	<b>SA-S-304-01-04 Ergonomics assessment process</b>			
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## Ergonomics assessment process

A standardized method for assessing ergonomic risks should be established, including appropriate ergonomic risk assessment tools and user training. This process should be used for both office and non-office environments. The Ergonomics template (Annex 1) should be used for recording results during assessment steps.

### 1. Defining team

A cross-functional team that is trained and qualified to perform ergonomic risk assessments. The team should include a representation of users/operators, production, quality, maintenance, and HSE professionals. Competent ergonomics specialists should be used according to the identified risk level.

### 2. Identifying jobs

Identify the area where ergonomic assessment is required by the data gathered from:

- Employee complaints/ requests. (employees' feedback can be most helpful in identifying high risk jobs).
- HSE incident and hazard records.
- Jobs or tasks that have a history of MSD incidents in both frequency and severity should be made a priority.
- Findings of workplace observations, paying more attention to any modifications made to chairs, tools, and other workplace items.

It is recommended to use the Musculoskeletal questionnaire (Annex 2)

### 3. Collecting workstation data

The procedures for collecting information for ergonomics workstation data can include the following:

- Observing the workers performing the tasks in order to provide time-activity analysis and job or task cycle data, videotaping the workers is typically done for this purpose.
- Still photos of work postures, workstation layouts, tools, etc.
- Workstation measurements (e.g., work surface heights, reach distances)
- Measuring tool handle sizes, weighing tools and parts, and measuring tool vibration and part dimensions

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- Determining characteristics of work surfaces such as slip resistance, hardness, and surface edges
- Measuring exposures to heat, cold, and whole-body vibration
- Biomechanical calculations (e.g., muscle force required to accomplish a task, or the pressure put on a spinal disc based on the weight of a load lifted, pulled, or pushed)
- Special questionnaires, interviews, and subjective rating procedures to determine the amount of perceived exertion and the psychological factors influencing work performance
- Ensure there are adequate resources and time allotted to perform assessments.
- Instruments such as light meters, sound level meters, infrared thermometers, force gauges, and goniometers may be needed.
- During the assessment, it is advised that the assessor verify that the selected job is being performed at its typical capacity or rate, and representative of its normal operation.

#### 4. Identifying risk factors

The first step in controlling an identified risk that is associated with complaints, accidents or injuries is to ask the below questions:

- Where do workers do these jobs?
- How often do injuries or losses occur?
- How severe are the injuries or losses?
- Are there reports of malfunctioning?

Health records, medical examinations and symptom surveys can specify the nature and extent of musculoskeletal problems in the workforce. Even without clear medical evidence, screening for musculoskeletal risk factors can offer a basis for early interventions. Below are the most common ergonomic risk factors:

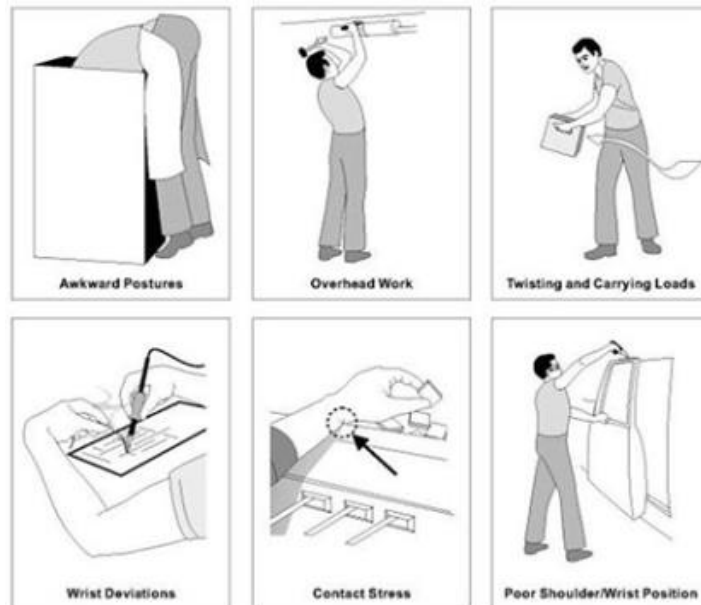
- **Awkward postures**

Body postures determine which joints and muscles are used in an activity and the amount of force or stress that is generated or tolerated. For example, more stress is placed on the spinal discs when lifting, lowering, or handling objects with the back bent or twisted, compared with when the back is straight.

Manipulative or other tasks requiring repeated or sustained bending or twisting of the wrists, knees, hips, or shoulders also impose increased stresses on these joints. Activities requiring frequent or prolonged work over shoulder height can be particularly stressful.

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Source: Elements of Ergonomics Programs, A Primer based on Workplace Evaluations of Musculoskeletal Disorders

### • **Forceful exertions (including lifting, pushing, and pulling)**

Tasks that require forceful exertions place higher loads on the muscles, tendons, ligaments, and joints. Increasing force means increasing body demands such as greater muscle exertion along with other physiological changes necessary to sustain an increased effort. Prolonged or recurrent experiences of this type can give rise to not only feelings of fatigue but may also lead to musculoskeletal problems when there is inadequate time for rest or recovery. Force requirements may increase with:

- increased weight of a load handled or lifted,
- increased bulkiness of the load handled or lifted,
- use of an awkward posture,
- the speeding up of movements, increased slipperiness of the objects handled (requiring increased grip force),
- the presence of vibration (e.g., localized vibration from power hand tools leads to the use of an increased grip force),
- use of the index finger and thumb to forcefully grip an object (i.e., a pinch grip compared with gripping the object with your whole hand), and
- use of small or narrow tool handles that lessen grip capacity.

### • **Repetitive motions**

If motions are repeated frequently (e.g., every few seconds) and for prolonged periods such as an 8-hour shift, fatigue and muscle-tendon strain can accumulate. Tendons and muscles can often recover from the effects of stretching or forceful exertions if sufficient time is allotted between exertions. Effects of repetitive motions from

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performing the same work activities are increased when awkward postures and forceful exertions are involved. Repetitive actions as a risk factor can also depend on the body area and the specific act being performed.

**High Risk Repetition Rates by Different Body Parts**

From Kilbom Å [1994]. Repetitive work of the upper extremity; Part II: The scientific basis for the guide. Int J Ind Erg 14:59–86.

Body Part	Repetitions Per Minute
Shoulder	More than 2½
Upper Arm/Elbow	More than 10
Forearm/Wrist	More than 10
Finger	More than 200

- **Contact stresses**

Repeated or continuous contact with hard or sharp objects such as non-rounded desk edges or unpadded, narrow tool handles may create pressure over one area of the body (e.g., the forearm or sides of the fingers) that can inhibit nerve function and blood flow. There are many soft tissues in the palm of your hand that are easily damaged when using the palm as a hammer, such as in this example putting hubcaps back on. Also, repetitively using your knee as a hammer, such as this carpet layer is doing to stretch the carpet using a knee kicker, can damage many of the same soft tissues that kneeling damages.

- **Vibration**

Exposure to local vibration occurs when a specific part of the body comes in contact with a vibrating object, such as a power hand tool. Exposure to whole-body vibration can occur while standing or sitting in vibrating environments or objects, such as when operating heavy-duty vehicles or large machinery.

- **Combination of risk factors**

There are many soft tissues in the palm of your hand that are easily damaged when using the palm as a hammer, such as in this example putting hubcaps back on. Also, repetitively using your knee as a hammer, such as this carpet layer is doing to stretch the carpet using a knee kicker, can damage many of the same soft tissues that kneeling damages.

- **Other conditions**

Workplace conditions that can influence the presence and magnitude of the risk factors for MSDs can include:

- cold temperatures,
- insufficient pauses and rest breaks for recovery,
- machine paced work, and

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- unfamiliar or unaccustomed work.

In addition to the above conditions, other aspects of the organization of work may not only contribute to physical stress but **psychological stress** as well. Screening jobs for these risk factors may involve the following:

- Walk-through observational surveys of the work facilities to detect obvious risk factors
- Interviews with workers and supervisors to obtain the above information and other data not apparent in walk-through observations, such as time and workload pressures, length of rest breaks, etc.
- Use of checklists for scoring job features against a list of risk factors

## 5. Risk assessment

### a) Perform risk assessment

Once a risk factor has been identified, a risk assessment must be conducted considering:

- **Duration** - refers to the amount of time a person is continually exposed to a risk factor. Job tasks that require the use of the same muscles or motions for long durations increase the likelihood of both localized and general fatigue. In general, the longer the period of continuous work (e.g., tasks requiring sustained muscle contraction), the longer the recovery or rest time required
- **Frequency** – is the risk common? How many people might be exposed to it? How many people might be affected if exposed?
- **Intensity** -Intensity refers to: the weight in pounds/ kilos of items lifted or carried, grip or pinch force of lifted or manipulated items and vibration level (meters/seconds) force on keys when typing. The nature of the injuries and losses associated with the risk, cost of injuries/incidents or damage associated with the potential risk should also be considered.
- **Combination of risk factors** - Exposure to more than one risk factor at a time greatly increases the risk of injury, e.g. bending and twisting while lifting, repetitive, forceful use of the hands with the wrists bent.
- **Work and individual factors** - which might contribute to the risk, e.g. the nature of the task, the load, the work environment, work organization, training, and individual capability.

### b) Ergonomics assessment tools

Assessing exposure to risk factors for MSDs is an essential stage in the management and prevention of MSDs. Jobs associated with:

- the task is not within the filter values,
- a musculoskeletal disorder is reported,
- a high/very high risk is identified in the ABRA.

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Cases of musculoskeletal problems deserve the highest consideration in follow up efforts to identify risk factors and implement control actions. Jobs associated with worker complaints of fatigue and discomfort should be ranked next in deciding the need for follow up job analysis and possible interventions.

Where screening efforts suggest the presence of significant risk factors for musculoskeletal disorders, more detailed job analyses should be done to assess the problem potential. Ratings of high or extreme levels of risk factors, especially occurring in combination, may indicate a need for control actions. While appearing last in the priority order, taking steps to reduce apparent risk factors for musculoskeletal disorders is a preventative approach.

**There are appropriate tools for each Ergonomic study.**

- Qualitative Tools - Qualitative tools are most commonly used and are good for screening jobs, however, the findings are not conclusive.
- Semi-quantitative Tools - Semi-quantitative tools generally require more expertise in their application. Typically, semi-quantitative tools are targeted for specific applications and risk factors such as lifting, handwork, or body region.
- Quantitative Tools - A third group of tools is called quantitative assessment tools which are typically used to perform more in-depth analysis. As a result, quantitative tools require a higher degree of user training, knowledge and skill.

**Recommended ergonomics assessment tools:**

- Strain index Moore & Garg for tasks involving elbow, forearm, wrist, and hand. Recommend using in the administrative tasks evolving an intense use of keyboard and mouse. (semi-quantitative)
- Rodgers Muscle Fatigue Analysis for non-office areas involving the whole body. Recommend using in the administrative tasks evolving awkward postures of neck, wrists, shoulders and legs. (semi-quantitative) - SA-S-304-01-03 Ergonomic Worksheets, Rodgers Muscle Fatigue sheet.
- NIOSH equation for vertical manual handling tasks (quantitative) - SA-S-304-01-03 Ergonomic Worksheets, NIOSH Lift Equation.

**6. Controlling exposures to risk factors**

After the significant risk factors have been identified, the next activity is to develop control measures for eliminating ergonomic stress or reducing the stress to acceptable levels.

The job analysis procedures described above should then be used to make certain that all ergonomics risks have been ameliorated as intended and that no new risks have been introduced. After the control measures have been fine-tuned and implemented on an operational basis, another job analysis should be performed to assure that the solution is working effectively.

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Finally, the health status of workers should be monitored on an ongoing basis to identify trends in the frequency and nature of injuries and disorders caused by exposure to ergonomics risk factors.

### 6.1. Risk assessment prioritization

Prioritize potentially significant concerns across jobs. Priorities are based upon the categorical rating of ten major body parts in terms of posture, motion and force. Three sub-categories are defined for each rating– Low, Moderate and High. Definitions for each are based primarily on select components of several peer-reviewed, published ergonomics assessment tools.

The results of using the ergonomics risk assessment tool allow the analyst to:

- Prioritize across jobs
- Identify the body parts of most concern
- Identify the worst task(s) for a job so that it can be improved

A dynamometer or simple spring scale, a tape measure, and various straps for pulling tasks are needed for collecting the data necessary for using these tables.

### 6.2. Determine risk controls

- a) Jobs with high-risk scores require immediate corrective measures to reduce the identified risk factors.
- b) The team must use the Hierarchy of Controls concept to select the most effective control measures. This often requires some use of cost/benefit analysis and return of investment calculations to select feasible control measures and help persuade decision makers.

Hierarchy of Controls concept:

1. Elimination (i.e. removal of the hazard/s)
  2. Substitution (e.g. changing methods, products or components)
  3. Engineering controls (e.g. reduction through design)
  4. Administrative controls (e.g. provision of policies and procedures, appropriate training, work breaks, job rotation, warning signs)
  5. Personal protective equipment (PPE) (e.g. safety glasses, hearing protection, safety instructions)
- c) Locations/Sites should develop, preferably through a cross functional team, control strategies to eliminate or reduce identified ergonomic risk factors. Control strategies may include a combination of engineering, work practice and administrative methods. Prior to their implementation, proposed ergonomic risk controls should be reviewed with representative affected employees to obtain additional input and identify potential implementation barriers.

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Implementation of ergonomic controls should be tracked to completion and verified for effectiveness.

- d) New or redesigned workstations, tools and equipment with the potential to introduce ergonomic risk factors, should be evaluated during the design stage.
- e) To assist in the management of the site ergonomic program, as well as demonstrate our efforts to improve, documentation should be maintained of ergonomic improvements. This includes documentation of completed ergonomic projects including tasks evaluated, evaluation results, improvement made, results, and the cost benefit where available.
- f) The ergonomics team should be involved in identifying and developing effective ergonomics solutions.
- g) Identified ergonomic successes and best practices should be communicated (through alerts, websites, email etc.) across locations and sites to increase awareness and enable technology transfer.

### 6.3. Implement corrective actions

#### a) Prioritization

- Should be based on the score derived from the tool used.
- Should be directed at solving the MSD problem faced by the employees.
- First priority should be given to significant scores with MSD problems faced by the employee.
- Second priority to be given to significant score with no MSD problems
- Decide whether a quick fix solution or minor workstation changes or a major change is required.

#### b) Employee involvement

- If the ergonomics issue is behavior based, an awareness session to be arranged for the concerned employees regarding the proper ergonomic postures.
- Discuss with the employee about the kind of intervention that is expected and what is actually troubling the employee.
- If the employee suggests a minor solution and if is acceptable by the supervisor/manager, then it should be implemented.
- If a major change is needed, it should be put to the management for approval.
- Before any changes are initiated, affected workers should be made aware of what will take place, why it is necessary, and when it will take place.
- Any special training needed by workers to use the controls effectively, should be provided prior to the implemented changes.
- Workers should be included in the process of selecting ergonomic interventions to create buy-in and ownership.

### 6.4. Update the workstation assessment

- After an ergonomic intervention a repeat assessment using the same ergonomic tool to be done and employee comments to be documented.
- A repeat the evaluation, to be done after 30 days of intervention.



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### 6.5. Analyze and report indicators

- The indicators provided from the Ergonomics template should be reported using the recommended database by HSE

### 6.6. Documentation and sharing good practice

- For an implementation that is deemed as good practice, a proper report with the highlights of the implementation and ergonomics risk before and after intervention with a photograph. The report should be completed with support from the country's HSE/SA. The report is to be a comprehensive one-page report.
- The interventions to be shared within and also across all locations, wherever a similar kind of work is involved even without MSD complaints the intervention has to be implemented.
- Soft copy data can be maintained in the system as it is learning material, hard copy to maintain for a period of 5 years.
- The implementation of improvement is controlled by 'Ergonomics template'.

## 7.0 Annexes

### Annex 1: Ergonomics template



Ergonomics%20template.xlsx

### Annex 2: Ergonomics Questionnaire



Ergonomics%20Questionnaire.xlsx