

**Implementation of an Ergonomics Program Intervention
to Prevent Musculoskeletal Injuries Caused by Manual Tasks**

Feasibility Study Final Report

NSW Joint Coal Board Health & Safety Trust

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Executive Summary

This feasibility study is the initial component of a 2.5 year project which aims to develop, implement, and evaluate an ergonomics intervention which aims to reduce musculoskeletal injuries due to manual tasks in coal mining.

The aims of the feasibility study were to:

- Assess the critical OHS issues within representative mine sites;
- Evaluate the appropriateness of the ergonomics program; and
- Tailor the program and materials to address the unique demands of the coal industry.

These aims have been achieved through 10 site visits to three open cut and two underground coal mines. Survey data were collected from a total of 175 staff at three sites (two open cut and one underground), and interviews were held with staff and management at each of the mines. An audit of OH&S management systems relevant to manual tasks was undertaken at three sites.

The training materials and processes were tailored to the coal industry through the use of the information and video footage obtained in the initial visits to each site. The training materials and processes were trialed with 46 staff at one open cut coal mine in training sessions spread over seven days. The training program was successfully adapted to the coal mining context and, following the training, staff were able to assess manual tasks risk, and suggest controls for those risks.

A number of modifications to survey tools and the intervention processes have been made as a result of the experience gained in the feasibility study, and the project team are ready to complete the remainder of the project as originally proposed.

Additional funding of \$195,051 has been awarded by the Australian Coal Association Research Program to enable a complementary project to be undertaken. This project focusses on open cut mining only, and aims to determine whether the manual task risk controls implemented at a sample of open cut coal mines may be implemented on an industry wide basis.

Background

The NSW Joint Coal Board Health and Safety trust provided funding of \$40,000 for the conduct of a feasibility study which forms the initial 6 month component of a 2.5 year project titled "*Implementation of an Ergonomics Program Intervention to Prevent Musculoskeletal Injuries Caused by Manual Tasks*". The feasibility study commenced in July 2001, and two progress reports have previously been provided (31/8/01 and 6/11/01). This is the final report of the feasibility study.

Aims

The aim of the project as a whole is to evaluate an ergonomics program intervention designed to improve Occupational Health & Safety outcomes in the coal industry.

This ergonomics program intervention aims to reduce musculoskeletal injuries caused by the manual tasks involved in coal mining by developing process improvement strategies for work groups. This involves:

- Providing education and training in manual tasks risk identification and control; and
- Addressing attitudinal factors that influence compliance with standard work practices, and participation in safety-related activities in the workplace.

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The following timetable summarises the schedule of work completed during the feasibility study.

Project Timetable and Summary of Work Completed

Month	Activity
July, 2001	Contract received (5/7) Negotiations with management of North Goonyella and Ulan mines
August, 2001	Research officer appointed (Ms D.Lee)
September, 2001	Visit to North Goonyella by Ms Lee & A/Prof Cliff (10-13/9) Production crews were identified as the best participants for the program and survey data collected from 81 staff. Interviews with management and staff. Limited video footage was collected due to high gas levels in the mine. Delays due to extended leave by OHS staff, and protracted enterprise bargaining negotiations have delayed scheduling of subsequent training sessions. Revision of survey tool.
October, 2001	Analysis of North-Goonyella survey data Negotiations with management of Tarong, Gregory, and Crinum mines Adaption of training materials and processes for coal mining context. Visit to Tarong by Dr. Burgess-Limerick, A/Prof Cliff and Ms Lee (4/10). Briefing of management, site tour, and negotiation of training.
November, 2001	Two Visits to Tarong by Ms Lee (8-9/11 and 15-16/11). Ms Lee was accompanied by Ms Leveritt on 15-16/11. Mobile and fixed plant maintenance crews were nominated to participate in the program. Risk assessment and survey data obtained from 43 staff. Interviews with management and staff, and collection of video footage for incorporation into training materials. Visit to Gregory by Ms Lee and Ms Leveritt (20-22/11). Briefing of management. Survey data obtained from 51 staff. Interviews with management and staff. Video footage collected for incorporation into training materials. Agreement for maintenance crew and wash plant operators to participate in training in 2002 (date to be determined, likely to be March/April 2002). Visit to Crinum by Ms Lee and Ms Leveritt (22/11). Briefing of management. Agreement obtained to conduct training with development and production crews in 2002 (date to be determined).

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Visit to Ulan by Ms. Lee (25/11). Briefing of management and site tour. Agreement for maintenance crew and wash plant operators to participate in training in 2002 (date to be determined, likely to be March/April 2002).

Incorporation of video footage into training materials.

- December, 2001 Two visits to Tarong by Ms Lee & Ms Leveritt (7-9/12) and 14-17/12) to conduct part 1 of the manual tasks risk management training. Training of 46 staff.
- January, 2002 Analysis of survey data
- Preparation of materials for part 2 training
- February, 2002 Visit to Tarong by Ms Lee and Ms Leveritt (13-15/2) to conduct part 2 of the manual task risk management training. Additional interviews with management and staff to evaluate training processes.
- Presentation to JCB Health & Safety Trust Seminars in Rutherford and Emerald.

Conclusions

General

Management and staff at the five mines were extremely cooperative and allowed sufficient time to be devoted to each component of the program. The Tarong management were pleased with the outcomes of the training, and in particular that staff gained an appreciation of the benefits of controls which were already in place.

A good range of video footage of maintenance and wash plant tasks have been obtained from open cut mines. Footage of underground tasks has proved more difficult due to high gas levels at North-Goonyella at the time of the site visit. It is hoped that the Crinum mine may prove more helpful in this regard. Two additional underground mines have expressed interest in participating in 2002.

The survey tool was well received. Some modifications were made following its initial use at North-Goonyella.

OH&S issues relevant to the reduction of manual tasks injuries

On the basis of the interviews undertaken with staff and management of the five mines involved, survey data gathered from 175 staff in one underground and two open cut coal mines, and the audit of OH&S management systems undertaken at three sites, the following conclusions may be drawn.

- Management are acutely aware of the ageing nature of their staff. At most sites the average age was 45-50 years.
- Staff, especially older staff, are concerned with their health, and the implications of musculoskeletal injury for their long term functional abilities.
- Many staff are aware of current musculoskeletal complaints, however they were reluctant to seek assistance because of a fear of forced retrenchment as a consequence.
- Relative to many other industries, staff turnover is very low. This has both positive and negative consequences. Given the cumulative nature of musculoskeletal injuries due to manual tasks, such low turnover makes the reduction of manual tasks risk even more important. The advantage of low turnover is that training and risk management interventions are more likely to have sustained benefit.
- The standard of OH&S management systems was generally very high, and staff demonstrated a good working knowledge of OH&S risk management. There were some indications that whilst systems for consultation may exist, they are not always used. This may suggest the need for specific campaigns in different hazard categories eg., manual tasks. The ergonomics program provided is likely to facilitate such a process by assisting staff to both assess risks and suggest controls. Further details of the management systems audit is provided in Appendix A.

Evaluation of the Ergonomics Program Intervention for Coal Mines

On the basis of interviews and discussions with staff and management in the five mines, and the experience gained by training of 46 staff at one site, the following conclusions may be drawn.

- The training materials were adapted to incorporate industry and workplace specific examples, and the training program was generally very well received by participants. As we have found with other industries and workplaces, the use of workplace specific video footage is extremely effective in both gaining trainees attention and conveying the relevant information.
- Following the training, the staff were able to use the risk assessment tool provided to assess manual task risks and suggest controls. An example of these assessments and controls is provided in Appendix B.
- It was also noted that staff were also very interested in footage of staff performing similar roles in other coal mines. In some cases this allowed staff to appreciate the benefit of controls already employed within their workplaces, and in others, allowed them to benefit from seeing new controls for existing manual task risks. This benefit is likely to increase as the program is undertaken in additional sites.
- Most staff, and especially older staff, demonstrated a high awareness of the risks of injury associated with manual tasks and an interest in reducing injury risks. There was, however, an under appreciation of the importance of risk factors other than forceful exertions prior to the training. The training program was successful in highlighting the importance of other risk factors ie, awkward postures, vibration, repetition and duration.
- Two changes to the training program are suggested on the basis of the feasibility study. One is to combine both parts of the training into a single session of longer duration and incorporating the risk assessment practice as the standard arrangement (whilst retaining the option of separate sessions if this better meets operational requirements). This would have the primary advantage of allowing immediate feedback on the risk assessments to be provided.
- The second change suggested is to modify the risk assessment tool to incorporate a risk score. This approach would be consistent with the previous training staff have had in the assessment of other hazards.
- There was also an interest expressed by both management and staff in addressing manual task risks beyond the workplace in the training.



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Appendix A: Results of the OH&S Management Systems Audits

The following were tools used to collect information to gauge the effectiveness of the OHS management systems at the 3 sites:

- Workplace Health and safety management system audit questionnaire, "Tri-safe" which was developed by the Division of Workplace Health and Safety.
- Supervisors checklist.
- Purchasing officer's checklist.
- Manual task risk assessment survey.

The Health and Safety management system at each site was reviewed under the ten categories outlined in Tri-Safe. The effectiveness of the local management systems was reviewed based on workplace outcomes. Although only three sites were audited, the findings provide some indication of the level of the health and safety systems implemented on an industry and site by site basis. The information is able to provide some broad indicators on how health and safety is being implemented and areas of recommendation. Further auditing of more sites would ensure a more representative finding on the current status of these systems in the industry and specify in more detail the areas where improvements can be made. In particular as only one underground site has so far been audited, more underground mines are required to provide more definitive conclusions.

Overall all the sites had fair to excellent established and document systems to manage risks to the health and safety of workers and others arising from the nature of work performed, equipment, materials used and the work environment. There were considerable differences in the maintenance and evaluation of the effectiveness of their systems. This trend had been noted across other industries. Regular review and evaluation of the effectiveness of each component of the implemented systems is vital in ensuring that the risks at the workplace are being properly and efficiently managed. All three sites demonstrated compliance to the basic requirements of a workplace health and safety system. One of the participating sites demonstrated best practice in a number of the categories in this review.

Health and Safety Policy Communication

All sites had in place a health and safety policy that covered the basic objectives of a good workplace health and safety policy. There was significant variability between sites on how regularly the policy was reviewed and the level of awareness by the workers of the policy. One site reviewed its workplace health and safety policy following a significant workplace health and safety event or on a yearly basis, whichever came sooner. Workers reported that they became aware of the health and safety policy at their workplace through different avenues especially through induction training and group meetings. Fewer workers noted that became aware of the policy through their manager or supervisor or in their procedures manual.

To achieve best practice in this area, sites could improve communication of the policy to all employees and others at the workplace through inclusion of the policy in procedure manuals, contract documentation, through the supervisor and manager.

Allocated responsibilities and accountabilities

Across all sites both management and supervisors had received formal (both written and verbal) communication of their workplace health and safety responsibilities. It was noted that better description of the workplace health and safety responsibilities and accountabilities in the duty statements for each position would be helpful. Some sites did not specify the workplace health and safety responsibilities for workers in their duty statements or other written communication. This should be a key inclusion to communicate to workers their duty of care in the workplace.

These accountabilities have been incorporated into the annual performance appraisal of managers and supervisors at all sites. One site also includes this during their 6 monthly appraisal. Management and supervisors appeared comfortable with the workplace health and safety responsibilities and accountabilities of their positions. However the performance measures used in performance appraisals appeared quite generalised. If the performance

measures were more specific and objective it would provide direction and specific objectives for management and supervisors to work towards and for their performance to be more accurately and easily to be assessed. An industry guideline on how to implement more specific and objective workplace health and safety performance measures would be useful. Assistance in how to review progress of these measures would also be helpful to produce best practice. This is an area that other industries are also lacking.

More regular feedback to management and supervisor on the effectiveness of their performance within the allocated responsibilities could help make the roles more effective.

All mines had identified positions that were responsible for achieving specific health and safety objectives. Workers indicated a very high awareness of the person in this position.

Suppliers, sub-contractors and purchasing controls

The majority of mines could improve here. Currently all sites have some procedures in place to conduct risk assessments prior to purchasing major equipment or plant and to monitor the health and safety performance of sub-contractors.

Although methods are available for each site to conduct risk assessments prior to purchasing equipment and plant or engaging a supplier, it is not undertaken consistently across a wide range of basic and specialised equipment and plant. At times the head office of the organisation also determines the equipment or plant to be purchased and the local sites have not participated in the decision. For accurate assessment of the workplace health and safety risk associated with any purchase consideration of local factors that may interact with the equipment is necessary. Improved communication and participation with representatives from the local site is required to ensure suitability of equipment for the local site and to minimise health and safety risks. Ideally a worker who will be using the equipment or plant should be involved in a pre-purchase risk assessment.

Manual task risk factors were considered very infrequently for the equipment or plant assessed prior to purchase. Assessments need to address the potential manual task risks. Greater emphasis on manual task risk factors need to be included in risk assessments, particularly for equipment used by a wide range of workers and those used for long durations or high frequency. The manual task risk factors that maintenance workers are exposed to also need attention. Poor design of many pieces of equipment and plant have been frequently identified as the main cause of the high risks associated with a number of manual tasks routinely undertaken by in maintenance workers.

There is industry wide acknowledgment that there is limited range of specialised mining equipment and plant available. There is a lack of competition in specialist mining plant with only two major manufacturers worldwide. A high level approach by senior management between the manufacturers and a consortium of large mining corporations with Australian mining operations is required to improve the design of the specialised mining plant to minimise musculoskeletal injuries. This could be supported by active pursuit by the statutory workplace inspectors to enforce the manufacturer's duty of care in the prevention and minimisation of workplace injuries. This would require the support of the statutory authority. There needs to be a greater uptake by manufacturers to follow through with their responsibility to improve the design of equipment to reduce workplace injuries.

The availability and use of pre-purchase guidelines would assist with the assessment of manual task risks. It would provide guidance and prompts for the purchasing officer /workplace health and safety staff to more easily and efficiently address basic manual task risk with equipment or plant. Specialised pre-purchase guidelines could be produced for equipment that is commonly purchased. These guidelines could more specifically assess the physical features of equipment that are used frequently and by a high proportion of workers. If inappropriate equipment is purchased, continued use of the equipment usually occurs until it requires replacement through wear and tear. Specialised pre-purchase guidelines have been used very successfully in other industries to assist in the selection of new equipment.

The use of these guidelines needs to be supported with training for head office and site purchasing officer in manual task risk assessment and encouragement for purchasing officers to work closely with workplace health and safety staff.

Another key component of successful/ good equipment selection is the trial of equipment prior to purchase. Trials will quickly identify the functional difficulties associated with the equipment and highlight how appropriate the equipment is for the intended work task. If possible a good trial will involve a few different models. This provides better comparison of the features of the equipment and enables better selection of appropriate equipment. Without comparison between different models, the sole model trialed may be the one purchased regardless of whether it may or may not be the best one for the task. Feedback on the trials can also be valuable for other sites in the corporation that are intending to purchase similar equipment. This is also a part of a good management system where there is consultation with workers on health and safety matters.

Sub-contractors

All sites supply basic health and safety instructions to sub-contractors on arrival to the site and provide on-going health and safety information. One site demonstrated best practice in the management of its sub-contractors. This site conducted random audits on sub-contractors health and safety, included them in regular observations of work practices and feedback the information promptly. The action following health and safety reports undertaken by the supervisors of sub-contractors at this site is expected to be at the same standard as mine supervisors. Other sites did not appear to monitor or evaluate its sub-contractors' workplace health and safety performance closely after their initial induction onto site.

For best practice, sites should incorporate their health and safety policy into tendering and contract documentation and outline the expected health and safety performance standards into contract documentation with suppliers and sub-contractors. This should be addressed at both the head office and local level.

On most sites, communication of the expected standard of performing manual tasks is not well performed between the site management and sub-contractors. More effort is required from the site management to achieve and maintain their expected health and safety standard by their sub-contractors. There was variation between sites in whether sub-contractors' reported incidents and injuries were included in the mine's own incident and injury rates and their LTIFs.

Workers commented on their questionnaires and through interviews that they noticed the difference between the accepted standard of workplace health and safety by sub-contractors and mine workers. Generally mine workers believe that the sub-contractors' workplace health and safety performance is below the expected standard at the site and that there would be greater compliance to their own standards if sub-contractors meet these standards as well. Workers expressed concerns of the lower workplace health and safety standards that sub-contractors worked in, the lack of assistive equipment for sub-contractors and the more laborious work sub-contractors had to perform.

Industry guidelines could help improve the overall health and safety of sub-contractors at mine sites. More specific objectives would clarify the expected standards and guidance for both the site and the sub-contractors. This would include: inclusion of the health and safety policy into any contract documentation, review of health and safety performance in tendering process, agreed measures of health and safety performance from sub-contractors during progress of work.

Health and safety consultation

Health and safety consultation consistently rated high to moderate across the sites. During the site visits it was noted that health and safety communication between managers and supervisors with workers was undertaken more frequently and in more depth in the coal

mining industry compared with other industries participating in the perform program. This may reflect the more serious consequences of the inherent hazards in coal mining.

Workers indicated that there was a very high awareness of the site's workplace health and safety officer in all sites, with a moderate to high awareness of health and safety committee and a slightly lower awareness of health and safety representative consistently across all sites. The workers from one site reported a very high degree of consultation on workplace health and safety matters. This could be reflected in the high degree of consultation with workers across other areas such as human resources.

One area of improvement that all sites could integrate into their management system is the monitoring and evaluation of the effectiveness of health & safety consultation at the workplace. Guidelines would help sites to formally review this area. This could be particularly helpful at sites where there appears to be a significant barrier or separation between management and workers.

Hazard identification, evaluation and control

All sites utilised the risk management approach to address workplace health and safety hazards. There appeared to be good documentation of the procedures available to support the approach. Some sites had written specific procedures for tasks involving high risks. The procedures were incorporated into their incident and accident reporting forms.

The workers at one site reported that they were active in hazard identification with regular job analysis and job/safety observations. Workers from other sites did not report that they undertook this on a regular basis.

Although all the sites have implemented these procedures, there is concern to how effectively they are being utilised. Some sites appeared to be using only hazard identification, evaluation and control in their incident and reporting forms. There was a lack of evidence that these sites were actually using the risk management approach other than for these occasions. To have an effective risk management approach it should be undertaken on a regular and planned basis. For example one site has regular planned audit and risk assessments throughout the year. Another approach could involving targeting a hazard category for a particular month in the year.

Mechanisms to evaluate effectiveness of this system could include more planned workplace inspections, as well as reviewing completed risk assessments, accident/incident reports and workplace health and safety committee minutes.

On review of completed manual task risk assessments there appeared to be a tendency to rely heavily on administrative types of control such as more training rather than design controls such as modification of equipment or workstation to address manual task risks. There is a concern that administrative controls are used as the long and medium term solution for these tasks, without consideration of implementing any design type controls.

Workers have agreed that a relatively high proportion of reported accidents have been investigated and controlled. However there may be the low reporting of incidents by workers who felt insecure about their job. One site demonstrated efficient follow up of incident and accident reports. This site found a commercially available software package that assisted with management, particularly the tracking and documentation of the incident and accident reports.

As part of controlling workplace hazards evaluation and review of implemented controls is necessary. Commonly recommended controls have included use of safe work procedures for high risk tasks. These need to be regularly reviewed the effectiveness of these procedures especially when equipment has been replaced or modified.

Across many industries, workers frequently report that they have not been informed of the results of the decision on the control measures decided by the workplace health and safety committee or management. They stated that they felt the issues that they had raised and

made suggestions for reducing the risks were not being considered. This highlights the need for timely communication with workers on progress of the action or decision on reported hazards, incidents or accidents. At workplaces where prompt communication and implementation of some control measure for the identified hazard occurs, the workers appear to have greater confidence in the health and safety management system and feel that management are genuinely supporting health and safety at their workplace.

Provision of information

All sites met the intent of this category in the provision of information without difficulty. They all demonstrated the ability to acquire knowledge of current workplace health and safety legislation, manufacturers' and suppliers' standards and changes in their management system. There are systems in place to restrict the movement of visitors into and throughout the workplace. Relevant information is usually passed on to visitors verbally rather than in written form. There are various methods of disseminating information of changes through the site or company such as notice boards and inclusion in training programs. However these avenues to disseminate information relating to the changes are not always used. Workers stated that there appears an inconsistency to informing them prior to the change in their workplace being implemented. It is important workers are informed of changes prior to implementation, particularly as it could result in adverse consequences, such as changing the equipment without informing workers could result in unintentional misuse of the equipment and injuries could result.

As with all categories, using some method of evaluating the effectiveness of the information provided would be best practice. This may include review of training and procedures manuals, testing awareness, job observation and informal inspections.

Maintaining health and safety information is another element of this category that is undertaken with widely differing standards across the sites. All the provided information needs to be maintained and recorded, such as keeping current and relevant notices on notice boards and maintaining all relevant written health and safety information in an easily accessible location.

A common issue faced by many industries is to ensure that the information is provided in consideration of any literacy barrier. Management and workplace health and safety staff appear aware of this issue and have used various strategies to address this issue. For example reading out important information at team meetings and not solely relying on written notices on the notice board.

Training

All sites had evidence of detailed induction training programs for new workers. This is in line with the health and safety material produced recently by the mining industry's training body. There was variability in the training of the health and safety aspects of operational work once initial training has been completed.

A moderate proportion of workers reported that they had received informal training specific to their job by other workers, that is "shown ropes by workmate". Slightly fewer workers indicated that they had received formal training for their current role. The same number reported that they had received supervised on the job training.

A moderate to high proportion of workers across all the sites reported that they received additional training when new equipment/tools or new work procedures were introduced.

Training of supervisors in helping them carry out their allocated health and safety responsibilities is important in any workplace. This may include accident investigation training or training in supervisory techniques. This was well done in one mine, but not consistently across sites and for all supervisors. The overall standard in training of supervisors appears to be higher than other industries.

All sites appeared to maintain induction and health and safety training records.

Evaluation of the information provided (as outlined above) could also be used to evaluate the material provided in training. Additional training evaluation could also be undertaken to ensure internal training quality is maintained.

For better management systems training programs should include procedures for high risk jobs on the site.

Workplace specific issues – manual tasks

All sites appeared to have systems in place to ensure that current health and safety legislative requirements as they impacted on the site specific operations were met. For these sites it included ticketed forklift drivers and operators of heavy plant, register of hazardous substances and dangerous goods on site and material safety data sheets (MSDS).

In relation to manual task hazards, there was wide range in how well it was managed. One site worked thoroughly to ensure that manual tasks were undertaken at best practice. In doing so, meeting all the legislative requirements, Australian standards, codes of practice/advisory standards and external consultant's recommendations. Other sites had systems in place to achieve a similar standard, however they had not actively assessed many tasks for ergonomic risks. This has been highlighted in the discussion of the hazard identification, evaluation and control category. These sites stated that they see the Ergonomics program as an opportunity to kick start assessment of manual tasks. Similar recommendations outlined in the hazard identification, evaluation and control category would apply for manual task workplace specific issues, particularly better identification of manual task hazards.

Workers reported good management of the use of personal protective equipment (PPE) across all sites. This includes issuing of PPE, ensuring it is worn, ensuring it is maintained, PPE is replaced as necessary and training is provided in its use.

It was noted that all sites had worked on their safe work procedures, maintenance programs and training programs towards meet the requirements of this category.

Reporting and investigating

All sites have written evidence of reasonable investigation and reporting systems, which is being used by workers and supervisors. There is evidence at the sites that the records are maintained and investigations into accidents occur. A high proportion of workers agreed that manual task related accidents they have been involved in or have witnessed were investigated. A slightly lower proportion of workers stated that steps were taken to prevent this accident from happening again.

A strong recommendation for all sites would be to evaluate the effectiveness of the investigation and reporting system. For example, by reviewing outcomes of reports, review of the quality of information from investigations.

In addition, another recommendation would be the implementation of strategies to minimise under reporting of hazards particularly ones that carry injury risks. This has been outlined in the hazard identification, evaluation and control category.

Appendix B: Example Risk Assessment and Control suggestion

PERforM

Participative Ergonomics for Manual Tasks

MANUAL TASKS RISK ASSESSMENT FORM

DATE & WORKPLACE

Date: Dec 2001 **Workplace:** Mine 2

RISK ASSESSORS

Work Unit / Team: Fixed Plant Electrical
Positions: Electrical Maintainers
Names:

TASK DESCRIPTION

Name of task: Bush Maintenance on Blower Motors 630E Rear Dumps

Why was this task selected?

This task involves handing upside down with a metal frame digging into your side with your full weight against you while you perform a twisting movement of the top half of your body with arms at full extension.

Location where task occurs: on 630E Rear Dumps

Who performs the task: Electrical Maintainers

General description:

Task involves checking, measuring and replacing blow motor brushes on 630E Rear Dumps. There is difficult access to the motor. Because of other cabinets near it, you need to sit on the housing of the motor and bend down to get to motor. There is a sharp upright lip around access opening (needed to prevent water entering motor housing). Very painful when leaning into opening. This is done every 6 weeks on each of the 8 rear dump trucks.

Postures:

Very awkward twisting action of back and neck at full stretch

Forceful / muscular exertions:

Strains to middle and lower back, neck and thoracic regions.

Repetition and duration:

Can take up to 60 minutes to change brush. Takes about 3-4 minutes to check brush.

Tools or equipment used:

Verniers and replacement brush

Work / task organisation and environment:

Done by one person

RISK ASSESSMENT

- Indicate on the body chart which area of the body you feel is affected by the task.
- If more than one body part is affected you may shade the different body parts in different colours. If so, use the matching colour when scoring the risk factors e.g. red for arms on the body and score sheet, blue for low back on the body and score sheet.
- Give each risk factor a score out of five. One is when the risk factor is not present and 5 is when the risk factor is the most severest and is liken to the greatest severity of that risk factor they have even experienced.

Exertion					<p style="text-align: center;">Body part</p> <p>Shaded low back and neck</p>
1 No effort	2	3 Moderate force & speed	4	5 R Maximum force or speed	
Awkward posture					
1 All postures neutral	2	3 Moderately uncomfortable	4	5 R Very uncomfortable	
Vibration					
1 R None	2	3 Moderate	4	5 Extreme	
Duration					
1 R (checking brush) < 10 mins	2 R (changing brush) 10-30 mins	3 30 mins – 1 hr	4 1 – 2 hrs	5 > 2 hrs	
Repetition					
1 No repetition	2 R	3 cycle time < 30 s	4	5 cycle time < 10 s	

RISK CONTROLS

DESIGN CONTROL OPTIONS:

- Make access easier by changing position of blower motor eg raising height of motor and turning it around. Will need to fins to re-direct hot air from motor.
- Make access opening larger.
- Replace sharp edging around opening with round pipe around edge.

ADMINISTRATIVE CONTROL OPTIONS: