 1: Answer (pdf)
  - ***Ethics Scenario 2: Free and Maintained Consent of the Participant*** *(pdf)*
    Scenario 2: Answer (pdf)
  - ***Ethics Scenario 3: Privacy of Personal Information*** *(pdf)*
    Scenario 3 Answer (pdf)
  - ***Ethics Scenario 4: Protection of Confidential Information*** *(pdf)*
    Scenario 4: Answer (pdf)
- ***How to Select Areas for Interventions*** (pdf)
- ***Information Poster*** (PowerPoint, 48" x 36" final print size)
- ***Using the Body Map Survey in your Ergo-Team Project*** (pdf)
- ***Cover Letter and Body Map Survey*** (Word)
- ***Draft Employee Interview*** (pdf)
- ***Body Map Data Spreadsheet*** (Excel worksheet)
- ***Video Recording Instructions*** (pdf)
- ***Video for Analysis and Development of Questions*** (.wmv file)
- ***Basic Ergonomics – Lecture*** (PowerPoint)
- ***Motion and Postures Description – Lecture*** (PowerPoint)
- ***Motion and Posture Handout*** (pdf)
- ***Explaining Activity-Centred Analysis*** (pdf)
- ***Example of Completed Analysis Tables 1 and 2*** (pdf)
- ***Analysis and Information Tables for Ergo-Team interventions*** (pdf)
- ***Picture Analysis Exercise for Motion and Posture*** (pdf)
  - ***Picture Analysis Exercise Answer*** (pdf)
- ***Intervention Evaluation Survey for Review of Workstation Changes*** (pdf)

5.1 Confidentiality agreements and general orientation in ethics and privacy

There are privacy and ethical issues associated with most phases of the Ergo-Team process (***Ethics Handout***). For this reason, training in the ethical conduct of research, awareness of privacy issues, and the signing of a confidentiality agreement by all members of the Ergo-Team and participants are

essential steps in the initial and on-going training of the Ergo-Team at each stage of the intervention. This training should be revisited on an annual basis to refresh Ergo-Team awareness of these issues.

There are four main areas of ethical concern associated with participatory ergonomics and Ergo-Team initiatives. These are outlined in ***Module 2* (Training Workbook)** and include:

1. **Full disclosure:** Management and worker participants who are asked to complete surveys, interviews or to be employee volunteers in the Ergo-Team interventions must be made aware of the purpose of the activity, who is involved with and funding or supporting the activity, and any possible benefits of their involvement, as well as possible risks to them.
2. **Prior and free consent:** Their participation in the Ergo-Team surveys, interviews and interventions should be free and voluntary (i.e. they have the right to opt out of the initiative without risk to their employment or income, or any other kind of penalty). Company managerial representatives should provide sign-off on key consent documents to demonstrate they agree with these concepts (***Consent to Take Part in a PE Project***).
3. **Maintained consent:** Employee volunteers must be made aware that they are free to terminate their involvement with the Ergo-Team intervention at any time without penalty. They must not feel as though they have to maintain involvement based solely on their initial consent.
4. **Privacy and confidentiality:** Employee volunteers must be made aware of how any information they disclose will be stored and used, including survey results, interview information and video recordings of them. They should also be aware of who will have access to that information and the steps that will be taken to protect their privacy and confidentiality.

The essence of the ***Ergo-Team Confidentiality Agreement*** is to ensure that information collected about the health and work habits of individuals during the Ergo-Team activities is only used for the purpose of the Ergo-Team's work and only made public with the consent of the participating employees. Concerning the confidentiality agreement, it is important that the Ergo-Team members understand the necessity to store personal and private information in a secure location (locked filing cabinet) where it can only be accessed by appropriate and identified Ergo-Team members and the ergonomist, where appropriate.

In addition to ***Training Workbook Modules*** and tools, we have also included ethics discussion scenarios (***1, 2, 3, 4***) and a ***Consent to Take Part in a PE Project***.

5.2 Training the Ergo-Team in basic ergonomics

Before the Ergo-Team investigators can do a job analysis including analyzing any video recordings they have taken of volunteer participants engaged in their jobs, they will need training in basic ergonomics and knowledge of the motions and postures that are associated with WMSDs. There are a number of resources that can be used to introduce the Ergo-Team to basic ergonomics concepts but, ideally, this introduction should rely on resources that have been developed for use in the particular province, region, or country in which the workplace is located. In some cases, introductory

ergonomics workshops are offered by consultant groups, local government, or compensation commissions. Where introductory ergonomics workshops are not offered, on-line introductory resources and tools can be compiled. While a good introduction to basic ergonomics can be provided through these workshops, this training will generally need to be supplemented and adapted for the work areas selected for job analysis. This means the facilitating ergonomist will generally need to provide additional training to the Ergo-Team members, drawing on their own expertise.

We have included a series of resources in the ***Training Workbook*** to help the facilitating ergonomist put together appropriate training for the Ergo-Team members. Some of the tools for training in basic ergonomics include:

- ***Basic Ergonomics – Lecture*** (PowerPoint)
- ***Motion and Postures Description – Lecture*** (PowerPoint)
- ***Video for Analysis and Development of Questions*** (.wmv file)
- ***Picture Analysis Exercise for Motion and Posture*** (pdf)
- ***Motion and Posture Handout*** (pdf)
- ***Video Recording Instructions*** (pdf)
- ***Explaining Activity Centred Analysis*** (pdf)
- ***Analysis and Information Tables for Ergo-Team interventions*** (pdf)
- ***Example of Completed Analysis Tables 1 and 2*** (pdf)

However, diversity in regulations and work environments means the ergonomist will need to use his or her discretion and experience to adapt and apply these and other resources to arrive at training appropriate for the situation. That said, the training should include modules on basic ergonomics, modules on anatomical motion description, and modules recognizing postures and movements that create risk.

5.3 Identification of areas in need of ergonomic analysis and intervention

When choosing the first intervention area it is worthwhile to go after one or more areas where the ergonomic risk is relatively simple and easy to identify, diagnose, and fix. The ergonomist might encourage Ergo-Team members to 'pluck the low hanging fruit' in the beginning because they will still be in learning mode when they undertake these interventions, and because relatively rapid and successful interventions can help build Ergo-Team confidence and gain credibility and buy-in among co-workers and management.

Either way, the Ergo-Team needs some way to systematically identify workplace areas in need of ergonomic intervention. Potential ways to do this include: a review of compensation claims for WMSDs; a review of JHSC minutes and workplace inspection reports; discussions with supervisors and union personnel (if applicable); administration of an anonymous body discomfort survey to the full plant labour force.

When choosing ways to identify problem areas, be aware that each approach has different strengths and weaknesses (***Training Workbook, Module 3***). For example, workers compensation claims are

records of claims and may thus contain information about a particular problem, but they are often not a good indicator of relative risk for WMSDs across work areas because some groups of workers may be more likely to file claims than others.

Inspection reports can be useful and are readily available but inspections are often not triggered by or concerned with WMSDs but rather by other kinds of hazards. As a result, they often contain limited information on the relative risk of WMSDs. It would be a good strategy to check with managers and record keepers of the inspection reports to determine if WMSD evaluations are included in past reports. If so, an appropriate review of these resources can be completed.

Discussions among Ergo-Team members and with the company OHS representative or the JHSC may reveal a consensus on certain areas of the workplace where the risk of WMSDs is high. Such discussions are not time-consuming or difficult. However, sole reliance on this approach may mean that workers in some areas will feel overlooked and excluded from the process. Another risk is that awareness of particular problem areas may reflect the experiences of the team members rather than the real distribution of relative risk in the workplace.

An anonymous ***Cover Letter and Body Map Survey*** distributed to the entire workforce is a useful tool for identifying a range of areas that might benefit from ergonomic intervention and for comparing the reported risk associated with those different areas (***Training Workbook - Module 4***). On these surveys, respondents are asked to list on a body map sites where they experience pain and fatigue both while they work and after work. In addition to the body discomfort survey, the employees are asked to indicate the area of the plant where they work and to list any particular tasks or movements within a task which result in pain in their experience. Instructions on how to apply the body map survey, distribute it, and interpret the results are included in the training workbook. There is also a ***Body Map Data Spreadsheet (Excel)*** available to help tabulate and manage the data.

A body discomfort survey is a useful tool that can generate information across the plant as a whole about potential WMSDs symptoms. It can also be re-administered on an ongoing basis to help monitor improvements and new, emerging problem areas in the plant. However, designing and administering such a survey and analysing the results can be a relatively complex procedure. The validity of the results from a body map survey may be affected by a poor response rate and the health information on such surveys must be handled with care, even when workers are not named, because of the risk of secondary identification. In addition, workers move around and are moved around, sometimes due to problems with WMSDs. It is thus possible that survey results showing a higher concentration of body discomfort in some work areas are actually a reflection of the history of moving injured workers to a particular area rather than the actual level of risk in that area.

Ideally, a combination of approaches should be used to identify priority areas for intervention. However, the number and type used will depend on the records and resources available.

All of the approaches outlined above require, to varying degrees, the Ergo-Team potentially gaining access to private information about employees. Ideally, access to personal and private information by the Ergo-Team will be limited and, where possible, anonymous. However, some access to such information is inevitable and essential at certain points in the Ergo-Team process – hence the need to train the Ergo-Team to manage this information appropriately and ethically.

Whatever the method used to select one or more areas for analysis and intervention by the Ergo-Team, the first intervention should take place in an area where, in the opinion of the Ergo-Team and the ergonomist:

- there is clear evidence that there already exist or could exist WMSDs;
- the hazards in the area are relatively easy to identify, assess and modify;
- where, ideally, the area is visible to a lot of other employees and to management; and,
- where workers and management are open to participating in the intervention and understand that the Ergo-Team is in learning mode.

Selecting a simple but real and recognized problem area for their first intervention will allow the Ergo-Team to gradually develop their skills in ergonomic assessment and to learn how to work together, while at the same time maximizing the chances of the Ergo-Team's success. It will also increase the likelihood that the intervention will move from analysis through to resolution in a smooth and timely fashion.

While the results of a simple intervention are unlikely to substantially improve the injury and discomfort rate in the overall workplace, a successful, smooth, and quick first intervention can help to increase the awareness of, and buy-in to the Ergo-Team's activities across the company. This, in turn, will help lay the foundation for more complex interventions requiring more careful analysis and potentially more costly changes that may arise in the future.

5.4 The intervention process

Once one or more intervention areas have been identified, the ergonomist and management members of the Ergo-Team need to meet with workers and supervisors from the intervention area(s). Where more than one shift operates in the workplace, meetings should be held with supervisors and workers from each shift.

In these meetings, the ergonomist and appropriate co-chair (worker, supervisor) should explain what the Ergo-Team is, how they became interested in this particular work area, and the steps involved in an Ergo-Team intervention.

As they go through the steps, they should emphasize that any information collected from individuals during the intervention process will be used only for the intervention and that names will not be used in any reports. They should also explain that employee involvement will take place within normal working hours and that, where necessary, affected workers will be excused from their normal work duties, with no loss of pay, to allow them to help out with the intervention.

At this time, it is a good idea to also distribute information to the employees, for example you could provide an ***Information Poster*** for the area that describes each step in the intervention process in the form of a checklist. This way, as the intervention progresses, each step can be checked off on the poster helping workers and supervisors see, at a glance, the progression of the intervention. The poster should also contain contact information for the ergonomist and the Ergo-Team members (in case some employees want to ask questions or discuss the project in private).

Employees and supervisors who are present at the meeting should be given the opportunity, either at the meeting or privately after the meeting, to raise any questions, concerns or insights they might have about the Ergo-Team process and inquire about work that might occur in their work areas.

5.4.1 Recruiting volunteers for pre-video interviews and/or group discussions with area workers and supervisors

At this introductory meeting, or shortly after, steps should be taken to recruit volunteers to participate in work area pre- and post-intervention interviews, group discussions, and job analyses. Initial interviews or discussions with employees from the work area(s) can help lay the foundation for a good partnership between the Ergo-Team investigators and area employees, help the team to identify the key sub-areas or activities they should pay attention to while conducting the analysis of video recordings, and help them identify the needs of the employees that should be included in their recommendations.

Recruiting volunteers of a variety of statures, ages, with different levels of seniority, and with different discomfort patterns for the interviews and/or discussion groups can help to ensure the information collected will be broadly representative of the worker population in that particular area. The ***Training Workbook, Module 5***, contains specific information about strategies to recruit volunteers and how to obtain their consent so they can be involved in these pre- and post-intervention activities.

5.4.2 Conducting pre-video interviews and/or discussion groups

The training workbook outlines strategies to help the Ergo-Team develop their interview skills. As the facilitating ergonomist, it is your task to prepare the employees to lead interviews and/or discussions so that they gain more information than simple 'yes or no' answers and to record what they have learned. If the Ergo-Team members are properly trained in interviewing their peers they will be better able to access key environmental information, and to identify aspects of the work that might be contributing to physical discomfort and injury and to mental stress for employees – aspects that should receive close attention in the job analyses.

Training Workbook, Module 5 and the ***Draft Employee Interview*** contain a proposed list of questions for inclusion in a pre-intervention set of interviews or group discussion(s). Interview/discussion topic areas include some related to each of the following:

- work station and environment;
- anthropometric considerations;
- psychosocial issues; and,
- job history and training.

The first section serves as a way to have the Ergo-Team Investigators and the employee volunteers develop a rapport by focusing the discussion on topics related to the job. This section helps to get the employee volunteers to think about the way they work and to consider how the job factors and work station might be affecting their physical, social, and mental health. The second section helps to

identify some of the physical characteristics of the fit between the work station and their bodies. This section also has some questions on the impact that previous work and training might have had on this individual's activities and health. The third section asks the employee volunteers to identify sites of fatigue and discomfort on their bodies that they think are related to the work they do. This section also asks them to talk about things in their work that might influence their stress levels. The fourth and final section is designed to investigate strategies that this individual has developed to deal with physical and mental stresses at work. It also invites employees to suggest recommendations for changes they believe will improve work conditions.

It is important to encourage the Ergo-Team members to expand on and adapt these questions to fit the work, work organization and employee concerns in the area. While the questions provided are basic and require supplementation and adaptation, pre-intervention interviews and group discussions should, ideally, touch on each of these four areas.

These pre-job analysis interviews/group discussion(s) are an excellent tool to help frame ergonomics analyses of the work areas. The employee participants will be able to identify tasks, situations, movements, and conditions for the investigators to focus on. It is unreasonable, however, to expect the Ergo-Team to do a detailed analysis of all motions and postures involved in work in a particular area. The purpose of the pre-job analysis interviews/discussions is to highlight key areas for further investigation thereby reducing the amount of work required for more detailed job analyses.

5.4.3 Training for job analysis using digital video recordings

Basic ergonomics training and job analysis training should be done with all Ergo-Team members but, for confidentiality reasons and to ensure maximum comfort among worker volunteers in selected job areas, **we recommend that only worker representatives on the team recruit worker volunteers and carry out the actual interviews/discussions and job analyses, as well as the post job analysis consultations with worker volunteers**. Once complete, these job analyses can be reviewed by the Ergo-Team as a whole (including management representatives) before getting incorporated into the Ergo-Team Report to the JHSC and, eventually, upper level management.

Doing a thorough job analysis can be very challenging, particularly for beginners. One way to make the task easier is by training the Ergo-Team members to digitally record each other (in teams of two) doing relatively simple jobs and have them analyse these practice video recordings (with input and oversight from the ergonomist and eventually the Ergo-Team as a whole) before they record the employee volunteer(s) doing their jobs. Details on how to approach potential worker volunteers, how to do a digital video recording, and how to analyse these recordings are contained in the ***Training Workbook, Module 6*** and within the ***Video Recording Instructions*****.**

Video cameras can be expensive to purchase and not all companies will be willing to make this investment. One solution is to use a relatively cheap ($100-200) regular digital camera with video capability. Many companies already own such cameras and operating one requires very little technical know-how. In addition, they are compact and easy to carry, and can be equipped with extra memory so they can record up to 10-20 minutes worth of video. The latter should be more than sufficient (a few minutes may be all that is needed) for the analysis of the movements involved in most jobs (this is particularly true of assembly line jobs).

During their practice video recordings, the Ergo-Team should practice approaching each other, explaining what is meant by a job analysis, and inviting the 'participant' to volunteer. They should focus on clearly explaining to each other that they should work as normally as possible, and try not to change their routine in response to the video recording process. Patience is also needed – they should not prompt workers to complete tasks on demand in order to speed up the recording process. This will help ensure the video recordings will provide a real-time representation of the **work-cycle,** allowing the Ergo-Team to get a clear sense of:

- the time it takes to complete tasks;
- the frequency of such tasks; and,
- the average amount of rest time between micro-cycles and cycles.

When learning how to analyse the practice video recordings, team members should be encouraged to watch the video in its entirety a few times *before* starting the analysis. They should watch it a few times first at regular speed and then at a slower rate in order to fully appreciate what is involved in the job task. They should practice extracting as much information as possible relevant to describing the work movements, identifying possible risk factors or difficulties and, once the analysis is complete, identifying different ways to do the job.

Overall, Ergo-Team members should be encouraged to be mindful of the following:

1. Who is working and what are the characteristics of this person?
2. Under what conditions are they working?
3. How does he or she do their job?
4. Why do they perform certain tasks in a particular way?
5. Are there other ways of performing the same task?

The training workbook contains sample tables that team members can use to: summarize tasks, operations, activities, movements, and postures; identify risks and potential solutions; summarize results of feedback meetings; and record the action plan for implementation of proposed solutions. We have adapted these from tables used by Dr. Nicole Vézina in graduate ergonomics training at the Université de Québec in Montréal.

The Ergo-Team members each complete a copy of Table 1 - Description of operations, postures, movement, and effort (found in **Analysis and Information Tables for Ergo-Team Interventions**). This table uses an activity-centered analysis where:

- A job is set up as a set of tasks/activities that are performed in a particular order, sometimes cyclically and sometimes tasks vary from day to day. The task being analyzed is recorded at the top of ***Table 1.***
- Each task requires a specific set of operations and sub-operations that an employee must complete, and these are also recorded in ***Table 1.***
- Postures and movements associated with each sub-operation are analyzed and entered into **Table 1**.

Ergo-Team members then use ***Table 2: Problems, Determinants, and Possible Changes*** (found in **Analysis and Information Tables for Ergo-Team Interventions**) to begin to link reported issues with operations and to record why they think that operation could contribute to the risk of a WMSD. The information recorded in the second table could come from the activity-centered analysis (Table 1) or from interviews with participants, conversations with employees, and observations of the production environment. Table 2 also encourages the Ergo-Team to propose potential ways to change elements of the activity/operations in order to eliminate the problem.

Table 3: Summary of Discussions about Analysis and Potential Solutions with Affected Workers, Supervisors, and Joint Occupational Health and Safety Committee (found in **Analysis and Information Tables for Ergo-Team Interventions**) should be completed during feedback meetings with employees (see the section 5.4.4), and during conversations with other Ergo-Team members, supervisors, and occupational health and safety committee members. This table is designed to capture suggestions or comments related to the accuracy of the analysis, the feasibility of the proposed solutions, and to identify ways to adapt and improve the proposed solutions.

Table 4: Implementation Strategy for Accepted Solutions (found in **Analysis and Information Tables for Ergo-Team Interventions**) summarizes the decisions made in a meeting involving the ergonomist, co-chairs of the health and safety committee, co-chairs of the Ergo-Team, and upper level management on the action plan for moving forward on the proposed solutions (see section 5.4.5).

After their skills improve and when dealing with more straightforward problems, the team may not need to rely on extensive use of video recording and these tools to do their job analyses. However, in these initial stages of learning, and when dealing with more complex workplace situations, use of these can help to ensure analyses are done systematically and with rigour.

5.4.4 Post job analysis worker consultation

The purpose of the post-job analysis consultation is to review the job analysis results with the worker(s) involved to seek their comments and input (***Training Workbook, Module 9***). During the training phase, Ergo-Team pairs of investigators can review their respective observations with each other. When they have done analyses of **real job situations** involving worker volunteers they will need to review the results of those with the employees involved including, initially, the worker volunteers and, secondarily, other workers in the area potentially affected by any recommended changes resulting from the intervention.

Using the information gathered in ***Tables 1 and 2*** (in *Analysis and Information Tables for Ergo-Team Interventions*), the investigators can review their analysis of the work with the employees to see if there are additional insights or corrections the employees can offer. Also, during this phase of the intervention, the Ergo-Team investigators can help to fill information gaps identified during the job analysis. For instance, they may try to find out more from the workers involved concerning:

- reasons for the location of tools/objects;
- perceptions of work-pace among employees;
- reasons why movements are performed in a certain manner or sequence;
- reasons for differences in technique among workers completing similar tasks;
- perceptions about how worker stature affects how they do their job; and,

- opportunities for cooperation and interaction among employees when completing job tasks that might augment or reduce risk.

5.4.5 Developing the ergo-team report and recommendations for submission to the JHSC/management

Once the Ergo-Team worker representatives have consulted with volunteers and others in the work areas under study, the next step is for them to review the digital video and results of their analysis with other representatives on the team in a meeting with the ergonomist. The key components of the presentation should include information from the employee and supervisor personnel in the work area under study regarding their perceptions of the tasks, workstation lay-out and design, and their thoughts on ways to make improvements in the workplace.

Once the worker representatives have made their presentation to the Ergo-Team as a whole, the co-chairs should lead a ***brainstorming* session** involving all of the team members and the facilitating ergonomist (***Training Workbook, Module 10***). In the first instance, a central goal of this brainstorming would be to develop as many potential solutions as possible to the risks identified. All members of the Ergo-Team should be encouraged to provide input and each potential solution should be recorded and discussed with a focus on its appropriateness and feasibility from a production, management, maintenance, and employee perspective. In the final portion of the meeting, the co-chairs should seek to come to a consensus, where possible, on appropriate recommendations to make in their report to the JHSC.

5.4.6 From the ergo-team to the JHSC - upper level management and implementation

The Ergo-Team submits their report and recommendations to the JHSC (***Training Workbook, Module 10***). If the JHSC approves of the recommendations, this approval is recorded in the meeting minutes and the co-chairs should arrange a meeting with upper level management to discuss the report. This meeting should include the ergonomist and co-chairs of the Ergo-Team in addition to the JHSC co-chairs and managers. If there are other union and management level champions, they should also be invited. The results of this meeting should be recorded in ***Table 4: Implementation Strategy for Accepted Solutions*** (in *Analysis and Information Tables for Ergo-Team Interventions*).

Information on management's response and the implementation strategy should be communicated to the other members of the JHSC and the Ergo-Team as well as to the workers and supervisors in the work areas affected and the larger plant labour force. One way to do this would be to have:

- The employee representatives on the Ergo-Team return to the intervention site to let the employee volunteers and others in the area know of the impending changes.
- Maintenance representatives on the Ergo-Team return to their peers to let them know of the proposed changes and discuss any adjustments in machinery and physical structure of the area that will be needed.
- Management/supervisory Ergo-Team members make other supervisors, particularly those in the intervention area, aware of the intervention plan to ensure they are

aware of pending adjustments and of their role in ensuring success and to give them a final opportunity for input.

- The JHSC and management create a general poster or pamphlet for distribution throughout the company detailing the proposed changes and outlining plans for future work by the Ergo-Team. The pamphlet could also serve as a way to recruit future Ergo-Team members and work area volunteers.

5.5 Evaluation and follow-up

The final step in an Ergo-Team intervention, particularly the first interventions, is to conduct an **evaluation of the Ergo-Team process and the intervention outcomes.**

5.5.1 Process evaluation

The ergonomist might want to lead the evaluation of the process in collaboration with the co-chairs of the Ergo-Team. The ergonomist could write up his or her own reflections and seek input from the Ergo-Team and upper level management. The Ergo-Team co-chairs could seek input from employees and supervisors in the affected area, as well as the JHSC, about the opportunities and challenges associated with the process as a whole. In short, part of the evaluation should examine what worked and what didn't work in the Ergo-Team process in such key areas as:

- Ergo-Team recruitment and retention;
- Ergo-Team training;
- role of the ergonomist and level of ergonomics support;
- identification of intervention targets;
- stakeholder engagement;
- communication;
- process costs (short and long term); and,
- process benefits (short and long term).

5.5.2 Intervention outcomes evaluation

Similar to all ergonomics interventions, effective evaluations of Ergo-Team interventions are challenging. Some of the challenges include: dealing with employee turnover, chronic versus acute injuries and, in the longer term, separating the effects of aging from work-related exposures. Furthermore, different groups and sub-groups in a workplace will tend to evaluate the success of an intervention using somewhat different criteria (Guérin et al., 2006). For example:

- employees and unions tend to evaluate success based on improvements in their ability to complete their job comfortably and without stress;
- production supervisors and Human Resources personnel tend to evaluate success based on improved productivity, and fewer complaints and fewer challenges with staffing;

- occupational health and safety committee members tend to evaluate success based on changes in the number of incident reports; and,
- managers tend to evaluate success based on reduced costs.

A month or so after the changes have been made the Ergo-Team worker representatives should visit the employee volunteers who were involved during the job analysis phases. These employees should be queried about:

1. their likes and dislikes with the new set-up;
2. whether it addressed previous concern(s);
3. if it has created new problems or issues; and,
4. if so, any ideas they might have to fix these new problems.

In addition to reviewing the effectiveness of the changes with the employee volunteers, other employees in the affected work area(s) should be given an opportunity to provide feedback. **Training Workbook, Module 11** refers to a short ***Intervention Evaluation Survey***. The questionnaire asks respondents:

1. whether they have worked in the area with the implemented changes;
2. the overall rating they would give those changes;
3. whether the changes have made their work easier or more difficult;
4. whether the changes have affected other work processes or workers in this area or other areas; and,
5. whether they have suggestions on how their work station could be further improved.

Finally, workers and management in adjacent production areas, including those upstream and downstream of the intervention(s), should also be consulted.

If new or ongoing problems/hazards are identified in the Evaluation process, further consultation and a careful review of the original report, recommendations and actual outcomes with workers and management might be required. A return to the *Investigate* phase of the ***Ergo-Team Framework***, re-analysis with the ***Analysis and Information Tables*** and progression through the subsequent phases might be needed. This will help them identify ongoing issues and guide the team to finding proper adaptations to fix the problem.

Essentially, the process of developing recommendations, implementing them, and following up with an evaluation should continue until the design matches the needs of the employees without negative consequences for their work and/or comfort.

If the company wishes to evaluate changes in fatigue and injury rates in future years, the body map survey can be re-administered by the Ergo-Team to determine if overall, longer-term changes have occurred at the departmental level.

6.0 Maintaining the Momentum

The basic premise of an Ergo-Team approach to PE is that substantial up-front investment in an ergonomist facilitator, Ergo-Team member selection, and in training in identifying and studying areas in need of intervention have the potential to provide longer-term ergonomic benefits to workplaces. Such advantages are potentially most important in areas where there is a shortage of trained ergonomists; where the company can't afford to rely extensively on an outside consultant; in remote workplaces; and in dynamic workplaces associated with rapid and often unpredictable changes in the work process.

The substantial up-front investment associated with the Ergo-Team approach to PE means that the sustainability of the Team and its ability to work in a semi-independent fashion with the support of management and others is crucial to the success of this approach to ergonomics. Sustainability is a major challenge for all ergonomics programs, including those based on PE principles.

6.1 Longer-term ergonomist involvement

Ideally, the facilitating ergonomist would continue to encourage and support the Ergo-Team over the longer term by providing: training for new-comers in the event of member turnover; professional advice and oversight on their reports and recommendations for change; and, maintaining communication between the Ergo-Team and upper-level management whose support is essential to the Ergo-Team success. Where this is not possible or feasible, the Ergo-Team might continue to function on its own for a while but this situation will be less than ideal; it is likely that the team will stop meeting and quality control and other problems may emerge. Another risk associated with inadequate ergonomist support is the possibility that the Ergo-Team will limit its efforts to the 'low-hanging fruit,' or easily fixed WMSDs hazards in the workplace, ignoring those that are more complex and require more sustained intervention but which might be substantially more important contributors to injury. At a minimum, the Ergo-Team should have the opportunity to periodically consult with an ergonomist to ensure their training is appropriate and up to date, that their interventions are being done appropriately and are being fully and appropriately evaluated in terms of their effects.

Over the longer term, members of the Ergo-Team must have the ability to function somewhat independently of upper-level management and union leadership (where relevant) and must be given the freedom and resources to conduct their investigations and develop their reports. Ideally, the Ergo-Team will remain separate but linked organizationally and through personnel to the JOSH committee. If there is an occupational health and safety officer at the workplace, they should be encouraged to support the Ergo-Team and help to maintain communications between the Team and upper level management and the JOSH. The champions for the Ergo-Team at various levels of the company must continue to support its work.

Above all else, it is important to encourage input from all levels of the Ergo-Team and appropriate representation of the intervention site's employees as the team moves forward. This will help to

ensure the participatory elements of the program continue and the interventions include physical, **psychosocial**, and **political-social** factors that can contribute to the risk of workplace injury.

It is probable that some members of the Ergo-Team will leave the company for other employment or retirement, or that some members may choose to stop volunteering as part of the Ergo-Team. In these cases, it will be necessary to train new members for the team. This training should only be given by an ergonomist, as they have a much greater depth of the knowledge of ergonomics and the facilitative process required for Ergo-Team interventions. It would not be wise to leave the responsibility for training new members exclusively with the Ergo-Team.

The skills of an appropriately supported and active Ergo-Team should improve over time increasing their ability to quickly identify or even anticipate WMSDs hazards, diagnose issues, and develop solutions. They may be able to tackle multiple projects simultaneously once they are adequately trained, comfortable with the process and materials, and once they have the support of the wider labour force including workers and management.

7.0 Concluding Remarks

This User's Guide and accompanying video ("A Team Approach: Participatory Ergonomics and Your Workplace"), training workbook, and tools have been written to support a facilitating ergonomist attempting to introduce an Ergo-Team approach to PE into an interested and appropriate workplace with a commitment to support that team in the longer term. There are inherent benefits associated with PE when compared to other ergonomic approaches including organized and sustained stakeholder participation, improved communication, greater likelihood that suggested changes will be appropriate and implemented, and greater work satisfaction and improved workplace organization. However, we recognize that this process is resource intensive and time consuming. It may be difficult for companies to see the potential return on investment when hiring an external ergonomist to facilitate the development of an Ergo-Team. Yet, we suggest that proper planning and management of the process can improve the efficiency of training and development, without wasting resources. Developing internal capacity for ergonomics at the company has the potential to achieve substantial benefit to the company in the future.

When management and employees from all levels of the organization work together to share their knowledge it can lead to the development of an ergonomics capacity that is sustained and that permeates the company. The Ergo-Team approach to PE is one way to try to achieve this wider organizational goal.

As ergonomists, we hope that access to the User's Guide, video ("A Team Approach: Participatory Ergonomics and Your Workplace"), training workbook, and tools can help you improve the quality, effectiveness, and sustainability of the workplace ergonomic interventions you facilitate. We see these resources as 'works-in-progress' and we encourage you to be innovative, adapt and try different tools and offer us your feedback on the resources as well as on your experiences with working with them in different workplaces. For this reason, we have included a **Feedback Form** with the kit and encourage you to complete that form and return it to us at your leisure. We look forward to hearing from you.

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9.0 Additional Resources

CCOHS (Canadian Centre for Occupational Health and Safety)
http://www.ccohs.ca/

ISO (International Organization for Standardization)
http://www.iso.org/iso/home.htm

National Seafood Sector Council
www.nssc.ca

NIOSH: Elements of Ergonomic Programs
http://www.cdc.gov/niosh/docs/97-117/

University of Waterloo- Participative Ergonomic Blueprint
http://www.iwh.on.ca/pe-blueprint

Workplace Health, Safety and Compensation Commission (WHSCC NL) and Government Services
Handbook- Guidelines for the Prevention of Soft Tissue Injuries
http://www.whscc.nf.ca/publications.whscc

WHSC (Ontario) - Ergonomic Toolbox Training
http://www.whsc.on.ca/whatnews2.cfm?autoid=449