NSW MAKING IT HAPPEN

NSW GOVERNMENT Department of Industry Resources Regulator

REPORT | INDUSTRY ASSISTANCE PROGRAM

Roof bolting workshops

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Contents

Introduction

In the wake of a death of a mine worker from a roof bolting incident, Centennial Coal, Sandvik and the Department of Industry engaged in a workplace agreed undertaking to increase industry awareness of underground mobile machine mounted bolting equipment hazards and to improve bolting practices.

The agreed undertaking report (May 2014) provided guidance information for industry for a step-change approach focusing on worker safety and wellbeing when roof bolting. The report recommended that industry, manufacturers and government bodies accelerate the application of technology and innovation to improve health and safety aspects of bolting activities.

The report outlined the key themes of risk and injury to roof bolters. It highlighted the need to focus on activities that provide opportunities for improvement within the sector. The key themes included:

- inadvertent operation
- selection errors
- musculoskeletal disorders
- direction errors
- operation while in a hazardous position
- being struck by an object
- fluid injection
- manoeuvring of drill steels.

To build on the work already completed, the department agreed to undertake further work on roof bolting. Roof bolting is identified by the industry as being one of the most hazardous and strenuous tasks performed by an underground miner. As the project will require consultation between original equipment manufacturers (OEMs) and end users to consider equipment design, the project is being undertaken via a step-change approach with three distinct phases. The three phases include:

- phase one - review of report, data and development of report and action plan
- phase two – end user regional workshops
- phase three - industry roof bolting roundtable focusing on the application of technology and innovation to improve the health and safety aspects of roof bolting.

Workshop aims

Three workshops were held in the key regional locations of Rutherford, Lithgow and Wollongong in March 2016. The aim of the workshops was to gain direct access to the mine operators and their workers to:

- communicate the outcomes of the agreed undertaking report and the recently completed roof bolting report
- understand the key issues of roof bolting in underground coal mines from the mine operator and end user’s perspective
- discuss the issues of legacy plant and fit-for-purpose equipment and what mine operators should be doing in the short term
- complete a group PErforM risk assessment to receive feedback from end users on the way to effectively control roof bolting risks.

Workshop format and participation

The workshops were facilitated by Chris Gearing (Mechanical Engineer, Gearing Engineering & Associates) and Kylie Newton (Practice Leader Health and Human Factors, Mine Safety).

One hundred and four people from varied backgrounds including OEMs, engineers, mine operators, unions, mine workers, and health professionals attended workshops across three regions.

The workshop format included the following key agenda items:

- agreed undertaking report
- roof bolting report
- safety bulletin
- fit-for-purpose equipment
- risk assessment tools
- completion of a PErforM risk assessment tool activity.

Key discussion points

There were a number of common discussion points across the three different workshops. Common themes identified at the workshop included:

- forecast demands on both primary and secondary bolting will be significantly greater in the future due to production requirements and difficult strata. As a result, the problems associated with injuries related to roof bolting may increase and become a more pressing issue for the coal mining industry
- provision of regular information from the department with regards to roof bolting injuries. This should include the delivery of regular updates and information and data on roof bolting injuries
- sharing of information between coal mines and OEMs on existing technologies and initiatives
- information on the financial impacts of new equipment and technology compared with current costs of roof bolting, including injuries
- bonus arrangements and the competitive nature of work, including use of contractors, may contribute to a lack of recognition of problems associated with the bolting process. It was highlighted that the industry generally concedes to ‘getting the job done’ without recognising the problems associated with manual handling and roof bolting installation
- mines generally believed they had a bolting rig procedure in place but that they may not adequately cover the circumstances in which rig operators were being injured. It was noted that injuries typically occurred when the workers encountered something ‘out of the usual’. Operators could see benefits in focusing attention on decision making and problem solving and that this should also be considered in the mine’s training arrangements. It was further suggested that a forum be held for operators to specifically deal with bolting procedures including the equipment some mines use and both primary and secondary support
- specific hazardous manual task risk assessments had not been undertaken. It was recognised that, with such a high degree of manual handling in the bolting process, hazardous manual task risk assessment should be undertaken.

Feedback

At the completion of the workshops participants were asked ‘where to from here’? The following lists are a collation of the responses to that question at each of the workshops.

Rutherford

- Would like to be provided with regular data updates with regards to roof bolting injuries
- Improvement in incident notification process to ensure the right information is being captured
- Would like to see a procurement standard for roof bolting including expectations of designers
- Update MDG 17 and MDG 35.1
- An indicative cost-benefit analysis for safety and production benefits for investing in roof bolting
- Provision of a risk assessment tool when focusing on hazardous manual tasks
- Provision of a report for the NSW Mine Safety Advisory Council on the roof bolting workshops.

Lithgow

- A workshop facilitated by the department breaking down the task of roof bolting into steps
- Controls for roof bolting should be shared, best practice initiatives and constraints should be documented
- Review MDG 35.1
- Provision of a cost-benefit analysis on self-drilling bolts versus standard bolts
- Research on self-drilling bolts
- Provision of a specific training and mentoring program for operators starting out in the job of roof bolting
- OEMs design risk assessment to include end users
- Compliance versus innovation.

Wollongong

- Need to demonstrate cost benefit
- Department to develop best practice examples within industry so this can be shared
- Breakdown of incidents and why they are occurring
- Look at the lobsters (feeds the cable bolt into and out of the pre-drilled hole in the strata) and provide this in cost-benefit analysis and best practice example
- Provision of a clear scope of work for mines and OEMs, including risk assessment
- Research light weight bolt and or flexible options
- Clear communication and collaboration between coal mines
- Design for future
- Workshop with OEMs and engineers on the design of roof bolting
- Investigate roof bolt length - there are complaints they are getting too long
- Manual tensioning needs elimination
- Mesh handling needs to be eliminated
- Proforma for roof bolting incidents
- Review MDG 35.1

- Mine mangers should participate in roof bolting for at least one shift
- Need ideas to engage senior people or decision makers
- Need to encourage innovation
- Force application information to be provided.

Perform risk assessments

Like all hazards, musculoskeletal disorder management requires a risk management approach. It became apparent during the workshops that even though a risk management process is being undertaken for the activity of roof bolting, attendees indicated that this does not include a specific hazardous manual task risk assessment.

There are tools available to assist in risk assessing hazardous manual tasks. As part of the workshop the participants completed a PErforM risk assessment for the task of roof bolting. As part of the participatory ergonomics process the participants were also asked to identify short and long-term controls for the task.

A copy of the completed risk assessments for each of the workshops is at **attachment A**.

For more information on the PErforM risk assessment process please click on the following link. https://www.worksafe.qld.gov.au/injury-prevention-safety/hazardous-manual-tasks/participative-ergonomics-for-manual-tasks-perform

Conclusion and future direction

Participant feedback indicated that they enjoyed the opportunity to share information and collaborate with other coal mines, and the opportunity to use the PErforM hazardous manual task risk assessment.

Consistent themes identified included an update of MDG 35.1, provision of a cost-benefit analysis for roof bolting versus injury and the need for the industry to provide relevant and accurate information with regards to injuries associated with roof bolting. There was also general consensus of the need to move towards adapting future technology with a preference for automation.

The department will look to implement phase three of the roof bolting project and facilitate an industry roundtable during the first half of 2017. The aim of the roundtable is to bring together key decision makers and industry experts to discuss the current risks and the feasibility, benefits and limitations to future technology including automation in the underground coal mining sector.

In addition the key discussion points the roundtable will draw from feedback received from the three workshops in March 2016. As such the roundtable will include discussion on:

- cost-benefit analysis for roof bolting with a focus on safety and production benefits
- procurement expectation for roof bolting and expectations on OEMs
- sharing of information among mines on best practice initiatives and innovations
- provision of a specific training and mentoring program for the safety critical task of roof bolting
- OEM design risk assessments and end user involvement.

In the meantime the department will undertake roof bolting project work to build a foundation for the roof bolting roundtable. This work will include reviewing cost data on roof bolting injuries, targeted evaluation on the safety critical task of roof bolting and undertake a detailed human and organisational assessment of roof bolting incidents. Information will be updated on the NSW Mine Safety webpage with regards to the roof bolting round table.

Attachment A : Perform Risk Assessements

Worksheet 1—PErforM Risk Assessment Tool

PErforM - Participative Ergonomics for Manual Tasks

Manual tasks risk assessment form

Date and Workplace

Date: 16-3-2016 Workplace: CONTINUOUS MINER #5.

Risk assessors

Work unit/team: A/S ACREN.

Positions: ROOF BOLT OPERATOR.

Names: CHRIS GEARING, STEVE BANCROFT, JEREMY [illegible].

Task description

Name of task: Operation of roof bolting rig..

Why was this task selected: Known injury history, statistically poor

Location where task occurs: On continuous miner

Who performs the task: Operators

General description:
- Manually move drill steel to rig (in & out).
- Manually insert & remove dolly.
- Manually move bolt, butterfly plate, washer.
- Manually insert chemical.

Postures: Reach. Twist.

Forceful/muscular exertions: 1

Repetition and duration: Repitition :- 20mins.
Duration :- >2HRS.

Tools or equipment used: Bolting Rig, Consumables, Hand tools.

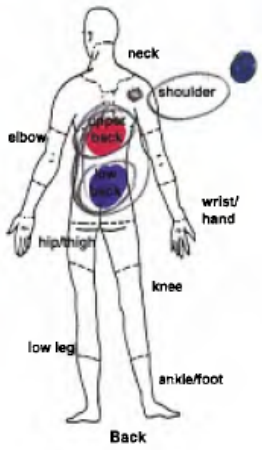
Work/task organisation and environment: 1

Worksheet 2—Risk factor assessment

1. Indicate on the body chart which area(s) of the body you feel are affected by the task.
2. 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).
3. Give each risk factor a score out of five. One (1) is when the risk factor is not present and five (5) is when the risk factor is the most severe level they have experienced.

Exertion -How much force is the person using? – think about starting or stopping quickly				
1 No effort	2	3 Moderate force & speed	4	5 Maximum force or speed
Awkward posture - How awkward is the person's posture?				
1 All postures neutral	2	3 Moderately uncomfortable	4	5 Very uncomfortable
Vibration- How much are the whole body or hand(s) being vibrated?				
1 None	2	3 Moderate	4	5 Extreme
Duration - How long is the action performed for?				
1 < 10 minutes	2 10-30 min	3 30 min – 1 hr	4 1 – 2 hrs	5 > 2 hrs
Repetition- How often are similar actions done?				
1 No repetition	2	3 cycle time < 30 s	4	5 cycle time < 10 s

Body part



Risk controls

Design control options:

(eliminate, substitute, engineer)

- Rotation of ~~posture~~ personnel – Reduce dem

Relocate consumables with easy reach.

Set markers to position. Put markers on Floor to stand close to

Administrative control options:

Worksheet 1—PErforM Risk Assessment Tool

PErforM - Participative Ergonomics for Manual Tasks

Manual tasks risk assessment form

Date and Workplace

Date: _____ Workplace: _____

Risk assessors

Work unit/team:

Positions:

Names:

Task description

Name of task: Install roof bolt into hole

Why was this task selected: repetive / hard work

Location where task occurs: At face on CM

Who performs the task: Operator

General description: Install Chemical, then insert bolt into hole

Postures: abnormal, reach, streching & lifting

Forceful/muscular exertions: to reach & stretch, lift & turn

Repetition and duration: Often

Tools or equipment used: hand / arm

Work/task organisation and environment: Wet, slippery

Worksheet 2—Risk factor assessment

1. Indicate on the body chart which area(s) of the body you feel are affected by the task.
2. 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).
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Body part

Risk controls

Design control options:

(eliminate, substitute, engineer) 1. Single pass self drilling bolt.

2. Full automation

3. Alternative Strata Control measures.

Administrative control options:

Worksheet 1—PErforM Risk Assessment Tool

PErforM - Participative Ergonomics for Manual Tasks

Manual tasks risk assessment form

Date and Workplace

Date: 16/3/16 Workplace:

Risk assessors

Work unit/team:

Positions:

Names:

Task description

Name of task: Roof Bolt - RH Mounted on CM

Why was this task selected: As per workshop

Location where task occurs:

Who performs the task: Roof bolter

General description: Roof bolting from 12CM30-Twin Boom

Postures: Back - bend / twist
Shoulders - Over reaching

Forceful/muscular exertions: - accessing roof bolts & mesh

Repetition and duration: Reaching up / across

Tools or equipment used: On board bolting rig

Work/task organisation and environment:

Worksheet 2—Risk factor assessment

1. Indicate on the body chart which area(s) of the body you feel are affected by the task.
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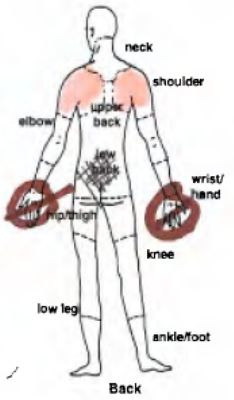

Risk controls

Design control options:

(eliminate, substitute, engineer)

Short Term :- ① Rotation of Job ② 9 Day fortnight.
② On board mesh carries. / bolt pod design
Long Term :- 1. Sandvik Electronic Bolting Rigs
Long Term - Wilson self drilling bolt
Very Long Term - Tunnell boring Machine ie something similar.

Administrative control options:

Workplace Health and Safety Queensland, Department of Justice and Attorney-General
PErforM Worksheet 1 and Worksheet 2
PN10865 Version 2 Last updated April 2011

Worksheet 1—PErforM Risk Assessment Tool

PErforM - Participative Ergonomics for Manual Tasks

Manual tasks risk assessment form

Date and Workplace

Date: _____ Workplace: _____

Risk assessors

Work unit/team:

Positions:

Names:

Task description

Name of task: _____

Why was this task selected: _____

_____

Location where task occurs: _____

Who performs the task: _____

_____

General description: _____

_____

_____

_____

Postures: _____

_____

Forceful/muscular exertions: _____

_____

Repetition and duration: _____

_____

Tools or equipment used: _____

_____

Work/task organisation and environment: _____

_____

Worksheet 2—Risk factor assessment

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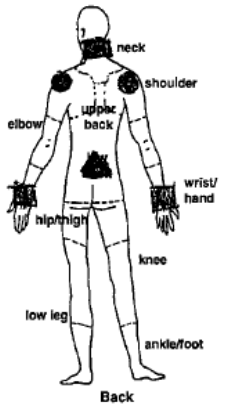

Risk controls

Design control options:

(eliminate, substitute, engineer) REDUCE PERSONNEL.

FULLY AUTOMATED BOLTING SYSTEM.

SELF DRILLING BOLTS

RE: FORWARD FACING RIGS.

Administrative control options:

ROTATE PERSONNEL.

Worksheet 1—PErforM Risk Assessment Tool

PErforM - Participative Ergonomics for Manual Tasks

Manual tasks risk assessment form

Date and Workplace

Date: 15/2/2016 Workplace: Beaford

Risk assessors

Work unit/team: B Team Plus.

Positions:

Names: Duncan, Bill, Trevor, Gary.

Task description

Name of task: Roof Bolting

Why was this task selected: Todd's!

Location where task occurs: Development Panel.

Who performs the task: Operators

General description: Installation of roof and rib bolts concurrently with cutting

Postures: Extension of arms with twisting of trunk.

Forceful/muscular exertions: Moderate—pulling bolts out of cassette

Repetition and duration: Short term, highly repetitive

Tools or equipment used: Drill steels, dollies, bolts anchors, washers, Mesh sheets

Work/task organisation and environment: Dark, dusty, dirty, hazardous

Worksheet 2—Risk factor assessment

1. Indicate on the body chart which area(s) of the body you feel are affected by the task.
2. 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).
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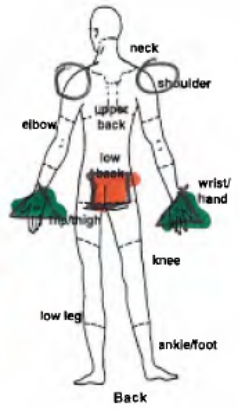

Risk controls

Design control options:

(eliminate, substitute, engineer)

Short – rotate workers – fitness programs
work platform layout – consumable management system
LONG – Automated strata support installation system

Administrative control options:

Worksheet 1—PErforM Risk Assessment Tool

PErforM - Participative Ergonomics for Manual Tasks

Manual tasks risk assessment form

Date and Workplace

Date: _____ Workplace: _____

Risk assessors

Work unit/team: MA Crew

Positions: Materials

Names:

Task description

Name of task: Re stocking bolting supplies on to MB650 Miner

Why was this task selected: Onerus manual task

Location where task occurs: Development panels

Who performs the task: All crew members

General description: Supplies are moved to the rear of Miner by LHD. A daisy chain of people then transfer materials into storage areas on Miner

Postures: Twisting to pass load. Reaching out with 14kg (two bolts) in hand.

Forceful/muscular exertions: Arms, shoulders, back moving 14kg.

Repetition and duration: 100 reps / 20 min.

Tools or equipment used: None.

Work/task organisation and environment: Uneven, muddy floor cond. this chain is up a 3 step staircase

Worksheet 2—Risk factor assessment

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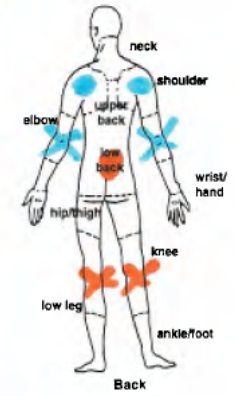

Risk controls

Design control options:

(eliminate, substitute, engineer) Short term – rotate operaters involved in daisy chain either break into 2 groups or change location within chain. long term – cassette which can provide bulk change over of materials using machine (LHD).

Administrative control options:

Worksheet 1—PErforM Risk Assessment Tool

PErforM - Participative Ergonomics for Manual Tasks

Manual tasks risk assessment form

Date and Workplace

Date:_____ Workplace: _____

Risk assessors

Work unit/team:

Positions:

Names:

Task description

Name of task: _____

Why was this task selected: _____

Location where task occurs: _____

Who performs the task: _____

General description: _____

Postures: _____

Forceful/muscular exertions: _____

Repetition and duration: _____

Tools or equipment used: _____

Work/task organisation and environment: _____

Worksheet 2—Risk factor assessment

1. Indicate on the body chart which area(s) of the body you feel are affected by the task.
2. 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).
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INSTALLING CHEMICAL & ROOF BOLT.

Exertion -How much force is the person using? – think about starting or stopping quickly				
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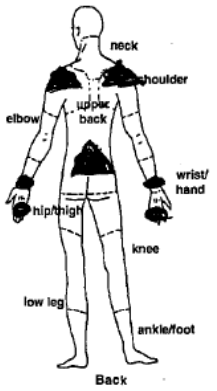

Risk controls

Design control options:

(eliminate, substitute, engineer) ROTATE OPERATORS ON JOBS.
LOOK AT OPTIONS OF WHERE DRILL STEELS AND BOLTS ARE POSITIONED PRIOR TO INSTALLATION.
POSITION OF OPERATOR
LONG TERM FULLY AUTOMATED BOLTING SYSTEM.
ONE STEP BOLT DRILLING + CHEMICAL.
BETTER POD LOADING - MACHINE + POD.

Administrative control options:

TRAINING, PROCEDURES, REGULAR RISK ASSESMENT.

Worksheet 1—PErforM Risk Assessment Tool

PErforM - Participative Ergonomics for Manual Tasks

Manual tasks risk assessment form

Date and Workplace

Date: _____ Workplace: Roof Bolter.

Risk assessors

Work unit/team: Jeremy Obrien, Stephen Beacroft, (Chris Geary

Positions:

Names:

Task description

Name of task: Roof bolting operation.

Why was this task selected: Statistically causing highest injury rates

Location where task occurs: Face

Who performs the task: Operator.

General description: Obtain drill steel, remove drill, insert dolly, insert chemical metal bolt, ch check, install bolt)

Postures: Twisting

Forceful/muscular exertions: High forces rapid.

Repetition and duration: each bolt cycle ~1min.

Tools or equipment used: —

Work/task organisation and environment: Dusty, noisy, confined, dark. access limited,

Worksheet 2—Risk factor assessment

1. Indicate on the body chart which area(s) of the body you feel are affected by the task.
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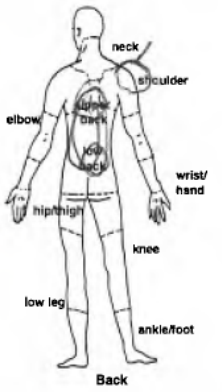
Body part



Risk controls

Design control options:

(eliminate, substitute, engineer)

Relocate consumable;
Rotation at operator

Administrative control options:

Re-orientation (Remount Control V")
On board mesh handler.

Worksheet 1—PErforM Risk Assessment Tool

PErforM - Participative Ergonomics for Manual Tasks

Manual tasks risk assessment form

Date and Workplace

Date: 16/3/16 Workplace: Bradford Hotel.

Risk assessors

Work unit/team:

Positions:

Names:

Task description

Name of task: Roofbolting

Why was this task selected: Potential for back/shoulder injury.

Location where task occurs: B/G on continuous miner

Who performs the task: Mine workers

General description:
- Pick up bolt from back of pod
- Pick up chemical.
- Insert chemical.
- Insert bolt into hole. - use bolter control to

Postures: lifting & twisting
stretching with arm above head.

Forceful/muscular exertions:
- lifting bolt 5kg. lifting & inserting dolly.
- pushing bolt into hole.
- inserting bolt with bent arm

Repetition and duration: 1 every 2 minutes.

Tools or equipment used: 2.1m roofbolt.
chemical inserter.

Work/task organisation and environment:

Worksheet 2—Risk factor assessment

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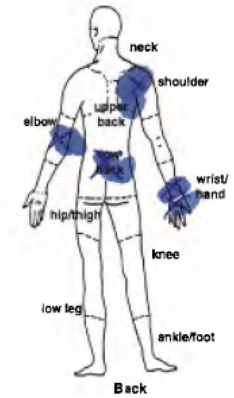

Risk controls

Design control options:

(eliminate, substitute, engineer) Confirm use of chemical insert. tool
Standard location of consumables.
housekeeping.

Long term - one step drill & bolt.

Administrative control options:

Worksheet 1—PErforM Risk Assessment Tool

PErforM - Participative Ergonomics for Manual Tasks

Manual tasks risk assessment form

Date and Workplace

Date: 16-3-16 Workplace: Roof Bolting.

Risk assessors

Work unit/team:

Positions: Mining. Roof Bolting.

Names: Ray, Derek, Nick, Daniel, Barry, Tony

Task description

Name of task: Install a 6m Cable Bolt

Why was this task selected: High risk. Manual handling Task.

Location where task occurs: Underground. Multi Bolter.

Who performs the task: Bolter operators.

General description: Drill the bolt hole using 1m Rope steels.
2. Drag the cablebolts to bolter. Aprox 30m outage.
3. Bolt weighs aprox 20kg (4) place chemical in hole. 1.2m tubes.
5. Install the cablebolt into drill hole, Manual feed.

Postures: Standing, bending & force pushing cable.

Forceful/muscular exertions: lifting, pushing, shoulder pushing. & rotating. leg stability.

Repetition and duration: 20 cable bolts per shift. 8hr shift. per person.

Tools or equipment used: LHD. to transport the mesh & bolts. Multi bolter. machine.

Work/task organisation and environment: Underground. wet. Muddy, development. work. humid. & hot.

This is a place change. Mining method.

On average 500 bolts per day.

Workplace Health and Safety Queensland, Department of Justice and Attorney-General
PErforM Worksheet 1 and Worksheet 2
PN10865 Version 2 Last updated April 2011

Worksheet 2—Risk factor assessment

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Body part

Wrist

Risk controls

Design control options:

(eliminate, substitute, engineer) Personnel Rotation.

SHORT TERM Materials closer to the machine. Third-Man if available.

LONG TERM Rig Direction from E/W to N/S.
Review Lobster Back System

Administrative control options:

Maintain Bolter Crew.

Worksheet 1—PErforM Risk Assessment Tool

PErforM - Participative Ergonomics for Manual Tasks

Manual tasks risk assessment form

Date and Workplace

Date: 16/3/16 Workplace: M/G20

Risk assessors

Work unit/team: DEVELOPMENT

Positions: BOLTER

Names: A HEALD

Task description

Name of task: ROOFBOLTING

Why was this task selected: WORKSHOP

Location where task occurs: M/G20 DEV

Who performs the task: ~~ROOFBOLTERS~~

General description: LOADING BOLT POOS
DRILLING/BOLTING
MESH TO POSITION

Postures: BENDING & STRETCHING

Forceful/muscular exertions: CHUCK IN/OUT.
LIFTING BOLTS

Repetition and duration: CONSTANTLY LIFTING/TURNING/STRETCHING

Tools or equipment used: BOLTS/CHUCKS/DRILL STEELS

Work/task organisation and environment: TRAINING, CONFINED
HOT/HUMID RUSHED

Worksheet 2—Risk factor assessment

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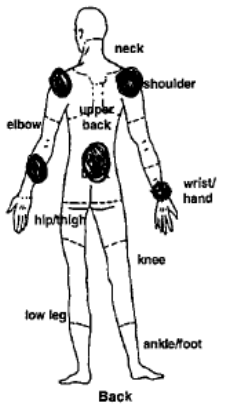

Risk controls

Design control options:

(eliminate, substitute, engineer)

Engineer Twisting
Task Rotation
Reduce weight | Bolt length |

Administrative control options:

Task Rotation

Worksheet 1—PErforM Risk Assessment Tool

PErforM - Participative Ergonomics for Manual Tasks

Manual tasks risk assessment form

Date and Workplace

Date: 22-3-16 Workplace: Clarence / Airly

Risk assessors

Work unit/team:

Positions:

Names: JAC, Pete, MATT, MICK

Task description

Name of task: Roof bolt installation

Why was this task selected: topical - relevent to all underground (coal) mining.

Location where task occurs: Coal face / Development face.

Who performs the task: trained operators.

General description: insert drill steel into chock, drill, remove drill, insert dolly into drill rig, add bolt, plate, chemical spin to roof, wait for set time, tighten bolt.
- some low roof requiring ~~cleat~~ 2 steel installation.

Postures: standing, reaching, ~~bend~~ twisting, stepping up/down

Forceful/muscular exertions: pushing steels, reaching into pod. lifting mesh, steels, plates, push chemical cpt into roof

Repetition and duration: 8hr shift on bolting, 4 rigs = 2 operators constantly bolting

Tools or equipment used: mobile bolter, drill steels, dollys mesh, bolts, chemicals & plates.

Work/task organisation and environment: roof support following support rule & TARPS. - in dark, wet, slurry drill tailing

Worksheet 2—Risk factor assessment

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Body part

Risk controls

Design control options:

(eliminate, substitute, engineer) Rotate workforce - add an additional person to assist with task management.
- Create a larger work area on bolter.
- Improve ergonomics (change levers - spacing & access)
- Self drilling roof bolts. plastic roof mesh (lighter)
- Full automation

Administrative control options:

Worksheet 1—PErforM Risk Assessment Tool

PErforM - Participative Ergonomics for Manual Tasks

Manual tasks risk assessment form

Date and Workplace

Date: _____ Workplace: _____

Risk assessors

Work unit/team:

Positions:

Names:

Task description

Name of task: ROOF BOLT INSTALLATION

Why was this task selected: COMMON TASK FOR ROOF BOLT INSTALLATION

Location where task occurs: UG FACE AREA

Who performs the task: BOLTER OPERATORS

General description: DRILLING & BOLT INSTALLATION

Postures: OVER REACHING, TWISTING

Forceful/muscular exertions: LIFTING BOLT FROM POD, LIFING RESIN BOX FROM POD, PULLING DOWN STUCK DRILL STEEL.

Repetition and duration: DRILL & BOLT HANDLING, STANDING ON STEEL. 6 HOUR PERIOD.

Tools or equipment used: DRILL STEELS, RESIN, BOLTS, DOLLY, OPERATION HYDRAULIC HANDLES. MULTI-BOLTER

Work/task organisation and environment: FACE CHANGE OPERATION, 2 PERSON TASK, NOISE, VIBRATION, WET, DARK

Worksheet 2—Risk factor assessment

1. Indicate on the body chart which area(s) of the body you feel are affected by the task.
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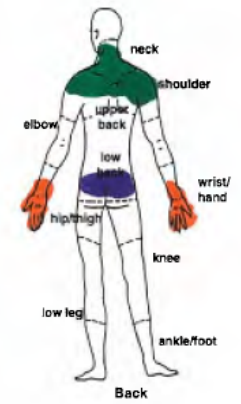

Risk controls

Design control options:

(eliminate, substitute, engineer)

STORAGE DESIGN, AUTO BOLT INSTALLATION

Administrative control options:

TASK ROTATION, STRETCHING, HAZARD INDENTIFICATION.

Worksheet 1—PErforM Risk Assessment Tool

PErforM - Participative Ergonomics for Manual Tasks

Manual tasks risk assessment form

Date and Workplace

Date: 22/3/16 Workplace: Springvale

Risk assessors

Work unit/team: G Grant T. Gleeson A West D. Lamb A. Nash

Positions: Operators / HSEC.

Names:

Task description

Name of task: Hand Bolter.

Why was this task selected:
Manual Handling Issues

Location where task occurs: SPRINGVALE – MINE GENERAL.

Who performs the task: 2 man crew.

General description:
Installing 8m Cable bolts using a hand held bolter – 55mm hole
4 x 1.5 2 x 1m length drill steels.

Postures: Standing, bending, reaching, lifting

Forceful/muscular exertions: Pushing, lifting, pulling, dragging.

Repetition and duration: 5 hrs per 8h shift
5 days a week

Tools or equipment used: Ramor hand held air operated bolter.

Work/task organisation and environment: 13 per shift, uneven floor, wet, bad roof, ribs, close proximity to conveyor.

Worksheet 2—Risk factor assessment

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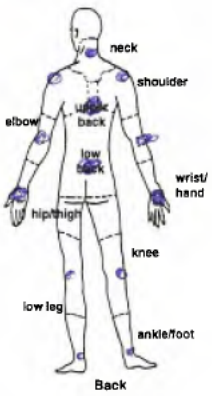

Risk controls

Design control options:

(eliminate, substitute, engineer)

Long Term — Substitute hand held bolter for a drilling rig

(rig design on cm's cannot reach in to install centre bolts)

Administrative control options:

Short Term — Job rotation with other employees.

(Job not performed. 5 days a week by some employees)

Worksheet 2—Risk factor assessment

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Body part

Risk controls

Design control options:

(eliminate, substitute, engineer)

LIGHTER MESH.
MESH HANDLER –
MESH SUPPORT ARMS.

Administrative control options:

CAPITAL.
PROCEDURE & MANUAL HANDLING TRAINING.

Worksheet 1—PErforM Risk Assessment Tool

PErforM - Participative Ergonomics for Manual Tasks

Manual tasks risk assessment form

Date and Workplace

Date: 23.3.16 Workplace: UNDERGROUND.

Risk assessors

Work unit/team: MICK, PETER, DENNIS

Positions:

Names:

Task description

Name of task: INSERTING CABLE BOLT INTO ROOF (LONG-TENDON CABLE)

Why was this task selected: - HIGHLY MANUALLY INTENSIVE
- DAILY TASK / REPETITIVE

Location where task occurs: UNDERGROUND (GENERAL)

Who performs the task: OPERATORS (OF BOLTING CREW)

General description: • POSITION CABLE AT HOLE LOCATION
• MANUALLY LINE UP CABLE END WITH DRILL HOLE
• GRIPPING CABLE FORCE-FEED CABLE INTO HOLE UNTIL REACHES DEPTH (6-10m.)

Postures: REACHING OUT THAN LIFTING TO ABOVE SHOULDERS, BENT OVER

Forceful/muscular exertions: - FORCING CABLE INTO ~~BOLT~~ ROOF
- DRAGGING CABLE, PUSHING.

Repetition and duration: 8-20 TIMES PER 6 HOUR UPTIME / SHIFT

Tools or equipment used: HANDS (GLOVED)
TEAM LIFT (2 PERSONS)

Work/task organisation and environment: UNEVEN GROUND, WET / MUD DARK, NEAR EQUIP.

Worksheet 2—Risk factor assessment

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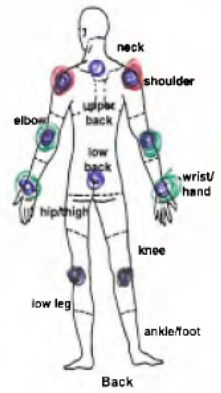
Body part

- NECK / BACK
- SHOULDERS
- ELBOWS / WRISTS



- KNEES

Risk controls

Design control options:

(eliminate, substitute, engineer)

- CABLE FIXED ATTACHMENT (REQUIRES REDUCTION IN MAST HEIGHT)
- SELF - DRILLING CABLE
- PROCESS DESIGN - PROXIMITY OF SUPPLIES
- ROBOTS! (AUTOMATION)
- RESIN INJECT BAD AREAS (PRB) REDUCES SECONDARY SUPPORTMENT.

Administrative control options:

- TASK ROTATION
- MIN 2 PERSON LIFT

Worksheet 1—PErforM Risk Assessment Tool

PErforM - Participative Ergonomics for Manual Tasks

Manual tasks risk assessment form

Date and Workplace

Date: 22/03/2016 Workplace: BOLTING WORKSHOP.

Risk assessors

Work unit/team:

Positions:

Names:

Task description

Name of task: ~~ROOF BOLTING~~ DRILLING 27mm HOLE FROM CM 30.

Why was this task selected: BOLTING WORKSHOP.

Location where task occurs: U/G.

Who performs the task: CM OPERATORS.

General description: PICK UP DRILL STEEL FROM HOLDER LOWER DRILL PODS, INSERT DRILL STEEL, HOLD DRILL STEEL AND RAISED TO ROOF, ENGAGED AUTO DRILL, REMOVE DRILL STEEL

Postures: TWISTING, ARMS EXTENDING, GRIPPING OF DRILL STEEL, HAND OPERATION ON DRILLS FUNCTION.

Forceful/muscular exertions: LIFTING &, SKIDDING & INSTALL OF DRILL STEEL

Repetition and duration: > 2h.

~~3 TO 5 HOURS~~ REPETITION:- 10 to 20 Sec.

Tools or equipment used: Roof Bolter,

Work/task organisation and environment: SUPERVISED, WORKING ON PLATFORM OF A MOBILE PLANT IN U/G ENVIRONMENT, L

Worksheet 2—Risk factor assessment

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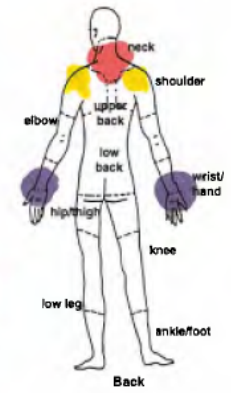

Risk controls

Design control options:

(eliminate, substitute, engineer)

1. → REPOSITION DRILL STEEL HOLDER 2 → INSTALL DRILL HOLDER
3 → INVESTIGATE SELF DRILLING BOLTS, 4 → CONSIDER TO USE DIFFERENT BIT SIZE TO REDUCE DRILLING TIME.

Administrative control options:

→ 1. ROTATE OPERATORS, 2 → TRAINED & COMMUNICATE OPERATOR.
3. UP DATE / REVIEW PROCEDURES.

Worksheet 1—PErforM Risk Assessment Tool

PErforM - Participative Ergonomics for Manual Tasks

Manual tasks risk assessment form

Date and Workplace

Date: 22-3-16 Workplace: CLARENCE.

Risk assessors

Work unit/team: G. GIBO DAMO EPTO

Positions: Visitor DEP/OP. ENG OP.

Names:

Task description

Name of task: INSTALL SHEET OF MESH OF MULT ROOFER

Why was this task selected: AWKWARD.

Location where task occurs: UNDER GROUND. FACE.

Who performs the task: OPERATORS.

General description: GET MESH FROM POD AT REAR OF M/C
LIFT MESH ONTO M/C.
PLACE ONTO RIGS. TRS.
INSTALL ROOF BOLTS TO PIN MESH.

Postures: AWKWARD.
DUE TO LIFTING & TWISTING.

Forceful/muscular exertions: PULLING. LIFTING. ABOVE SHOULDERS

Repetition and duration: 2 HOURS. PER. SHIFT.

Tools or equipment used: ROOF BOLTER. POD. EIMCO

Work/task organisation and environment: DARK. RESTRICTED.
WET MUDDY. LOOSE COAL.

Worksheet 2—Risk factor assessment

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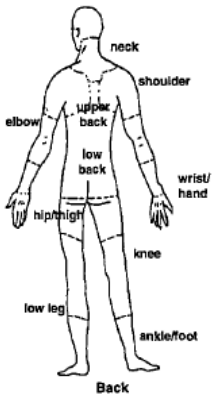
Body part



Risk controls

Design control options:

(eliminate, substitute, engineer) .....

.....

.....

.....

Administrative control options:

.....

.....

Worksheet 1—PErforM Risk Assessment Tool

PErforM - Participative Ergonomics for Manual Tasks

Manual tasks risk assessment form

Date and Workplace

Date: 23-3-16. Workplace: Underground Coal Mines - various sites.

Risk assessors

Work unit/team: Clinton Smith.

Positions: H

Names:

Task description

Name of task: Drill hole. off roof bolter on mast mounted Rig.

Why was this task selected: Known to be one of highest risk activities to shoulders and upper body.

Location where task occurs: Development panel.

Who performs the task: operators (mining technicians)

General description: obtain drill steel from pod, reach out and insert drill steel into drill pod of (chuck) of drill pod, Drill hole to depth remove from chuck, place back into drill/bolt pod.

Postures: reaching, twisting, bending.

Forceful/muscular exertions: pushing/pulling steel into drill chuck and removing from chuck, twisting hand action when uncoupling from chuck.

Repetition and duration: repitition every 60 to 70 seconds. 20 mins per hour over 6 hr period.

Tools or equipment used: drill steel. and drill rigs.

Work/task organisation and environment: wet, dark, slippery, confined space.

Worksheet 2—Risk factor assessment

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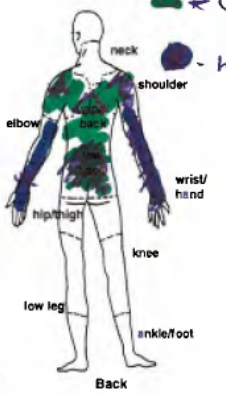
Body part

- Shoulder
- Back upper + lower back.
- hand/ wrist



Risk controls

Design control options:

(eliminate, substitute, engineer) - Substitute - Self drilling bolt - one step, reposition drill steel - magnetic stand/rack. , Engineering - review access platform.

Long Term - Automation - self drilling bolt with self load abilities.

Administrative control options:

Review bolting Tarps (Strata Support plan Tarps) reviews bolting requirements

Worksheet 1—PErforM Risk Assessment Tool

PErforM - Participative Ergonomics for Manual Tasks

Manual tasks risk assessment form

Date and Workplace

Date: 23/3/16 Workplace: DEVELOPMENT

Risk assessors

Work unit/team: /

Positions:

Names: Brett Shepherd Gary Gibson Allan Burgess, Tim Mutt

Task description

Name of task: Roof Bolting continuous miner 12CM30

Why was this task selected: Topic 1

Location where task occurs: Gate road drivage

Who performs the task: Trained Operator

General description: Installation of roof support roof 3 rib mesh 1m spacing 4 of 7ft bolts 2 cable bolts 4 rib bolts.

Postures: Standing upright, bending feet movements, stepping

Forceful/muscular exertions: Lifting of mesh 3 bolts. Pushing of cable bolts into hole, carrying of consumables

Repetition and duration operation of valve bank handles, daily replacement of drill steel replacement, chemical installation

Tools or equipment used: 4 roof bolters, 2 rib bolters, mesh carrier, consumables - chemical - Bolts - steel - bolts - tensioner - wrench - extension - dolly - plates - mesh -

Work/task organisation and environment: wet, noisy, dusty, restricted space, poor visibility, heavy strata conditions

poor ribs, falling roof, fall of stone, gas

12 hr shifts

Workplace Health and Safety Queensland, Department of Justice and Attorney-General
PErforM Worksheet 1 and Worksheet 2
PN10865 Version 2 Last updated April 2011

Worksheet 2—Risk factor assessment

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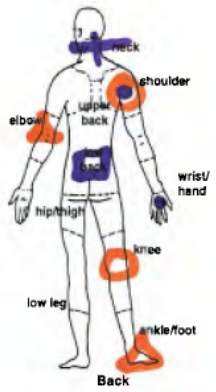

Risk controls

Design control options:

(eliminate, substitute, engineer) Lobster cable installer; dedicated consumable storage crew; hydraulic tensioner lifting gear; North South rig orientation

Administrative control options:

Job rotation (procedures, training package) Reduction of bolters, (increase operating levels)

Worksheet 1—PErforM Risk Assessment Tool

PErforM - Participative Ergonomics for Manual Tasks

Manual tasks risk assessment form

Date and Workplace

Date: 23-3-16 Workplace: Clarence

Risk assessors

Work unit/team: Joy / Centennial

Positions:

Names: Grant Sullivan, Daniel Chan, James Streeter, Andrew Thomas

Task description

Name of task: Mesh Handling

Why was this task selected: Awkward, shoulder, neck injuries.

Location where task occurs: Underground Dev roadways.

Who performs the task: Bolter Operators

General description: Transfer mesh from rear of machine to the top of the TRS.

Postures: Hands above head

Forceful/muscular exertions: Shoulders, back muscles, neck, arms.

Repetition and duration: 7 minute cycle - 30 seconds. 7 cycles per hour.

Tools or equipment used: hands PPE

Work/task organisation and environment: Underground, wet, coal spillage. Uneven floor

Worksheet 2—Risk factor assessment

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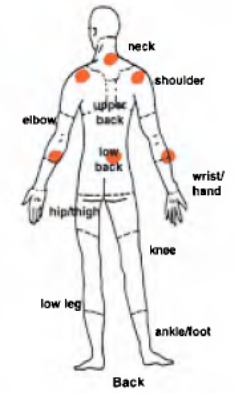

Risk controls

Design control options:

(eliminate, substitute, engineer) Engineer a solution
Have a rack mounted at the front of the roofbolter. The rack can have a hydraulic cylinder to raise it to the horizontal position, operators can use a hook to slide off and place ontop of ATRS.

Administrative control options:

Worksheet 1—PErforM Risk Assessment Tool

PErforM - Participative Ergonomics for Manual Tasks

Manual tasks risk assessment form

Date and Workplace

Date: 23-3-16 Workplace: METRO

Risk assessors

Work unit/team: WALLY, GORDON, PAUL, SHANE, CRAIG

Positions: IME, CHECKY, GEO, OPERATOR

Names:

Task description

Name of task: GETTING MEGABOLT FROM POD → JOB

Why was this task selected: KNOWN SAFETY ISSUE

Location where task occurs: OUTBYE, SECONDARY SUPPORT

Who performs the task: CONTRACTORS x2 OPS

General description: UNLOADING, DRAGGING & INSERTING MEGABOLTS AS PER SUPPORT PLAN

Postures: AWKWARD LIFTING, TWISTING, EXERTION

Forceful/muscular exertions: DRAGGING MEGABOLT & PUSHING INTO HOLE

Repetition and duration: 20 TIMES PER SHIFT

Tools or equipment used: ELECTRIC, HYDRAULIC DRILL RIG

Work/task organisation and environment: UNEVEN GROUND, WET MUDDY ROADWAY

Worksheet 2—Risk factor assessment

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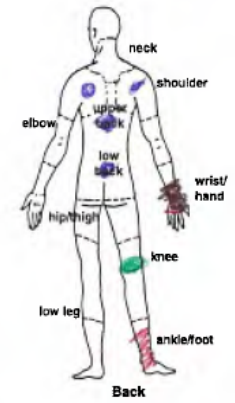

Risk controls

Design control options:

(eliminate, substitute, engineer) LOBSTER CABLE BOLT PUSHER, HOUSEKEEPING

Administrative control options:

ROTATE EXERSION LEFT -> RIGHT, FRONT -> BACK BETWEEN OPS

Worksheet 1—PErforM Risk Assessment Tool

PErforM - Participative Ergonomics for Manual Tasks

Manual tasks risk assessment form

Date and Workplace

Date: 23/3/16 Workplace: UNDERGROUND

Risk assessors

Work unit/team: DEVELOPMENT

Positions:

Names: DARREN, JOE, ROY, DANNY, JAMES, MATT

Task description

Name of task: INSTALLING 8M CABLE BOLT (PRIMARY SUPPORT)

Why was this task selected: PRIMARY ROOF SUPPORT AS PER TARP

Location where task occurs: ALL GATE ROADS

Who performs the task: OPERATORS

General description: INSTALL 8M SUMO BOLT EVERY 2M (2x2 PATTERN). MANUAL HANDLING REQUIRED TO INSTALL BOLT IN TO HOLE

Postures: POOR. LIMITED ROOM TO MOVE. BENT OVER & TWIST TO LIFT ABOVE HEAD.

Forceful/muscular exertions: YES, APPROX 24 kg FOR A 8M CABLE. NEED TO PUSH INTO HOLE ABOVE HIS HEAD

Repetition and duration: APROX 2 PER HOUR

Tools or equipment used: ALL MANUAL HANDLING TO PUSH INTO HOLE

Work/task organisation and environment: DEVELOPMENT PANEL ROADWAY. CABLE BOLT INSTALLATION OFF SANDVIK MB650 MINER.

HOT & HUMID WORKPLACE.
12 HR SHIFTS.
WET ENVIRONMENT

Worksheet 2—Risk factor assessment

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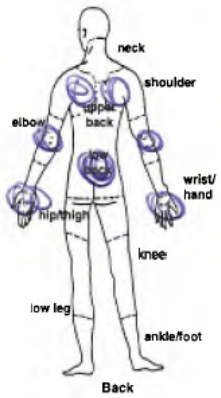

Risk controls

Design control options:

(eliminate, substitute, engineer)

SHORT TERM – ~~2 PERSON JOB, JOB ROTATION~~
CABLE HANDLER OPTIONS (LOBSTER), CHANGES TO CABLE BOLT MATERIALS & PATTERNS
LONG TERM – AUTOMATED BOLTING CYCLE / MACHINES.
BETTER DESIGN OF PLATFORM

Administrative control options:

2 PERSON JOB, JOB ROTATION
REVIEW STRATA TARPS

Worksheet 1—PErforM Risk Assessment Tool

PErforM - Participative Ergonomics for Manual Tasks

Manual tasks risk assessment form

Date and Workplace

Date: 23/3/16 Workplace: DEV PANEL

Risk assessors

Work unit/team: AL, GEOF, PROFESSOR, EDDY, PETER + BILL CREW.

Positions: OPERATORS.

Names: A TEAM.

Task description

Name of task: CUT + BOLT.

Why was this task selected: HIGH FREQUENCY OF INCIDENT.

Location where task occurs: FACE

Who performs the task: ALL ROTATION.

General description: CUT OUT + BOLT ROOF + RIBS.

Postures: BENDING, MANUAL HANDLING, EXERTION - STRETCHING, REPETITION, VIBRATION + DURATION.

Forceful/muscular exertions: INSERTION OF BOLTS. - TWISTING / BENDING.

Repetition and duration: VERY REPETITIVE - 6 REPETITIONS / HR

Tools or equipment used: HYDRAULIC RIGS., DRILL STEELS BOLTS, MECH CHEMICAL.

Work/task organisation and environment: SWP's. - BOLTING, TRAINING, SUPERVISION, PPE - HOT, HUMID, VARIABLE ROOF + RIB CONDITIONS.

Worksheet 2—Risk factor assessment

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Body part

Risk controls

Design control options:

(eliminate, substitute, engineer)

ST - CONTROL - FREQUENT JOB ROTATION.
ST - TRAINING + AWARENESS REFRESHER.
- POSITION OF OPERATING CONTROL.
LT. - AUTOMATION
- ~~SELF DRILLING BOLTS~~. - ASSESS ~~THE~~ + IMPLEMENT CONTROL FOR SELF DRILLING BOLTS

Administrative control options:

STANDARDS.
PROPER MAINT + QUALITY EQUIPMENT CONTROL.
REVIEW + IMPROVE SWP's.

Workplace Health and Safety Queensland, Department of Justice and Attorney-General
PErforM Worksheet 1 and Worksheet 2
PN10865 Version 2 Last updated April 2011

Worksheet 1—PErforM Risk Assessment Tool

PErforM - Participative Ergonomics for Manual Tasks

Manual tasks risk assessment form

Date and Workplace

Date: 23/3/16. Workplace: TAHMOOR

Risk assessors

Work unit/team: J.VANHEERDEN, J.COUGHARD, G.FOODEY, D.PRIEST, C.DOTHER, C.DAVIES

Positions: ENGINEERS, OPERATIONS

Names:

Task description

Name of task: PUTTING DRILL/STEEL IN DRILL POT.

Why was this task selected: THIS IS A SIGNIFICANT & REPETITIVE PART OF THE BOLTING CYCLE.

Location where task occurs: PRODUCTION FACE

Who performs the task: OPERATOR\TRADES, TRAINED AND AUTHORISED.

General description: JOY CM12CM20, NORTH-SOUTH FACING RIGS HPX210. BOLTIN POD POSITIONED 1-2M BEHIND BOLTING STATION, NO PLATFORMS, NO TRS, NO RIB

Postures: ~~AWKWARD POSTURING~~. AWKWARD GETTING BOLT/ STEEL OUT OF POD

Forceful/muscular exertions: REACHING BACK TO GRAB STEEL OUT OF POD, HEAVY, OVER REACHING, TWISTING,

Repetition and duration: YES, REPETITIVE 6X PER M, 10M PER SHIFT.

Tools or equipment used: N/A TO LIFT & MOVE STEEL.

Work/task organisation and environment: DARK, DUSTY, HOT, 9-12hr shift lengths

Worksheet 2—Risk factor assessment

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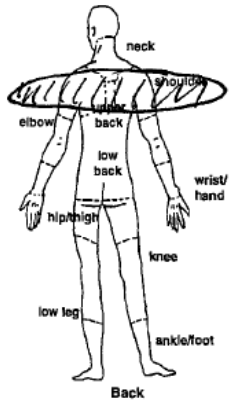

Risk controls

Design control options:

(eliminate, substitute, engineer)

ELIMINATE : AUTOMATION (2)

SUBSTITUTE : WITH SELF DRILLING BOLTS (1)

ENGINEER: RE-POSITION STEEL POD (1).

: LIGHTEN DRILL STEEL. (2)

Administrative control options:

→ PROCEDURE: WALK BACK TO POD RATHER THAN REACH POD (1)

Workplace Health and Safety Queensland, Department of Justice and Attorney-General
PErforM Worksheet 1 and Worksheet 2
PN10865 Version 2 Last updated April 2011

SHORT TERM: (1)

LONG TERM: (2)

Worksheet 1—PErforM Risk Assessment Tool

PErforM - Participative Ergonomics for Manual Tasks

Manual tasks risk assessment form

Date and Workplace

Date: 23/3/16 Workplace:

Risk assessors

Work unit/team:

Positions:

Names:

Task description

Name of task: DRILL ROOF HOLE W/ ROOFBOLTER

Why was this task selected:
HIGHEST RISK OF PERSONAL INJURY

Location where task occurs: DEV PANEL.

Who performs the task:
OPERATORS

General description: • OBTAIN DRILL STEEL FROM POD.
• INSERT DRILL STEEL, DRILL HOLE TO DEPTH, REMOVE DRILL STEEL.

Postures: REACHING, TWISTING, PULLING & PUSHING.

Forceful/muscular exertions: PUSHING & PULLING STEEL IN TO DRILL MOTOR.

Repetition and duration: 20MIN PER HR. OVER 6HR PERIOD.
REPETITION 1 EVERY 60-70 SEC.

Tools or equipment used: DRILL STEELS, RMD DRILL RIG.

Work/task organisation and environment:
WET, SLIPPERY, DARK, CONFINED.

Worksheet 2—Risk factor assessment

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Body part

Risk controls

Design control options:

(eliminate, substitute, engineer) REPOSITIONING STEELS, REVIEW ACCESS TO DRILL MOTORS.

SHORT TERM: SUBSTITUTE W/ SDRB TO REDUCE MOVEMENTS BY 50 %

LONG TERM: AUTOMATION.

Administrative control options: