"Further risk assessment methods" for Hazardous Manual Tasks

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Abstract

Risk assessment requires both risk analysis and risk evaluation ie, comparing the results of risk analysis with risk criteria to determine acceptability. The Safework Australia Hazardous Manual Tasks Code of Practice, Appendix F, provides a list of "Further risk assessment methods" including methods developed during a research project which evaluated a participative ergonomics program. This commentary provides more appropriate citations for the methods referred to, as well as a brief discussion of more recent methods appropriate for routine workplace use which provide risk evaluation in addition to risk analysis.

Background

In August 2004, it was my great privilege to provide the Cumming memorial lecture at the 40th Annual Conference of the Human Factors and Ergonomics Society of Australia Inc. For the most part the lecture described described the outcomes of a workplace based randomised controlled trial of a participative ergonomics intervention [1]. The project was conducted from 1999-2004 in collaboration with Prof Leon Straker, Prof Clare Pollock (both Curtin University of Technology) and Roxanne Egeskov (then Workplace Health and Safety Queensland) with funding from the National Health and Medical Research Council and Workcover Queensland (QComp). At the request of the editor of Ergonomics Australia of the day, I provided an accompanying paper titled "A tale of two acronyms: PErforM and ManTRA" which was published in the December 2004 issue [2].

I was somewhat surprised to see this paper, and a related unpublished manuscript [3, attached] cited seven years later in the December 2011 Hazardous Manual Tasks Code of Practice [4]. (Such is the power of the internet for giving longevity to documents otherwise bound for obscurity). However, in addition to providing an abbreviated title for the the journal paper, the citation is not the most useful to readers seeking information about alternative methods for assessing injury risks associated with manual tasks. In this paper I wish to bring readers' attention to more detailed sources of information about the methods referenced, as well as providing information about more recently published methods.

ManTRA & PErforM

ManTRA (Manual Task Risk Assessment) was the tool devised by Profs Straker & Pollock, Ms Egeskov, and myself in 2000. Conceptually based on the upper limb Strain Index [5], ManTRA was devised as a measurement tool to be employed by Workplace Health and Safety Inspectors auditing the workplaces involved in the randomised controlled trial. (The logic underlying the tool is described in the 2004 Ergonomics Australia paper, and in an issues paper [6] prepared for the the Worksafe Australia review of the 1990 National Code). The inspectors using the ManTRA tool as part of the research project were requested to gather information about the total time for which a task was undertaken and the typical duration the task was performed, and then make semi-quantitative judgements using a five point scale of five task characteristics (cycle time, force, speed, awkwardness and vibration) for different body regions. The scores for duration and cycle time were combined to derive a rating of "repetition" risk, and force and speed rating were similarly combined to provide an "exertion" risk rating. The ratings were summed with those for total time, awkwardness and vibration" assuming a linear scale, and with equal weight for each risk factor. The method included risk evaluation in that inspectors were provided with guidance regarding the scores which should be considered as indicating risk levels which required action - in this case the provision of formal advice or issuing an improvement notice. A revised version of the tool was subsequently made available [3].

PErforM (Participative Ergonomics for Manual Tasks) was the acronym Prof Pollock devised to refer to the intervention program which was implemented with the workplaces participating in the randomised controlled trial. ManTRA was judged to be unnecessarily complex for routine workplace use, and the PErforM program utilised a much simpler method of analysing the risks associated with a manual task. The methods employed in the intervention involved semi-quantitative ratings of five characteristics (duration, exertion, posture, vibration, repetition) for different body regions. Detailed descriptions of the intervention, and examples of the use of the method are provided in papers describing the outcome of the randomised controlled trial [1], and subsequent case studies in surface and underground coal mines [7,8] and civil construction [9] conducted in collaboration with Dr. Gary Dennis. (A handbook aimed at general industry based on these materials was subsequently published by Workplace Health and Safety Queensland [10]). Importantly, the method utilised within the PErforM program described the degree of exposure to the different risk factors in a "risk profile", and can be considered to be a risk analysis tool, however no method of combining the scores was provided and guidance was provided regarding evaluation of the risk profiles. Risk evaluation is an essential component of risk assessment as defined by AS/NZS ISO31000:2009, and consequently this method should not be considered to be a risk assessment tool.

This short-coming was highlighted during the evaluation of the program in the mining industry [7,8]. While the tool was able to be utilised to devise potential control measures (as it had with the small businesses involved in the original evaluation), the safety management systems utilised within the large mining organisations required an evaluation of the risk against risk criteria to allow incoorporation of the information within the wider safety management systems - an essential part of facilitating resource allocation for the control measures.

More recent developments

In 2005/2006, I was able to spend 6 months at the National Institute of Occupational Safety and Health (NIOSH), Office of Mine Safety and Health Research, Pittsburgh. One of the projects undertaken was the implementation and evaluation of a participative ergonomics program in collaboration with Vulcan Materials, the largest manufacturer of aggregates in the USA [11]. A number of different tools for implementing the program were identified and developed. One of the tools provided (and described in the resulting NIOSH publication [12]) was an unimaginatively named "Manual Task Risk Assessment" tool which attempted to achieve the simplicity of PErforM while providing an evaluation of manual task injury risk compatible with wider safety management systems. This assessment tool provided an exponential rather than linear scale, and unequal weightings for different risk factors. The latter decision reflects an understanding that "exertion" and "exposure" task characteristics are more strongly implicated in the causation of injury than posture and movement characteristics.

At the same time, I was conducting a project for the Australian Coal Association Research Program focussed on reducing injury risks associated with underground coal mining equipment. The outcomes of the project included a handbook [13] aimed at assisting mine sites to assess and control such risks, including manual tasks risks. The handbook included a tool titled, a "Simplified matrix for assessment of manual tasks risks" which was a modified version of the risk assessment tool published in the NIOSH Information Circular. In this version, vibration is assessed as an "environmental" characteristic rather than a task characteristic. The logic behind this decision is that if vibration, whether whole body or peripheral, is the primary cause of injury risk associated with a task, then an assessment of the vibration characteristics via accelerometer with respect to the relevant standards is indicated, rather than using a semi-quantitative Manual Task Risk Assessment tool.

In 2008 I was engaged by Xstrata Copper at Mt Isa to provide a "Procedure for Managing Injury Risks Associated with Manual Tasks". The resulting document [14] outlines the requirements for a participative ergonomics process and included a reformatted and slightly modified version of the "simplified matrix" in Appendix B, as well as additional guidance materials. This procedure was made freely available under a Creative Commons Attribution-Noncommercial-No Derivative Works license, and has been subsequently adopted, or adapted with permission, by a number of large organisation in a range of industries; and is cited in guidance materials prepared by NSW and WA mining safety authorities [15, 16]. The version of the tool in Appendix B of this procedure forms the basis of the risk assessment method utilised within an on-line database provided for the management of hazardous manual tasks risks [17].

Conclusion

Implementation of a participative ergonomics program remains the only evidence based method for the reduction of injuries associated with manual tasks [18, 19]. Analysing and evaluating the risks of injury associated with manual tasks is a key step in this process. A range of semi-quantitative tools are available which are both simple enough for routine workplace use and provide useful information to guide the participative identification, development and implementation of design controls. In some organisational contexts it will critical to choose a tool which allows risk evaluation, in addition to risk analysis.

References

1. Straker, L., Burgess-Limerick, R., Egeskov, R., & Pollock, C. (2004). A randomised and controlled trial of a participative ergonomics program (PErforM). *Ergonomics*, *47*, 166-188.

Burgess-Limerick, R. (2004). A tale of two acronyms: PErforM and ManTRA. *Ergonomics Australia*, 18(4), 10-13.

3. Burgess-Limerick, L., Straker, L., Pollock, C., Egeskov, R. 2004. Manual Risk Assessment Tool (ManTRA) V2.0. School of Human Movement Studies, The University of Queensland, Australia. http://ergonomics.uq.edu.au/download/mantra2.pdf
4. Safework Australia (2011) Hazardous Manual Tasks Code of Practice. http://safeworkaustralia.gov.au/AboutSafeWorkAustralia/WhatWeDo/Publications/Documents/640/COP_Hazardous_Manual_Tasks.pdf
5. Moore, J. S. and Garg, A. (1995) The Strain Index: A Proposed Method to Analyze Jobs For Risk Of Distal Upper Extremity Disorders", *American Industrial Hygiene Association Journal, 56*, 443-458.
6. Burgess-Limerick, R (2003) *Issues associated with force and weight limits and associated threshold limit values in the physical handling work environment*. Issues paper commission by the National Occupational Health and Safety Commission for the review of the National Standard and Code of Practice on Manual Handling and Associated documents. http://burgess-limerick.com/download/d2.pdf
7. Burgess-Limerick, R. Leveritt, S., Nicholoson, M. & Straker, L. (2004). Reducing Musculoskeletal Risk in Open Cut Coal Mining. ACARP project C11058 final report - Appendix A. http://burgess-limerick.com/download/d4.pdf
8. Burgess-Limerick, R., Straker, L., Pollock, C., Dennis, G., Leveritt, S., & Johnson, S. (2007). Participative ergonomics for manual tasks in coal mining. *International Journal of Industrial Ergonomics*, 37, 145-155.
9. Dennis, G., & Burgess-Limerick, R. (2007). *Participative ergonomics in civil construction handbook*. Workplace Health and Safety Queensland. http://www.deir.qld.gov.au/workplace/resources/pdfs/construction_ergonomics.pdf

Department of Justice and Attorney-General, Queensland (2011). *Participative Ergonomics for Manual Tasks (PErforM) Handbook*. http://www.deir.qld.gov.au/workplace/resources/pdfs/performreduceriskmusc.pdf

11. Torma-Krajewski, J., Hipes, C., Steiner, L., & Burgess-Limerick, R. (2007) Ergonomic Interventions at Vulcan Materials Company. *Mining Engineering*. November, 54-58.
12. Torma-Krajewski J, Steiner LJ, Burgess-Limerick R. (2009). *Ergonomics Processes: Implementation Guide and Tools for the Mining Industry*. Pittsburgh, PA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH). Publication No. 2009-107, Information Circular 9509. http://www.cdc.gov/niosh/mining/pubs/pubreference/outputid2879.htm
13. Burgess-Limerick, R. (2007). *Reducing injury risks associated with underground coal mining equipment*. ACARP project C14016 final report - Appendix A. http://burgess-limerick.com/download/d5.pdf
14. Burgess-Limerick, R. (2008). *Procedure for Managing Injury Risks Associated with Manual Tasks*. http://burgess-limerick.com/download/d7.pdf
15. Industry and Investment NSW (2009). A practical guide to preventing musculoskeletal disorders in the NSW mining and extractives industry. http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0004/291784/Guide-to-the-prevention-of-musculoskeletal-disorders-in-the-mining-and-extractives-industry-in-NSW.pdf
16. WA Department of Mines and Petroleum (2010). Implementing an effective program to manage the risks associated with manual tasks. Guidance for mining workplaces. http://www.dmp.wa.gov.au/documents/Guidelines/MSH_G_ManualTasks_ImplementingProgram.pdf
17. Ergo Enterprises (2011). Introduction to ErgoAnalyst. http://burgess-limerick.com/download/introea.pdf
18. Cole D, Rivilis I, Van Eerd D, Cullen K, Irvin E, Kramer D. (2005) *Effectiveness of participatory ergonomic interventions: A systematic review.* Institute for Work and Health, Toronto.

http://www.iwh.on.ca/sys-reviews/effectiveness-of-pe-interventions.

19. Rivilis I, Cole DC, Frazer MB, Kerr MS, Wells RP, Ibrahim S. (2006) Evaluation of a participatory ergonomic interventions aimed at improving musculoskeletal health. *American Journal of Industrial Medicine, 49*, 801-810.
20. Van Eerd D, Cole D, Irvin E, Mahood Q, Keown K, Theberge N, Village J, St. Vincent M, Cullen K, Widdrington H. (2008). *Process and implementation of participatory ergonomics interventions: A systematic review*. Institute for Work and Health, Toronto. http://www.iwh.on.ca/sys-reviews/implementation-of-pe-interventions

Manual Tasks Risk Assessment Tool (ManTRA) V 2.0

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http://ergonomics.uq.edu.au/download/mantra2.pdf

Manual Tasks Risk Assessment (ManTRA) V 2.0

This document describes the revised version of an audit tool developed by Robin Burgess-Limerick PhD CPE, School of Human Movement Studies, The University of Queensland; Roxanne Egeskov CPE, Senior Principal Advisor Ergonomics, Workplace Health and Safety Queensland; Leon Straker, PhD, School of Physiotherapy, Curtin University of Technology, and Clare Pollock, PhD, School of Psychology, Curtin University of Technology. The development of the tool was undertaken as part of a research project funded by Workcover Queensland (QComp) and the National Health and Medical Research Council through a Translational Grant in Injury.

One aim of ManTRA, as originally developed, was to assist DWHS inspectors in auditing workplaces across all industries for compliance with the Queensland Manual Tasks Advisory Standard. A second aim was to make an assessment of the exposure to musculoskeletal risk factors associated with manual tasks in the workplace. For workplace use the assessment should be undertaken by a team including employees who perform the task and staff responsible for manual task risk management.

The physical risk component of the revised tool combines information about the total time for which a person performs the task in a typical day (exposure) and the typical time for which the task is performed without break (duration) with an assessment, for each of four body regions, of five characteristics of the task (cycle time, force, speed, awkwardness and vibration). The assessment of each characteristic is for the task *as a whole*, rather than individual task elements. The assessment is for a specific person performing a task, rather than people generally. The aim is for the assessor to make a judgement regarding the severity of each characteristic of the task at each region for the task as a whole. The text which corresponds to the numeric codes is provided as a guide only.

The codes for each characteristic describing the task are then combined to assess the extent of exposure to each of the direct risk factors identified in the Queensland Manual Tasks Advisory Standard. The risk factors are assessed independently for each region because a task only needs to overload one body structure to cause injury. A maximum score for exertion for any body region, or a high combined exertion and awkwardness score, indicates a high risk of acute injury; while a high risk of cumulative injury is indicated by the presence of multiple risk factors for a particular body region. Suggested thresholds are provided to aid the user in making judgements about the need for action.

Explanations for each of the codes are provided below.

Total time
Total time refers to the total time which would be spent performing the task on a typical day. The code will be the same for each body region.

Total time

1	2	3	4	5
0-2 hours/day	2-4 hours/day	4-6 hours/day	6-8 hours/day	8-10 hours/day

Repetition
Tasks which involve short cycle time and prolonged duration are considered to be a risk factor because of the inevitable loading of the same tissues during the task. Tasks performed for a very long duration without interruption (> 2 hr) are similarly a risk, regardless of the cycle duration. Reduced risk is associated with tasks involving longer cycle times and shorter task duration. Cycle time and task duration are first assessed independently, and then a combined score for repetition is allocated.

Cycle time refers to the duration of task which is performed more than once without interruption. The cycle time code may vary between body regions. If a task is performed once only at any time without repetition then the code for cycle time is minimum (1). *Duration is defined as the typical length of time for which repetitions of the task are performed without any rest break or substantial interruption by any other task*. The duration code will be the same for all regions for any particular task. Cycle time and duration codes are combined to give an overall score for repetition using the key below.

Duration

1	2	3	4	5
< 10 minutes	10 min - 30 min	30 min - 1 hr	1 hr - 2 hr	> 2 hr

Cycle time

1	2	3	4	5
> 5 minutes	1 – 5 minute	30 s - 1 min	10 s - 30 s	< 10 s

Repetition Risk Factor

			Duration		
Cycle Time	***1***	***2***	***3***	***4***	***5***
1	1	1	2	3	4
2	1	2	3	4	4
3	2	3	4	4	5
4	2	3	4	5	5
5	3	4	5	5	5

Force
The exertion risk factor identified in the advisory standard has been expanded in ManTRA to separate force *per se*, from the speed of movement. Exertion in this audit tool requires an assessment of the force exerted within each region during the task relative to the maximal force which can be exerted. Note that the assessment should be made relative to the strength capability of the region rather than absolute force ie, a relatively small force may still require a "maximal" rating if exerted by a small muscle group (eg., fingers) but not if exerted by the lower limbs. The assessment of force is relative to the capability of the person performing the task. The force required should be rated independently of the duration of the exertion, that is, a short task which involves moderate force in the region is rated the same as a longer task. (Duration is a separate risk factor). *A maximum force score corresponds to the maximum force possible*, if greater force could have been exerted, the score should be reduced accordingly.

Force

1	2	3	4	5
Minimal force		Moderate force		Maximal force

Speed
The speed of movement has been identified as a separate risk factor. The least risk arises when a task involves slow to moderately paced movements. Tasks which involve primarily static application of force in the region contribute to the risk of musculoskeletal injury. Tasks involving fast movements, and especially those involving rapid accelerations and decelerations constitute higher risks again. The assessment should be of the overall task eg., a tasks which involves mostly slow movements with some fast elements should be rated as moderately paced. However, *the code "3" is reserved for predominantly static tasks only.*

Speed

1	2	3	4	5
Slow movements	Moderately paced	Little or no movement– static posture	Fast and smooth movements	Fast, jerky movements

Exertion Risk Factor
Codes for force and speed are combined to give an overall score for exertion using the following key.

			Force		
Speed	***1***	***2***	***3***	***4***	***5***
1	1	1	2	3	4
2	1	2	3	4	4
3	2	3	4	4	5
4	2	3	4	5	5
5	3	4	5	5	5

Awkwardness
Awkwardness is difficult to define independently of specific joints, but typically postures which involve significant deviations from the mid range of movement constitute an increased risk of injury. Higher risk occurs when the deviation occurs in combinations, eg, trunk flexion combined with trunk rotation, or wrist extension and ulnar deviation. As before, the rating is for the task as a whole and the rating should be adjusted to reflect the proportion of time spent in postures of varying awkwardness. Here especially, the text is a guide only and judgement is required.

Awkwardness

1	2	3	4	5
All postures close to neutral	Moderate deviations from neutral in one direction only	Moderate deviations in more than one direction	Near end range of motion posture in one direction	Near end range of motion in more than one direction

Vibration
Exposure to whole body vibration in addition to other risk factors contributes to increased injury, particularly in the back and neck, and lower limbs. Peripheral vibration, on the other hand, is primarily a risk factor implicated in upper limb disorders. Consequently an assessment of the *severity of whole body vibration is requested for lower limbs, back, and neck regions*, while the severity of *peripheral vibration should be indicated for shoulder/arm and wrist/hand regions.* The rating is for the whole task and the score should be adjusted for duration of exposure as a proportion of the task.

Vibration (Whole body or Peripheral)

1	2	3	4	5
None	Minimal	Moderate amplitude	Large amplitude	Severe amplitude

Suggested thresholds for further action

After combining the force and speed codes to obtain a rating of the exertion risk factor, and combining the cycle time and duration to obtain a repetition risk, a cumulative risk score for each region should be calculated as the sum of codes for:

Total time + repetition + exertion + awkwardness + vibration

That is, the cumulative risk score is the sum of the scores in the unshaded columns. This yields a possible range of scores between 5 and 25.

One aim of the audit tool was to assist inspectors make a determination regarding compliance of a task with the Manual Tasks Advisory Standard. It was suggested that further action may be indicated if for any body region**:**

the combined risk factor for exertion is 5,
the sum of exertion and awkwardness is 8 or greater; or
the combined cumulative risk scores is 15 or greater

These threshold values provide guidance in the prioritisation of tasks for control, and the profile of risk factor ratings should be utilised in provided advice regarding aspects of the task to which controls should be targeted.

Manual Tasks Risk Assessment tool (ManTRA) V 2.0 Scoring Matrix

			Task Codes							CumulativeRisk
Body Region	Total time	Duration	Cycle time	Repetition Risk	Force	Speed	Exertion Risk	Awkwardness	Vibration	
Lower Limbs										
Back										
Neck/ Shoulder										
Arm/ Wrist / Hand										

Cumulative risk is the sum of unshaded cells.

Codes

Total time

1	2	3	4	5
0-2 hours/day	2-4 hours/day	4-6 hours/day	6-8 hours/day	> 8 hours/day

Duration of continuous performance

1	2	3	4	5
< 10 minutes	10 min - 30 min	30 min - 1 hr	1 hr - 2 hr	> 2 hr

Cycle time

1	2	3	4	5
> 5 minutes	1 – 5 minute	30 s - 1 min	10 s - 30 s	< 10 s

Force

1	2	3	4	5
Minimal force		Moderate force		Maximal force

Speed

1	2	3	4	5
Slow movements	Moderately paced	Little or no movement – static posture	Fast and smooth movements	Fast, jerky movements

Awkwardness

1	2	3	4	5
All postures close to neutral	Moderate deviations from neutral in one direction only	Moderate deviations in more than one direction	Near end range of motion posture in one direction	Near end range of motion in more than one direction

Vibration **(Whole body or Peripheral)**

1	2	3	4	5
None	Minimal	Moderate	Large amplitude	Severe amplitude

Scoring Keys for Repetition & Exertion

Scoring key for Repetition

			Duration		
Cycle Time	***1***	***2***	***3***	***4***	***5***
1	1	1	2	3	4
2	1	2	3	4	4
3	2	3	4	4	5
4	2	3	4	5	5
5	3	4	5	5	5

Scoring key for Exertion

			Force		
Speed	***1***	***2***	***3***	***4***	***5***
1	1	1	2	3	4
2	1	2	3	4	4
3	2	3	4	4	5
4	2	3	4	5	5
5	3	4	5	5	5

Action may be indicated if, for any region, the Exertion risk factor is 5, the sum of exertion and awkwardness is 8 or greater, or the cumulative risk is 15 or greater

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Identify ... Assess ... Control

The ErgoAnalyst System

Specifically designed to facilitate a Participative Ergonomics system and created by the same people who brought you PErforM and ManTRA (Dr Gary Dennis PhD CPE and Dr Robin Burgess-Limerick PhD), ErgoAnalyst is a simple and effective manual task risk management system based on years of scientific research that reduces injuries and improves the productivity associated with manual tasks.

The ErgoAnalyst system includes:

- An easy, effective & engaging on-line application with no software to install or update
- Comprehensive out-come focused training with flexible delivery modes
- Access to 1000's of tasks and existing solutions with an integrated search engine
- A detailed task identification register with priorities, descriptions and attachments that can be shared across the business
- Unique visual assessment tools that calculate both acute and cumulative risks of injury
- Control evaluation tools to assess the outcome and quantify the risk reduction before implementation
- Advanced and integrated 'one-touch' reporting tools

ErgoAnalyst

The Complete Ergonomics Solutions System

THE ERGOANALYST SYSTEM

ErgoAnalyst is a complete system to reduce the injury risks and improve the productivity associated with Manual Tasks. Designed by the leaders in the ergonomics industry Dr Gary Dennis PhD CPE and Dr Robin Burgess Limerick PhD CPE, ErgoAnalyst has a scientific and proven background which gets results even with the biggest global companies in a simple and effective system that works.

ErgoAnalyst is a software-based application which enables companies to internally implement and manage a participative ergonomics program to reduce the injury risks associated with manual tasks whilst improving productivity. The system includes comprehensive; training, risk identification and prioritisation registers, unique risk assessment and control analysis tools, report documentation and more, all within a centralised on-line software package that has been designed to be simple to use and results focused.

ErgoAnalyst is a web-based application that does not require any installation on client systems, with all information stored on secure ErgoEnterprises servers accessed via any internet browser. This has the advantage that the information describing the all of the potentially hazardous tasks identified, the risk assessments, the potential control measures and implemented control measures, across the whole organisation are stored in a central on-line database that is easily accessible from any internet browser. This database provides a powerful tool for tracking progress and sharing risk assessments, as well as being able to search for controls that have already been implemented and proven to be effective.

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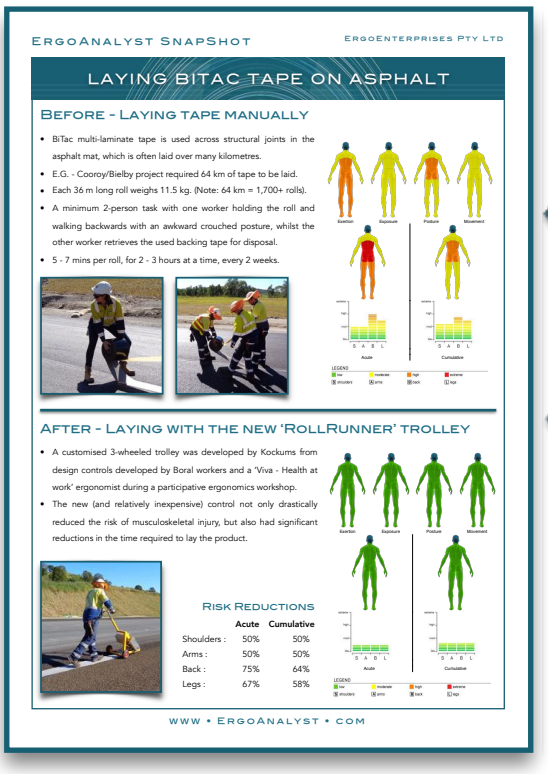
THE ERGOANALYST PROCESS

A SYSTEMATIC 6-STEP IMPLEMENTATION PROCESS THAT GETS RESULTS WITH A PROVEN TRACK RECORD



ErgoAnalyst SnapShot — ErgoEnterprises Pty Ltd

LAYING BITAC TAPE ON ASPHALT

BEFORE - LAYING TAPE MANUALLY

- BiTac multi-laminate tape is used across structural joints in the asphalt mat, which is often laid over many kilometres.
- E.G. - Cooroy/Bielby project required 64 km of tape to be laid.
- Each 36 m long roll weighs 11.5 kg. (Note: 64 km = 1,700+ rolls).
- A minimum 2-person task with one worker holding the roll and walking backwards with an awkward crouched posture, whilst the other worker retrieves the used backing tape for disposal.
- 5 - 7 mins per roll, for 2 - 3 hours at a time, every 2 weeks.

AFTER - LAYING WITH THE NEW 'ROLLRUNNER' TROLLEY

- A customised 3-wheeled trolley was developed by Kockums from design controls developed by Boral workers and a 'Viva - Health at work' ergonomist during a participative ergonomics workshop.
- The new (and relatively inexpensive) control not only drastically reduced the risk of musculoskeletal injury, but also had significant reductions in the time required to lay the product.

RISK REDUCTIONS

	Acute	Cumulative
Shoulders :	50%	50%
Arms :	50%	50%
Back :	75%	64%
Legs :	67%	58%

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TRAINING

Face-to-Face and On-line

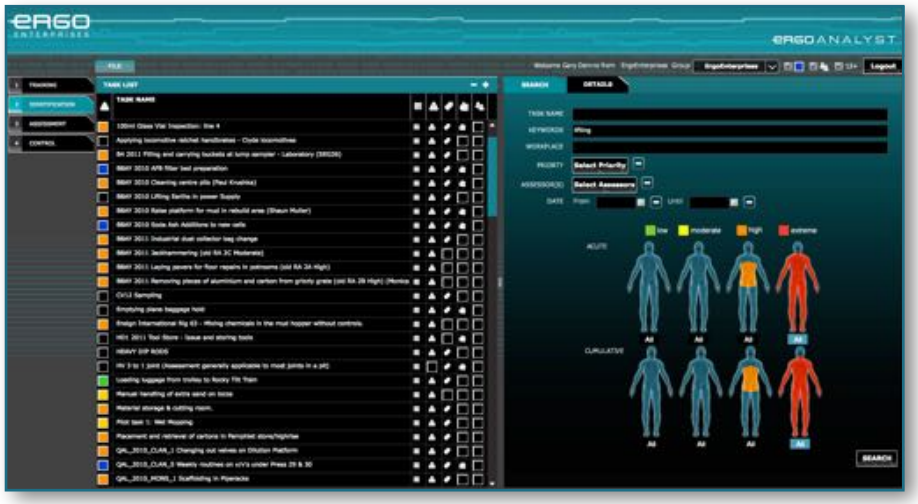
Training forms an important part of any ergonomic program by up-skilling the internal workforce. *However, it is important to note that training in 'correct lifting techniques' or other similar worker modification training has NO effect on reducing injuries in the workplace and should not be conducted.* The only way to effectively reduce the risk of injury risk is to design the workplace to suit the workers. The training given as part of the ErgoAnalyst system can be tailored to each business and can be delivered via video, interactive on-line and/or face-to-face training designed specifically for workers, managers and/or internal Health & Safety staff.

The training given as part of the ErgoAnalyst system is designed to harness the knowledge that already exists within the business and then to focus that knowledge on evaluating and redesigning task processes and equipment that will have the maximum return on investment by reducing injuries and maximising productivity. Thus, ErgoAnalyst training focuses primarily on teaching: the real causes of injury; how to correctly assess the exertion, exposure, posture, moment patterns and environmental risk factors that cause injury; how to facilitate the development of effective controls, and the essential elements at each phase of the 6-step implementation process to ensure success.

IDENTIFY

Know your risks - Share your solutions

The ErgoAnalyst 'Identification' screen (shown below) is the window into all potentially hazardous manual tasks that have been identified across the organisation. A full list of all tasks across the business including, when they were identified, assessed and controlled can be easily viewed and appropriate reports generated, and filtered so that all progress can be monitored.



New tasks are also added to the database via this tab, and information describing each task (including images, videos or other documents) are attached, uploaded or entered here.

An integrated search engine function within the software also provides a means of filtering the tasks displayed by; key word, assessor, date identified, task name, or risk level; which is particularly helpful when looking for videos and descriptions of pre-existing solutions that may already exist within the business or within another company, or when examining the highest risk tasks across the business.

ASSESS

Easy - Engaging - Effective

The assessment performed in ErgoAnalyst is designed to be simple to perform and visually engaging. The risk factors (exertion, exposure, posture, movement patterns and environmental factors - plus data from the free Whole Body Vibration App) are evaluated via a simple 'click and select' drop down menu with colour and descriptors (embedded help menus are also included if further clarification is required). The software is then able to calculate the level of acute and cumulative injury risk for each body region based on the interplay of those risk factors.

Although ErgoAnalyst is based upon years of scientific research, it is the simple analysis and clear presentation of risk that enables anyone to effectively evaluate and understand the risk that makes it so powerful. ErgoAnalyst makes the risk assessment of tasks easy (some even say fun) to perform.

CONTROL

Know your outcome in advance

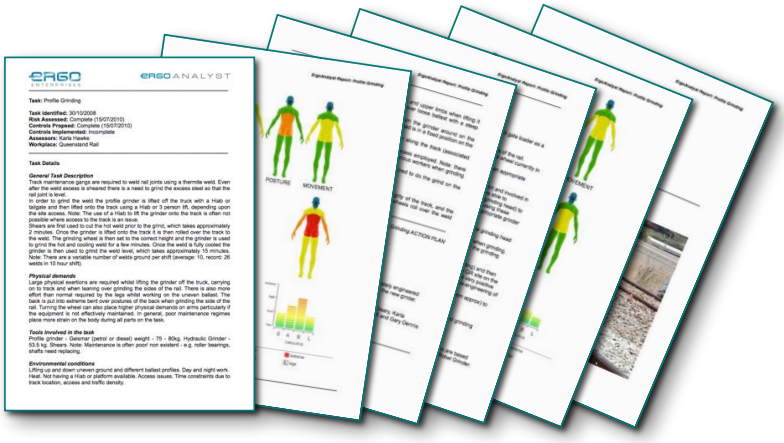
The control tab allows information about multiple control options to be entered and evaluated. Each proposed control option can be prospectively assessed for its physical and environmental tasks characteristics, so that the potential risk reduction can be calculated and objectively compared with alternate control options BEFORE any time or money is spent developing those controls. This prospective analysis is designed to ensure that the injury risk reduction is known in advance, and if required the control can be modified and/or justified via a cost-benefit analysis.

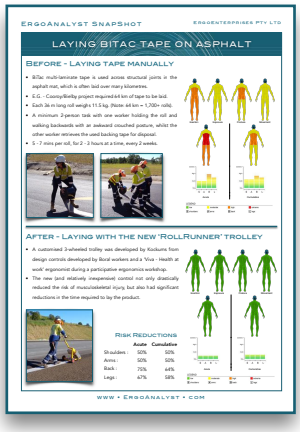
Likewise, after a control has been implemented, the analysis tools on the control tab allows the task to be analysed once more so that the risk reduction and the residual risk are quantified. Not only is it essential to document the risk reduction delivered by an implemented control, but it also enables these improvements to be documented into the future; and most importantly it allows appropriate sharing of the benefit of the controls that were implemented when searching for potential controls to similar tasks.

DOCUMENT & SHARING

Integrated reporting and sharing

A variety of reporting tools are provided within the software to assist in the management of the process, including: areas for developing action plans and delegating responsible persons; detailed printable reports for each task; and reports detailing the progress of all hazardous tasks on the risk register including the dates when the tasks were identified, assessed, controlled and reviewed. A huge rapidly growing database with 100s of solutions displayed via unique single-page "ErgoAnalyst SnapShots" is also available to all ErgoAnalyst members, so that they can easily harness the knowledge and effective solutions that have already been developed by other ErgoAnalyst members.





CLIENT TESTIMONIALS

Rio Tinto - Global Operations

"Rio Tinto has adopted ErgoAnalyst as the standard across all its global businesses and operations as a tool to facilitate assessment and control of manual handling risks. ErgoAnalyst is a unique and easy to use tool for implementing an effective participative ergonomics program as well as to share best practice solutions across the business so that we don't re-invent the wheel."

Ian Firth

Principal Advisor - Occupational Health

Queensland Rail

"ErgoAnalyst has enabled Queensland Rail to effectively identify, assess, control and review its hazardous manual tasks in a way that fosters collaboration between management and employees. By visualising the risk management process, ErgoAnalyst enables the workforce to be engaged as experts in their field, without complicating the process using clumsy risk matrices."

Mike Aitken

Senior Safety Manager

CLIENTS INCLUDE

Rio Tinto
NSW Government HealthShare
Sedgman
BMA BHP Billiton Mitsubishi Alliance
Spotless
toxfree
Chevron
CMOC
Northparkes
Holcim
Dyno Nobel
QUT Queensland University of Technology
Incitec Pivot
East Coast Pipeline Pty Ltd
ERA
BlueCare
Kockums Bulk Systems Pty Ltd The professionals in powder handling
Viva Health at Work
Downer EDi Mining
Pfizer
Pacific Aluminium
Hastings Deering CAT

WHERE TO NOW?

Typical implementation process

Whilst the ErgoAnalyst 6-step implementation process has been designed to ensure that success is a simple and reliable process, the implementation of the system is often tailored to meet the logistical and cultural differences of each company. With decades of experience developing and implementing Participative Ergonomic systems across most industry sectors and business sizes, both domestically and internationally, ErgoEnterprises can help your business develop an implementation strategy that is both comprehensive and straightforward so that success is assured. A typical implementation process may involve some or all of following steps:

- Free consultations to discuss and examine your current injury risk management processes
- Free 30-Day trial of the ErgoAnalyst Software - available upon request
- Discussions and tailoring of a customised implementation plan specific to your business
- Presentation and communication with management and key internal staff and sign-off on the project process
- Site visits, development and delivery of customised training modules to be used by EA-Facilitators
- Face-to-face and/or on-line training of internal Health and Safety staff to become qualified EA-Facilitators
- Identification and prioritisation of potentially hazardous manual tasks by the trained EA-Facilitators
- Scheduling and delivery of ErgoAnalyst - Participative Ergonomics assessments and control workshops
- Implementation of proposed and assessed controls, and subsequent re-analysis using ErgoAnalyst
- Documenting and sharing of results via the ErgoAnalyst SnapShots database of solutions

Note: Whilst the system is designed to build the capability of staff so that the entire system can be managed within the business, as part of the system ErgoEnterprises staff are always available to help and mentor at all stages. "When you succeed ... we succeed!"

COSTS

ErgoAnalyst Subscription Fees

ErgoAnalyst annual license fees are all inclusive of the training materials, access to the software, setup of company specific secure server, security, etc. The cost per license depends upon the number of licenses held, typically ranging from $159 - $199 AUD per month. Face-to-face training costs can vary depending upon the level of training required, but all on-line training is free as part of the system.

CONTACT US

Contact Details

Please feel free to contact the Managing Director, Gary Dennis, directly with any queries that you have, and/or to set up a free 30-Day trial of the ErgoAnalyst software.

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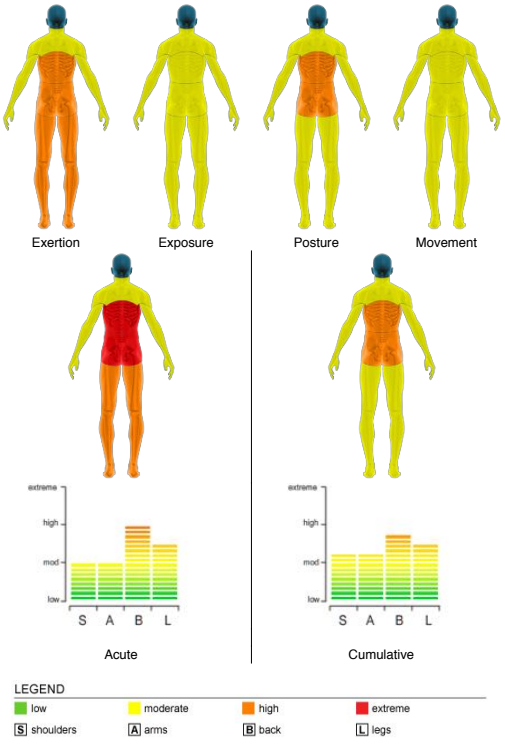
mobile: +61 410 629 626
ph: +61 7 5668 3422

Laying BiTac tape on asphalt

Before - Laying tape manually

- BiTac multi-laminate tape is used across structural joints in the asphalt mat, which is often laid over many kilometres.
- E.G. - Cooroy/Bielby project required 64 km of tape to be laid.
- Each 36 m long roll weighs 11.5 kg. (Note: 64 km = 1,700+ rolls).
- A minimum 2-person task with one worker holding the roll and walking backwards with an awkward crouched posture, whilst the other worker retrieves the used backing tape for disposal.
- 5 - 7 mins per roll, for 2 - 3 hours at a time, every 2 weeks.

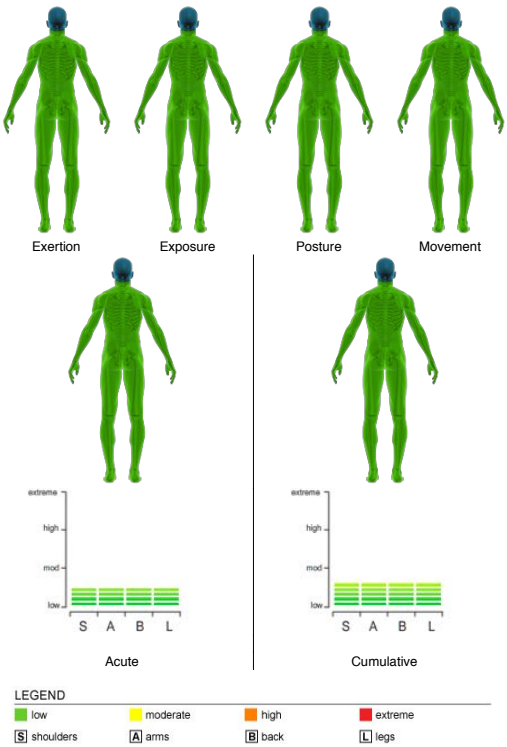


After - Laying with the new 'RollRunner' trolley

- A customised 3-wheeled trolley was developed by Kockums from design controls developed by Boral workers and a 'Viva - Health at work' ergonomist during a participative ergonomics workshop.
- The new (and relatively inexpensive) control not only drastically reduced the risk of musculoskeletal injury, but also had significant reductions in the time required to lay the product.

Risk Reductions

	Acute	Cumulative
Shoulders :	50%	50%
Arms :	50%	50%
Back :	75%	64%
Legs :	67%	58%



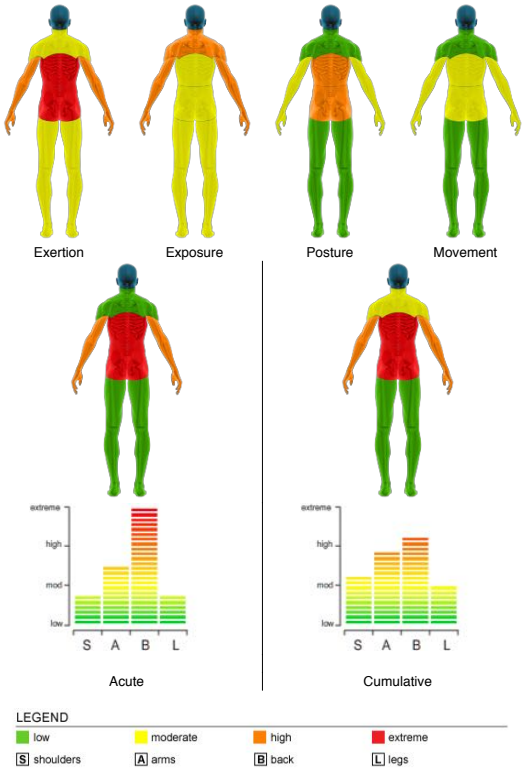
Profile Grinding Train Rail Joints

Before - Static grinder

- This task involves welding 2 rail sections together and then grinding the weld so that the rail profile is maintained. Each grind took 5 - 20 mins and there was up to 30 welds per shift.
- The grinder in use had a static grinding mechanism so the worker had to lean over to grind the side of the rail whilst supporting the wight of the 68 kg grinder (pictured). Additionally, lifting the heavy grinder on and off the ruck and carrying it to the track could also be difficult.

- Hot, humid, localised vibration & sometimes time pressures with limited time for track closures.

Pinch Point

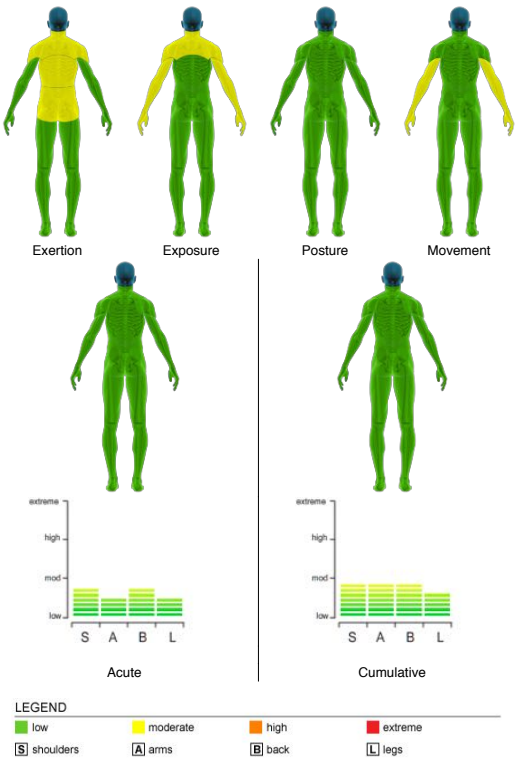


After - New grinder with a movable grinding disc

- A new grinder was constructed, where the grinding disc moved around the rail by turning a wheel whilst the operator stayed upright (pictured), (i.e. no bent over postures are required). The grinder also had an outrigger so the grinder's weight is self supported at all times.
- More powerful motor which more than doubled productivity.
- Dead man safety switch installed, and an electric motor to wind the grind head down, with a 'set button' so that the maximum depth can be set to prevent 'dipping' the rail (i.e. less error).

Risk Reductions

	Acute	Cumulative
Shoulders :	0%	30%
Arms :	67%	53%
Back :	75%	61%
Legs :	33%	38%

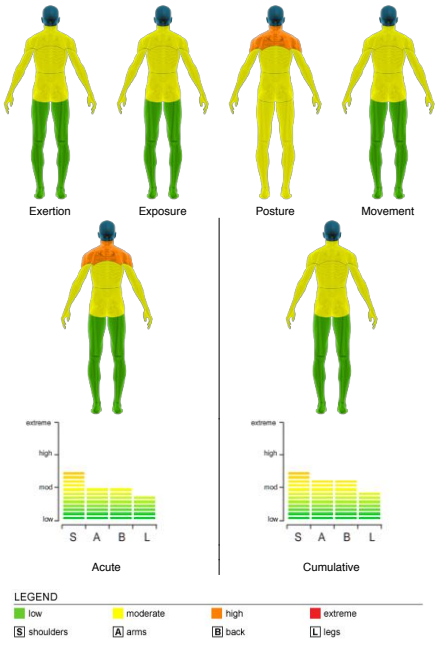


Checking Truck Tyre Pressures

Before - Manually checking pressures

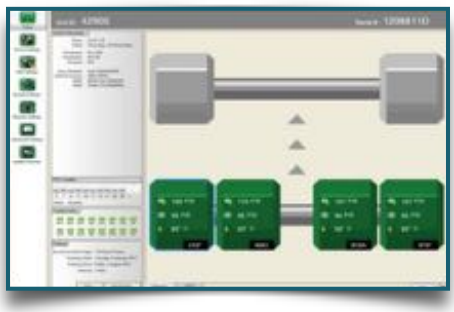
- Mine operators were routinely required to check tyre pressures on their trucks. This task was done during vehicle inspections and servicing. The task involved personnel attaching a tyre gauge to a valve located within the rim. Often this valve was located up high (dependent on wheel rotation), some operators would have to strain to reach up high. Other operators even reported climbing within the rim to take tyre pressures. Significant safety risk was also related to the possibility of tyre failure due to the enormous pressures in mine truck tyres.

Pinch Point



After - Elimination: Remote tyre pressure sensor system

- This cumbersome manual handling task has now been completely eliminated. 'Tyre Sense' is a computerised system that transmits information (i.e. tyre pressure and temperature) wirelessly from the tyre to a Wenco box and can be viewed remotely on a computer screen (pictured). It is anticipated the whole fleet will be fitted out by March 2014. This innovation has eliminated both the musculoskeletal injury risk as well as the potential of serious injuries occurring as a result of tyre failure.



Pinch Point

Risk Reductions

	Acute	Cumulative
Shoulders :	100%	100%
Arms :	100%	100%
Back :	100%	100%
Legs :	100%	100%