Chapter 54: Ergonomics

Quick Start Summary

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URL: http://www-group.slac.stanford.edu/esh/eshmanual/references/ergonomicsQuickstart.pdf

1 Who needs to know about these requirements

The requirements of Ergonomics apply to workers, supervisors, ergonomic specialists, ESH coordinators, and the program manager; and the Occupational Health Center (OHC) and Space Planning and Management.

2 Why

Activities that require work in a restricted space or with awkward or static postures, repetitive motions, pressure points, vibrating tools, or forceful exertions can lead to injuries and reduced worker effectiveness.

3 What do I need to know

Workers and supervisors should be actively screening activities and workplace conditions with potential ergonomic risks and are strongly encouraged to engage their ESH coordinator or contact the program manager and/or OHC for assistance, ranging from informal consultations to formal evaluations.

Workers who use computers for more than two hours a day must complete ESH Course 291, Ergonomics Training - Office Worker (ESH Course 291), either when they arrive at SLAC or when moving to a different office. Formal office ergonomic evaluations (ESH Course 291EV), performed by an ergonomic specialist provided by OHC, are available and are particularly recommended for computer users. Formal evaluations and informal consultations are also performed at non-office locations, such as machine shops and laboratories, and a voluntary industrial ergonomic awareness course (ESH Course 323) is available. Supervisors and workers are expected to implement the recommendations resulting from formal evaluations. Stretching and back safety courses are available to increase awareness and support this program.

4 When

These requirements take effect 20 June 2017.

5 Where do I find more information

SLAC Environment, Safety, and Health Manual (SLAC-I-720-0A29Z-001)
- Chapter 54, “Ergonomics”

Or contact the program manager.
1 Purpose

The purpose of this program is to prevent ergonomic injuries. It covers identifying, evaluating, and mitigating ergonomic risks. These risks stem from activities that require work in a restricted space or with awkward or static postures, repetitive motions, pressure points, vibrating tools, or forceful exertions, all of which can lead to injuries and reduced worker effectiveness. It applies to workers who engage in these activities, their supervisors, ergonomic specialists, ESH coordinators, and the program manager; and the Occupational Health Center (OHC) and Space Planning and Management.

2 Roles and Responsibilities

Functional roles and general responsibilities for each are listed below. More detailed responsibilities and when they apply are provided in the procedures and requirements.

The roles may be performed by one or more individuals and one individual may play more than one role, depending on the structure of the organizations involved. Responsibilities may be delegated.

2.1 Worker

- Works with supervisor to plan work properly to identify risk of ergonomic injury, for example by evaluating activities using the Ergonomics: Industrial Ergonomics Screening Checklist and by comparing lifting activities to established thresholds (see Ergonomics: Ergonomic Evaluation Procedures)
- Takes precautions to prevent injury, including following guidance to reduce ergonomic risks in job safety analyses (JSAs), activity training and authorizations (ATAs), and work procedures
- Promptly reports conditions that may result in ergonomic injuries and any discomfort, pain, or ergonomic concern associated with a particular task to supervisor
- Visits the OHC with any work-related medical concerns
- Contacts the OHC ergonomic specialist directly for guidance or to schedule an office evaluation
- Completes any required training and ergonomic evaluation (see Section 4, “Training”)
- Uses equipment and follows work practices described in training and ergonomic evaluation reports
- Follows any work restrictions established by OHC
- Follows Safe Office Moves guidance and uses tools, if involved in an office move
2.2 Supervisor

- Ensures that work is planned and evaluated to reduce ergonomic risks. Coordination with the ESH coordinator and use of the Ergonomics: Industrial Ergonomics Screening Checklist will facilitate this.
- Assigns ergonomic training as appropriate (see Section 4, “Training”)
- For workers performing routine lifting, must evaluate associated risks, using the threshold limit values (TLVs) as guidance (see Ergonomics: Ergonomic Evaluation Procedures, Table 1)
- Ensures workers observe the TLVs
- If activities are determined to be near a threshold in the TLVs for lifting, documents mitigations in a JSA, ATA, and/or work procedure
- If activities are determined to exceed the thresholds in the TLVs for lifting, and cannot be mitigated, engages the ESH coordinator, who will determine the need for a formal evaluation by an ergonomic specialist. Mitigations must be documented in a JSA, ATA, and/or work procedure
- Reviews ergonomic evaluation reports and ensures prompt implementation of needed worksite corrections/improvements
- Supports needed behavioral or work practice changes of affected workers
- For workers who are injured or experiencing reoccurring discomfort
  - Reports all injuries promptly to OHC
  - Contacts OHC to request an ergonomic evaluation and adds ESH Course 291EV to the worker’s training assessment (STA)
- Assists workers in following work restrictions established by the OHC as a result of any ergonomic injury
- Reviews Safe Office Moves information with workers who will be involved in an office move

2.3 Occupational Health Center

- Provides resources, including ergonomic specialists, and assists with program implementation and assessment
- Assists line management with identifying activities/tasks with ergonomic risks
- Provides ergonomic evaluations/consultations (for both office and non-office tasks) as requested or needed
- Recommends work environment or work practice changes to decrease the risk of injury
- Enters recommendations from evaluations into the Action Tracking System (ATS), when warranted
- Evaluates and assigns/documents work restrictions related to any ergonomic injury/illness
- Follows up after the initial evaluation to determine if recommendations are being implemented and are effective
- Maintains records of ergonomic evaluations and support activities
- Assists with development of and provides ergonomics training
- Provides feedback for updates to the SLAC Furniture Guidelines
Supports injury and illness data analysis and reports trends in ergonomic injury and/or incidence rates

2.4 ESH Coordinator

- Assists in identifying and evaluating activities with ergonomic risk and assists in implementing controls to mitigate those risks. Use of the Ergonomics: Industrial Ergonomics Screening Checklist will help facilitate this.
- Performs and/or assists with non-office ergonomic evaluations and helps determine when support from ergonomic specialists and/or formal evaluations are warranted
- Assists with the investigation of ergonomic and materials handling injuries/illnesses, helps identify and implement corrective actions, and follows up to ensure they are implemented and effective
- Supports the analysis of ergonomic injury and related first aid data and lessons learned

2.5 Program Manager

- Develops, implements, and assesses program
- Maintains this chapter and associated documents
- Identifies, develops, and maintains training and assists with the qualification and authorization of trainers
- Develops and maintains resources and tools related to safe office moves
- Assists in identifying and evaluating activities with ergonomic risk activities and implementing controls to mitigate those risks
- Assists in investigating ergonomic injuries/illnesses, provides feedback on corrective actions, and follows up to ensure corrective actions are implemented and effective
- Provides feedback for updates to the SLAC Furniture Guidelines

2.6 Space Planning and Management

- Engages the ergonomic specialist as needed
- Maintains the SLAC Furniture Guidelines and seeks input from the ergonomics program manager and specialist on content.
- Submits new office and control room furniture plans to the Building Inspection Office for review
- Assists with communication of the Safe Office Moves resources to all involved in moves
- Recommends to worker to schedule ergonomic workstation evaluations, as needed
- When height-adjustable workstations are recommended, assists with selection and coordinates removal and installation

3 Procedures, Processes, and Requirements

These documents list the core requirements for this program and describe how to implement them:
4 Training

Workers who use computers for more than two hours a day must complete the following course (either upon arrival at SLAC or when moving to a different office):

- ESH Course 291, Ergonomics Training - Office Worker (ESH Course 291)

Workers who are experiencing pain or discomfort from their work at a computer workstation should complete the following course:

- ESH Course 291EV, Ergonomic Evaluation - Office Worker (ESH Course 291EV)

Workers who use hoisting and rigging equipment regularly or perform lifting/manual handling tasks (see Ergonomics: Ergonomic Evaluation Procedures) and their supervisors should complete the following course:

- ESH Course 410, Back Safety Training (ESH Course 410)

Workers who perform industrial or laboratory tasks with known or potential ergonomic risk factors and/or work in non-office locations with ergonomic risk factors and their supervisors should complete the following course:

- ESH Course 323, Industrial Ergonomic Awareness (ESH Course 323)

Pre-shift warm-ups and periodic stretching help prevent injury; workers should be encouraged to enroll in the following online courses:

- ESH Course 320, Warm-up and Stretch Training for the Office Environment (ESH Course 320)
- ESH Course 321, Warm-up and Stretch Training for the Non-Office Environment (ESH Course 321)

5 Definitions

*Activity with ergonomic risks.* A work activity that possesses identified risk factors for workers to develop an RMI or MSD

*Disorder, musculoskeletal (MSD).* An injury or disorder of the muscles, nerves, tendons, joints, cartilage, and supporting structures of the upper and lower limbs, neck, and lower back that are caused, precipitated,
or exacerbated by sudden exertion or prolonged exposure to physical factors such as repetition, force, vibration, or awkward posture. Also called work-related musculoskeletal disorder (WMSD).

Ergonomics. The multidisciplinary science that applies design principles based on the physical and psychological capabilities of people to the design of jobs, equipment, products, and workplaces

Injury, repetitive motion (RMI). An MSD resulting from a repetitive job, process, operation, or similar work activity. Injuries include carpal tunnel syndrome, tendinitis, tenosynovitis, and muscle strain. Also called cumulative trauma disorder (CTD) and repetitive strain injury (RSI).

Value, threshold limit (TLV). Recommended guidelines for occupational exposure published by the American Conference of Governmental Industrial Hygienists (ACGIH). TLVs represent the average concentration for an eight-hour workday and a 40-hour workweek to which nearly all workers may be repeatedly exposed without adverse effect.

6 References

6.1 External Requirements

The following are the external requirements that apply to this program:


6.2 Related Documents

SLAC Environment, Safety, and Health Manual (SLAC-I-720-0A29Z-001)

- Chapter 2, “Work Planning and Control”

Other SLAC Documents

- Action Tracking System (ATS)
- SLAC Training Assessment (STA)

Other Documents

- American Conference of Governmental Industrial Hygienists (ACGIH). Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs)-2016 (ACGIH TLVs and BEIs-2016)
- Stanford University, Office of Environmental Health and Safety. Ergonomics
1 Purpose

The purpose of these procedures is to prevent ergonomic injuries. They cover identifying, evaluating, and mitigating ergonomic risks. They apply to workers, supervisors, ergonomic specialists, ESH coordinators, and the program manager; and the Occupational Health Center (OHC) and Space Planning and Management.

2 Procedures

The following procedures cover conducting office and non-office ergonomic evaluations. But workers and supervisors should be actively screening activities and workplace conditions with potential ergonomic risks and are strongly encouraged to engage their ESH coordinator or contact the program manager and/or OHC for assistance, ranging from informal consultations to formal evaluations.

2.1 Ergonomic Evaluation

2.1.1 Office

Office ergonomic evaluations are formal, conducted by an OHC ergonomic specialist, and documented in an evaluation report, and, if warranted, in the Action Tracking System (ATS).

<table>
<thead>
<tr>
<th>Step</th>
<th>Person</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Supervisor and worker</td>
<td>If not previously completed within 2 years, worker is to complete ESH Course 291, Ergonomics Training - Office Worker (ESH Course 291)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Worker and supervisor discuss results of ESH Course 291 workstation self-assessment and implement identified workstation corrective actions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>When warranted or desired, requests ergonomic evaluation by calling OHC at ext. 2281</td>
</tr>
<tr>
<td>2.</td>
<td>Supervisor</td>
<td>Adds ESH Course 291EV, Ergonomic Evaluation - Office Worker (ESH Course 291EV), to worker’s SLAC Training Assessment (STA) for an office evaluation</td>
</tr>
<tr>
<td>3.</td>
<td>Ergonomic specialist and worker</td>
<td>Performs evaluation at worker’s computer workstation</td>
</tr>
<tr>
<td>4.</td>
<td>Ergonomic specialist</td>
<td>Documents evaluation and recommendations in evaluation report</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sends evaluation report to supervisor and worker</td>
</tr>
</tbody>
</table>
### Step Person Action

<table>
<thead>
<tr>
<th>Step</th>
<th>Person</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1.2 Non-office</td>
<td></td>
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</tr>
</tbody>
</table>

For non-office evaluations, the emphasis is on workers and supervisors working together to identify and minimize hazards (for guidance see the [Ergonomics: Industrial Ergonomics Screening Checklist](#)) and contacting their ESH coordinator for assistance.

When appropriate, a formal evaluation by an ergonomics specialist may be performed, following this procedure.

<table>
<thead>
<tr>
<th>Step</th>
<th>Person</th>
<th>Action</th>
</tr>
</thead>
</table>
| 5. | Supervisor/ESH coordinator | Assesses activities (using the [Ergonomics: Industrial Ergonomics Screening Checklist](#)) and determines if an ergonomic specialist is needed  
Requests an ergonomic evaluation  
Contacts OHC at ext. 2281 to schedule |
| 6. | Ergonomic specialist | Coordinates with the ESH coordinator to perform the evaluation |
| 7. | ESH coordinator | Coordinates the evaluation with the supervisor and affected staff |
| 8. | Ergonomic specialist and worker | Performs evaluation at worker's location |
| 9. | Ergonomic specialist | Documents evaluation and recommendations in evaluation report  
Sends evaluation report to supervisor and worker  
When warranted, enters recommendations from evaluations into the Action Tracking System ([ATS](#)) |
| 10. | OHC and/or ESH coordinator | Provides follow-up support as necessary or as requested  
Tracks implementation of report recommendations |
| 11. | OHC | Maintains evaluation reports and records |
### 2.2 Office Moves

In addition to minimizing ergonomic risks in their workspaces, office workers must take care to avoid injury when moving their offices, which tends to involve activities and efforts with which they are unaccustomed and unfamiliar.

#### Step 1
- **Person**: Space Planning and Management
- **Action**: Assists with communication of ergonomics and safe office move resources (provided by ESH) to workers who are moving and their supervisors

#### Step 2
- **Person**: Supervisor and worker
- **Action**: Reviews tools and guidance on the [Ergonomics](#) and [Safe Office Moves](#) web sites

#### Step 3
- **Person**: OHC
- **Action**: Reviews Safe Office Moves guidelines with work groups upon request before move

#### Step 4
- **Person**: Supervisor and worker
- **Action**: Conducts moves following Safe Office Moves guidelines

#### Step 5
- **Person**: OHC
- **Action**: Provides office ergonomic tutorials and informal evaluations after the move upon request

### 2.3 Lifting Activities

For workers who perform routine lifting, supervisors must evaluate associated risks, using the *threshold limit values (TLVs)* in Table 1 below as guidance. (See Figure 1 for a simplified version.)

If activities are determined to be near a threshold in the TLVs for lifting, the supervisor must document mitigations in a job safety analysis (JSA), activity and training authorization (ATA), and/or work procedure. If activities are determined to exceed the thresholds in the TLVs for lifting, and cannot be mitigated, the supervisor must engage the ESH coordinator, who will determine the need for a formal evaluation by an ergonomic specialist.

Workers performing such lifts are to observe these thresholds. Workers routinely performing lifting/manual handling tasks, and their supervisors, should complete ESH Course 410, Back Safety Training ([ESH Course 410](#)).
### Table 1 Maximum Weights (in pounds) and Frequencies for Lifting

<table>
<thead>
<tr>
<th>Horizontal/vertical Location</th>
<th>Close 0 to 12”</th>
<th>Intermediate 12 to 24”</th>
<th>Far 24 to 31”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low-frequency lifting: less than 2 hours/day or more than 2 hours/day with less than 12 lifts/hour</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Shoulder to 12” above the shoulder</td>
<td>35</td>
<td>15</td>
<td>No known safe limit</td>
</tr>
<tr>
<td>Knuckle to chest</td>
<td>70</td>
<td>35</td>
<td>20</td>
</tr>
<tr>
<td>Shin to knuckle</td>
<td>40</td>
<td>30</td>
<td>15</td>
</tr>
<tr>
<td>Floor to shin</td>
<td>30</td>
<td>No known safe limit</td>
<td>No known safe limit</td>
</tr>
<tr>
<td>Moderate-frequency lifting: more than 2 hours/day and less than 30 lifts/hour</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shoulder to 12” above the shoulder</td>
<td>30</td>
<td>10</td>
<td>No known safe limit</td>
</tr>
<tr>
<td>Knuckle to chest</td>
<td>60</td>
<td>30</td>
<td>15</td>
</tr>
<tr>
<td>Shin to knuckle</td>
<td>35</td>
<td>25</td>
<td>10</td>
</tr>
<tr>
<td>Floor to shin</td>
<td>20</td>
<td>No known safe limit</td>
<td>No known safe limit</td>
</tr>
<tr>
<td>High-frequency lifting: more than 2 hours/day and less than 360 lifts/hour</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shoulder to 12” above the shoulder</td>
<td>24</td>
<td>No known safe limit</td>
<td>No known safe limit</td>
</tr>
<tr>
<td>Knuckle to chest</td>
<td>30</td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>Shin to knuckle</td>
<td>20</td>
<td>15</td>
<td>5</td>
</tr>
<tr>
<td>Floor to shin</td>
<td>No known safe limit</td>
<td>No known safe limit</td>
<td>No known safe limit</td>
</tr>
</tbody>
</table>

Adapted from American Conference of Governmental Industrial Hygienists (ACGIH), Threshold Limit Values for Lifting, in Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs)-2016 (ACGIH TLVs and BEIs-2016)
The following forms are required by this procedure:
- None

The following checklist is provided as guidance:
- [Ergonomics: Industrial Ergonomics Screening Checklist](SLAC-I-730-0A21J-052). Checklist for identifying and minimizing industrial (non-office) ergonomic hazards

### 4 Recordkeeping

The following recordkeeping requirements apply for this procedure:
- OHC maintains evaluation reports and records
5 References

**SLAC Environment, Safety, and Health Manual** (SLAC-I-720-0A29Z-001)
- Chapter 54, “Ergonomics”

Other SLAC Documents
- SLAC Training Assessment ([STA](#))
- ESH Course 291, Ergonomics Training - Office Worker ([ESH Course 291](#))
- ESH Course 291EV, Ergonomic Evaluation - Office Worker ([ESH Course 291EV](#))
- ESH Course 410, Back Safety Training ([ESH Course 410](#))
- **Ergonomics** (including checklists for identifying risks and guides to using computers and furniture safely)
- **Safe Office Moves**
- Action Tracking System ([ATS](#))

Other Documents
- California Department of Industrial Relations and the National Institute for Occupational Safety and Health (NIOSH). Ergonomic Guidelines for Manual Material Handling ([DHHS (NIOSH) Publication No. 2007-131](#))
- American Conference of Governmental Industrial Hygienists (ACGIH). Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs)-2016 ([ACGIH TLVs and BEIs-2016](#))
- Stanford University, Office of Environmental Health and Safety. [Ergonomics](#)
Supervisors and workers are to use this checklist to identify risk factors for work activities with ergonomic concerns and risk-reduction solutions (see Ergonomics: Ergonomic Evaluation Procedures [SLAC-I-730-0A21S-059]). Analyze the task and mark the check boxes for any risk factors. List the ergonomic control measures that mitigate the identified risk factors. Contact the ergonomics specialist at ext. 4588 for additional assistance. There are no recordkeeping requirements for this checklist.

<table>
<thead>
<tr>
<th>Task</th>
<th>Location</th>
<th>Department</th>
<th>Evaluated by</th>
<th>Date</th>
</tr>
</thead>
</table>

### 1. Lifting

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Risk Factor Observed</th>
<th>Risk Control Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lifting between 50 and 70 lbs.</td>
<td>☐</td>
<td>(e.g., mechanical assists, making load smaller, additional help, lifting technique, postural awareness, microbreaks, work rotation)</td>
</tr>
<tr>
<td>Lifting objects above shoulder level or below the knees</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td>Lifting objects with the hands &gt; 12 inches horizontally from the body</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td>Frequent lifts Low-frequency: &lt; 2 hours/day or &gt; 2 hours/day with &lt; 12 lifts/hour Moderate-frequency: &gt; 2 hours/day and &lt; 30 lifts/hour High-frequency: &gt; 2 hours/day and &lt; 360 lifts/hour</td>
<td>☐</td>
<td></td>
</tr>
</tbody>
</table>

Note: if one or more items are checked, efforts should be made to minimize one or more of the following: load weight, load distance, and lifting frequency. For recommended weight limits, refer to the Oregon Safe Lifting Calculator ([http://osha.oregon.gov/OSHAPubs/apps/liftcalc/lifting-calculator-app.html](http://osha.oregon.gov/OSHAPubs/apps/liftcalc/lifting-calculator-app.html)).
## 2. Awkward Postures

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Check If Observed</th>
<th>Risk Control Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Image] Overhead work - hands above the head, elbows above the shoulders. Cumulative duration &gt; 2 hours/day.</td>
<td>[ ]</td>
<td>(e.g., mechanical assists, adjustable workstations, tools with alternate handles, stands, larger grips, postural awareness, microbreaks)</td>
</tr>
<tr>
<td>[Image] Neck or back is bent &gt; 30°, little ability to vary posture. Cumulative duration &gt; 2 hours/day.</td>
<td>[ ]</td>
<td></td>
</tr>
<tr>
<td>[Image] Squatting or kneeling. Cumulative duration &gt; 2 hours/day.</td>
<td>[ ]</td>
<td></td>
</tr>
<tr>
<td>[Image] Bent wrists. Cumulative duration &gt; 2 hours/day.</td>
<td>[ ]</td>
<td></td>
</tr>
</tbody>
</table>
### 3. Forceful Hand Movements

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Check If Observed</th>
<th>Risk Control Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pinching to hold unsupported objects ≥ 2 lbs/hand (using pinch force equivalent to holding half a ream of paper). Cumulative duration &gt; 2 hours/day.</td>
<td>☐</td>
<td>(e.g., mechanical assists, tools with alternate handles, stands, larger grips, clamps, making load smaller)</td>
</tr>
<tr>
<td>Gripping ≥ 10 lbs/hand to hold unsupported objects (using gripping force equivalent to squeezing car jumper cables). Cumulative duration &gt; 2 hours/day.</td>
<td>☐</td>
<td></td>
</tr>
</tbody>
</table>

### 4. Other (Body Movements, Vibration, Slip/Trip/Fall)

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Check If Observed</th>
<th>Risk Control Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repeating the same movement with little or no variation (≥ 5 times/min). Cumulative duration &gt; 2 hours/day.</td>
<td>☐</td>
<td>(e.g., automated processes, gloves/grip handles, barriers, proper tool maintenance, microbreaks, work rotation, proper housekeeping)</td>
</tr>
<tr>
<td>Work involving sudden movements (e.g., starting a chainsaw)</td>
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<td></td>
</tr>
<tr>
<td>Vibration from high-vibration tools (e.g., chain saws, jackhammers, impact wrenches) &gt; 30 minutes/day OR from moderate-vibration tools (e.g., saws, sanders) &gt; 2 hours/day.</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td>Work around potential slip/trip/fall hazards (e.g., loading docks, stairs, wet/greasy surfaces)</td>
<td>☐</td>
<td></td>
</tr>
</tbody>
</table>

**References**

- Based on Stanford University, Office of Environmental Health and Safety. Ergonomics Screening Tool (OHS 14-026, [https://ehsapps.stanford.edu/secure/14-026.pdf](https://ehsapps.stanford.edu/secure/14-026.pdf))
- American Conference of Governmental Industrial Hygienists, Threshold Limit Values for Lifting, in Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs)-2016 ([ACGIH TLVs and BEIs-2016](https://www.acgih.org/))