



General Risk Factor Solutions Manual

**(Environmental Conditions
and Work Organisation)**



Table of Contents

Introduction	3
Risk Control Key	4
Environmental Conditions	5
Heat Exposure	5
Cold Exposure.....	7
Lighting.....	9
Noise	10
Vibration – General.....	11
Vibration – Whole Body.....	12
Vibration – Hand-Transmitted.....	14
Work Organisation.....	15
Work-Recovery Cycles.....	15
Task Variability	16
Work Rate	18

Introduction

For any job, environmental conditions and work organisation issues may directly or indirectly influence the risk of injury to the body, often affecting more than one body part at a time. Many of the solutions, which address these issues, can be effective or applicable in several work environments.

The purpose of the General Risk Factor Solutions Manual is to provide general, preventative information on solutions to address the impact of environmental conditions and work organisation in the workplace. This manual provides additional solutions to supplement those reported in the Work Manuals.

Risk Control Key

Risk control measures (solutions) are commonly grouped into four categories:

E

ENGINEERING CONTROLS

These include physical changes to workstations, equipment, materials, production facilities, or any other relevant aspect of the work environment, that reduce or prevent exposure to risk factors.

A

ADMINISTRATIVE CONTROLS

These include any change in procedure that significantly limits daily exposure to risk factors, by control or manipulation of the work schedule or manner in which work is performed. Administrative controls include, but are not limited to, job rotation, rest breaks, alternative tasks, job enlargement, redesign of work methods, and adjustment of work pace or output. Some models of risk control include work practice controls within this category.

WP

WORK PRACTICE CONTROLS

These include techniques used to perform the tasks of a job, such as reaching, gripping, using tools and equipment, or discarding objects, etc. Education and training are an integral part of work practice controls.

PPE

PERSONAL PROTECTIVE EQUIPMENT

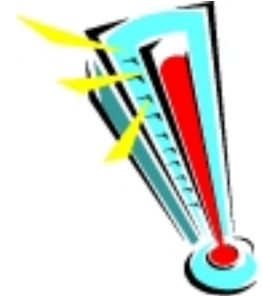
These are devices worn by a worker to reduce the risk of injury, including gloves, knee pads, hearing protection, and leather aprons.

On the following pages, the icons next to the solution options indicate the type of risk control.

Environmental Conditions

HEAT EXPOSURE

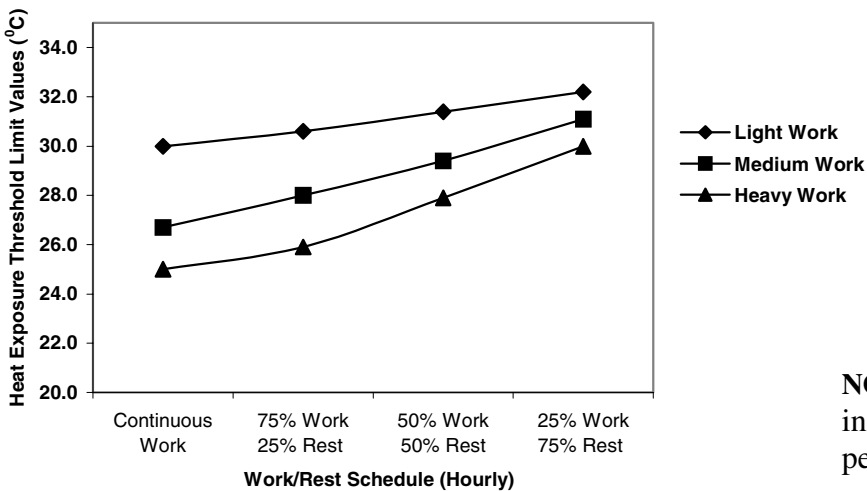
High temperatures can increase the risk for potential injuries and other medical conditions such as heat exhaustion and heat stroke (National Safety Council, 1988). For temperature exposure of high level and/or prolonged duration, a formal heat stress policy incorporating advanced engineering solutions is required. For more information on Heat Stress refer to the WCB Regulations (Sections 7.50 to 7.62).



Possible solutions:

Work rest cycles

A Implement acceptable work rest cycles as shown in the graph to the right.



NOTE: As the temperature increases the number of rest periods should also increase.

Reference - ACGIH 1996 TLV Handbook

Slow rate of work

A In high temperatures, reduce the load by slowing down the rate of work.

More informal breaks

A In high temperatures, reduce the load by increasing the number of informal work breaks.

Provide water

A Provide water close to the work area or allow for quick breaks to get a drink of water. Another alternative on really hot days is to supply the worker with an electrolyte-enriched drink.

Cool break area

A Provide water close to the work area or allow for quick breaks to get a drink of water. Another alternative on really hot days is to supply the worker with an electrolyte-enriched drink.

Shade shelters

E Create shelters that provide shade thus protecting workers from radiant heat exposure.

Air circulation/conditioning

E Provide cool air circulation to increase air motion and convective heat loss (Note: fans will blow the dust around).

COLD EXPOSURE

A decrease in temperature can contribute to potential injuries due to a loss of dexterity and touch sensitivity (Morris Fraser, 1989). For more information on Cold Stress refer to the WCB Regulations (Sections 7.63 to 7.75). Please note that protecting for cold exposure may not fully eliminate a worker's risk for MSIs, due to the physiological tissue effects of cold temperatures.



Possible solutions:

Heated shelter

A Provide a heated shelter for workers to take breaks and lunch.

Work rate

A Allow workers to maintain a work rate that will not cause excessive sweating.

Heated change room

A Provide a heated change room for workers.

Spot heaters

E Provide general or spot heaters at the workstation to warm the worker while working.

Shield work area

E Shield the work area if it is exposed to high air velocity.

Well fitting, insulated gloves

WP
PPE Use gloves that fit well and are insulated (avoid liners because of bulk) to keep hands warm. If gloves are too large then more grip force is needed. If gloves are too small they can reduce the circulation in the hands decreasing the sensitivity of the hands. Consult with workers on the appropriateness of gloves for specific work environments.

Dry gloves

WP PPE	If gloves tend to get wet, assure that dry gloves are available, and workers change them when appropriate.
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Education on protective clothing

WP PPE	Educate the workers on proper protective clothing and the insulation value of certain material types (e.g., cotton vs. acrylic).
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LIGHTING

Potential distraction or injury due to lighting level and glare.



Possible solution:

Appropriate lighting levels

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 The appropriate lighting level depends upon the visual demands of the tasks being performed at each workstation. For guidance on appropriate lighting levels for different tasks see Table 4-1 in Section 4.65 of the WCB Regulations. For more information on Illumination refer to the WCB Regulations (Sections 4.64 to 4.69).

Location of lighting source

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 Make sure that none of the lighting sources shine into the eyes of the workers (reduce glare).

More lights

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 In work areas provide more lights, each of a lower power, than a few high-powered lights. Workers should be encouraged to use this system of lighting rather than a single high-powered light source.

Position lights

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 Position lights to decrease shadowing and glare at the workstation.

NOISE

Potential hearing loss and other effects of high noise level (e.g., annoyance and decreased productivity) can contribute to MSIs. For more information on Noise in the workplace refer to the WCB Regulations (Section 7.1 to 7.23). Pay particular attention to Sections 7.2, 7.13, 7.14, and 7.15.

Possible solution:

Hearing protection

WP PPE	Wear hearing protection. Workers should be made aware of the appropriateness of specific types of hearing protection (e.g., foam inserts, muffs) in specific noise environments.
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Maintain equipment and machinery

A	Decrease the noise by maintaining the equipment and machinery.
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Contain noise source/isolate worker

E	Noise can be decreased by containment of the noise source or by isolating the worker from the noise source.
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Quiet breaks

A WP	Take breaks and lunch in a quieter environment than the work area. Workers should be educated on the benefits of leaving a noisy environment whenever possible.
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VIBRATION – GENERAL

The human body can experience vibration in two main forms. One form is whole body vibration, or vibration which is experienced throughout the body. Whole body vibration is usually transmitted to the body through the feet (being in contact with a vibrating surface, such as a catwalk) or through the buttocks (being in contact with a vibrating seat, such as the seat of a forklift). The second form of vibration experienced by humans is through localised contact with a vibrating object. This is commonly called hand-transmitted vibration and affects the fingers and hands (commonly caused by contact with vibrating tools such as a chainsaw or vibrating controls). Localised vibration could also affect the feet in certain circumstances.

Quantifying the risk associated with exposure to vibration requires that vibration be both measured and analysed according to accepted standards (e.g., ISO). This is a task that was not undertaken by this project as vibration levels may vary significantly in different work environments. However, there are certain circumstances where exposure to vibration has been well documented in scientific literature as a risk factor for musculoskeletal injuries. These circumstances include whole body vibration experienced through the operation of heavy machinery (e.g., forklift) and hand-transmitted vibration experienced through the use of power tools.

If your mill has specific concerns with regards to vibration exposure we recommend that a professional assessment of vibration levels be sought.

VIBRATION – WHOLE BODY

Whole body vibration is associated with general discomfort, symptoms of motion sickness (sweating, nausea, and vomiting), decreased performance on simple hand activities (such as operating controls, writing, etc.), degraded vision or hearing, chest pain, and premature degeneration of the lower spine and low back pain.



Eliminating/Reducing Exposure:

Through the Seat (e.g., seat of a fork-lift)

Damping seats

E	Ensure that heavy equipment has vibration isolating (or damping) seats and that the operators are educated on how to adjust such seats. Vibration isolating seats can aid in reducing the amount of vibration that is transmitted to the operator.
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WP	

Neutral postures

WP	Maintain neutral postures while working in a vibrating vehicle – avoid twisting, bending, and slouching of the torso. This can help to decrease the transmission of the vibration through the body and decrease the risk of compounding vibration with awkward and possibly forceful postures.
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Maintenance of machines and yard

A	Ensure that vehicles are properly maintained and that yards are kept in good repair. Properly maintained vehicles operating on smooth earth can significantly reduce the amount of vibration experienced by the operator.
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Avoid excessive speed

WP	Instruct vehicle operators to avoid excessive speed as much as possible and to avoid driving unnecessarily over rough terrain. Excessive speed and rough terrain can increase the severity of vibration experienced by the operator.
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Through the Feet (e.g., vibrating catwalks)

Isolate vibration

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 Isolate vibrating machinery from workers by grounding platforms where workers operate, and ensure that there is no contact between the vibrating machinery and commonly used platforms.

Neutral postures

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 Maintain neutral postures while working in a vibrating environment to decrease the transmission of the vibration through the body and the risk of compounding vibration with awkward and possibly forceful postures.

Maintenance of machinery

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 Ensure vibrating machinery is properly maintained. This can help to minimise the severity of the vibration.

VIBRATION – HAND-TRANSMITTED

Exposure to hand-transmitted vibration can lead to ‘Vibration White Finger’, bone and joint disorders of the hand, wrist, elbow, or shoulder, and may lead to an earlier onset of certain MSIs.



Eliminating/Reducing Exposure:

Tool design

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 Ensure that tool design minimises the transmission of vibration to the operator, does not require awkward or forceful postures to operate, and does not blow cold exhaust air over the operator’s hand/arm. Addressing these design issues will decrease the likelihood of MSI.

Anti-vibration gloves/wraps

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| PPE |

 Anti-vibration gloves or handle wraps can be provided to workers in order to decrease the transmission of vibration to the hand. Gloves may be more appropriate if a variety of vibrating tools/controls are used, while wraps may be considered if there are a small number of vibrating tools/controls which are used often.

Tool maintenance

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 Ensure that tools are maintained – tools in need of repair can often increase the amount of vibration that is transmitted to the operator’s hand/arm.

Work schedules

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 Work schedules should allow for breaks from exposure to tools that create hand-transmitted vibration.

Worker education

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 Operators of vibrating tools/equipment should be trained on their appropriate use and how they can minimise their exposure to hand-transmitted vibration. Proper work techniques, such as minimising the grip force and push force used to operate the tool/equipment, should be encouraged in order to decrease the exposure of the worker to hand-transmitted vibration, as well as other risk factors. Balancing or supporting tools may aid with proper work techniques.

Work Organisation

Reducing the risk of musculoskeletal injury through job rotation, task rotation, rest periods, and changes in work practices. Proper use of these methods will reduce the exposure to risk factors.

WORK-RECOVERY CYCLES

Rest Breaks

Informal rest breaks throughout the shift can give a physical and mental break to workers. Rest pauses are essential; not only during manual work but also during work that taxes the mind. The need for rest breaks can be influenced greatly by certain environmental conditions, worker characteristics, and the nature of the task.

Relief personnel

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Rest breaks are often provided by having relief personnel available to cover for workers (e.g., a utility man). Relief personnel can be of great value in areas where heavy manual work is consistently required, and workers are at risk of fatiguing quite quickly.

General considerations:

- Rest breaks are of particular importance in jobs that may involve exposure to very hot or very cold climatic conditions. For example, more rest breaks are needed for workers performing heavy physical jobs in a hot climate, in order to prevent heat stress and undue fatigue. Or, for workers exposed to extremely cold climates, more rest breaks can allow the worker to warm-up and regain some of the sensitivity that is temporarily lost during exposure to cold. In these jobs, the scheduling or availability of rest breaks may need to be reviewed on a seasonal basis.
- Rest breaks can be of great importance during times of high production. Having extra workers available during these times can help to decrease the physical demands placed on any one worker, and allow workers to break from these physical demands for short periods of time.
- Rest breaks are often thought of as coffee breaks, lunch breaks, or smoke breaks. However, effective rest breaks do not always mean the worker is not working. Rest breaks may allow a worker in a physically demanding job to break from this work by performing a mental task for a period of time. The use of rest breaks in this manner is similar to job rotation or task rotation.

TASK VARIABILITY

Job Rotation

Rotating working time between jobs which expose workers to different risk factors can aid in reducing the duration workers are exposed to any one risk factor. In addition, the interest levels of the workers can be increased.

In order to implement a successful job rotation scheme, the following factors need to be considered:

Jobs involved in rotation

A The jobs which workers rotate through must have different physical demands. When suitable jobs are being sought, the physical demands associated with certain jobs can be determined by reviewing the Physical Demands Analysis (PDAs), MSI Safety Guides, and Work Manuals.

Informal job rotation

A There have been many reports of informal job rotations in mills. Workers rotate between jobs, which they are qualified to perform in order to introduce variety into their working day. If informal job rotation is in place in your mill it should be encouraged. Be sure to refer to the PDAs, MSI Safety Guides and Work Manuals to check that physical demands vary between the jobs.

Education

A Ensure that workers are informed of the reasoning behind job rotation, and are encouraged to participate in job rotation. Education is an important factor in reducing the resistance to change.

Rotation timing

A To prevent loss of productivity, job rotation after formal breaks is suggested (at least every 2 hours).

Participation and planning

A Successful job rotation requires the support of management, the union (if applicable), and the workers. Discussions and planning for job rotation should include all parties.

Task Rotation

Task rotation refers to rotating through different tasks associated with a job in order to vary the physical demands. Not only is task variation good for productivity, it also helps keep the workers mentally stimulated.

Task rotation as a means of reducing ergonomic risk requires:

Task evaluation

A WP	An evaluation of each job (in terms of the required tasks) should be performed to determine whether task rotation is possible within that particular job. For example, if clean-up work, maintenance, or other tasks must be performed daily as part of a job, a work schedule can be designed so that these tasks are performed at regularly scheduled intervals throughout the shift. This scheduling will allow the worker to regularly perform different physical demands than those associated with their main tasks.
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Meaningful task rotation

A WP	The tasks which workers rotate through must have different physical demands. The physical demands associated with certain tasks can be determined through reviewing the Physical Demands Analyses (PDAs) and Work Manuals for each particular job.
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Enlarging responsibilities

A WP	Enlarging the responsibilities of jobs, where there is little variation in the tasks performed, can aid in implementing task rotation. Job enlargement could include a re-distribution of clean-up or maintenance tasks among a number of jobs in order to ensure that all jobs have tasks that vary in demands. This also allows workers to rotate tasks with differing demands.
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WORK RATE

Work Pace

Maintaining a work pace, which is relatively steady and manageable by the workers, can decrease the risks associated with sudden bursts in workflow.

Steady workflow

A Maintaining a steady workflow can be achieved by planning for relief personnel during high production times.

Plan for busy times

A If work pace is known to fluctuate throughout a shift, planning for busy times is a necessity. Busy times should be avoided at the beginning and end of shifts when workers are not “warmed up” or when they are fatigued from the day’s work. Thus, busy periods should take place in the middle of the shift whenever possible.

Scheduling

For workers involved in lumber handling, scheduling of the sizes and types of lumber to be handled over a shift can aid in reducing the risk of injury.

Dealing with heavy runs:

A If “heavy runs” are scheduled, provide a longer time span in between these runs so that the workers will have more time to physically recover.

A Avoid scheduling heavy runs first thing in the shift to allow the muscles to warm-up. Gradually working up to a faster pace allows an increased blood flow to the area which in turn decreases the chance of muscle and joint injury (Heyward, 1991).

A In an ideal world “heavy runs” should be avoided after the shift is 80% complete.