



Ergonomics: OSHA's Draft Standard for Prevention of Work-Related Musculoskeletal Disorders

Scott Schneider Column Editor

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Scott Schneider, Column Editor

Introduction

On March 20, 1995, the Occupational Safety and Health Administration (OSHA) released a draft of its standard for Prevention of Work-related Musculoskeletal Disorders. While it is likely to change significantly before it is published in the Federal Register as a Notice of Proposed Rulemaking, the purpose of the summary is to stimulate discussion of what OSHA should do to stem the tide of musculoskeletal injuries affecting workers. A flow chart of the process under the standard is shown in Figure 1.

Summary of the Proposal

Scope

The standard applies to any workplace that has daily exposure to one or more of these five signal risk factors. (Signal risk factor definitions were revised by OSHA in May 1995. The revised definitions are included in Table 1.)

The standard is also triggered if the employer has one or more employees with work-related musculoskeletal disorders either recorded in the OSHA log or accepted as workers' compensation claims. Such disorders are defined as signs or persistent symptoms, lasting at least 7 days or interfering with work, or clinically diagnosed work-related musculoskeletal disorders that are caused or aggravated by exposure to workplace risk factors.

Application

Employers who can demonstrate that they already have an equally effective program when the standard goes into effect may be exempt from the initial assessment requirements. Employers on multiemployer sites must share responsibility for meeting the requirements.

Identification of Problem Jobs

Problem jobs are to be identified using a risk factor checklist (Figure 1, Parts 2-7). The checklist is in three parts: upper extremity, back and lower extremity, and

manual handling. Each risk factor is rated based on the length of time a worker is exposed each day (<2 hours, 2 to 4 hours, 4 to 8 hours, or over 8 hours). The scores are summed for the upper extremity, and the score from the manual handling checklist is added to the back and lower extremity checklist. A score on either checklist of 6 or above defines it as a problem job. Alternative checklists can be used if they cover all the appropriate risk factors and are equally effective.

Control of Workplace Risk Factors

For each problem job, the employer must either fix the job within 60 days (a "quick fix"), which means lowering the score to 5 or below on the checklist by reducing some of the risk factors, or do a more in-depth job analysis and begin a "job improvement process." The job improvement process includes a written assessment of the job; description of all tasks; identification of the risk factors and materials handling tasks; employee input into the process, selection, and implementation of controls; and evaluation of the effectiveness of controls. Jobs that cannot be feasibly controlled to a score of 5 or below must be controlled as low as possible and then supplemented with employee training. The employer must then begin a continuous improvement process to watch for new technologies that could eventually fix the job. Employers are expected to use ergonomic principles in designing new or changed jobs and complete a checklist within 60 to 120 days of beginning the job. Employers must also ensure that, prior to lifting or carrying, employees can determine the relative weight of materials they must routinely handle. Personal protective equipment, such as corrective lenses, gloves, and padding, may supplement other controls when scores cannot be reduced to 5 or below, but back belts and wrist braces are not considered personal protective equipment. Handles less than 4 ft long are prohibited for agricultural tools for weeding, etc.

Training

All employees covered by the standard will receive a basic fact sheet supplied by OSHA on work-related musculoskeletal disorders and the risk factors that produce them. Employees doing job analyses and ergonomics team members (where they exist) must be provided with special training on how to analyze jobs and implement and evaluate control measures. Employees in problem jobs, and their supervisors, must also get specific training on how to recognize and control risk factors, the signs and symptoms of injuries, the importance of and procedures for early reporting, current control measures and how to use them, and how to get a copy of this standard. Training must be during work hours and at no cost to the employees. Training should occur prior to initial assignment to a problem job and be repeated at least annually as long as it is a problem job.

Medical Management

Employers must designate a contact person (someone who is familiar with the risk factors and jobs) to work with the healthcare provider. Prompt assessment by a health care provider who is knowledgeable in assessing and treating work-related musculoskeletal disorders must be provided at no cost to employees who report them. The healthcare provider must be allowed to make periodic walk-through visits of the work site. The assessment must be made available no later than 5 days after signs or persistent symptoms are reported and must include an occupational and health history as well as a physical exam. The healthcare provider must be provided with the risk factor checklist for the job, the contact person's name and number, and a copy of the relevant parts of the standard. He or she must then develop a musculoskeletal disorder management plan and provide it to the employer within 3 days of the assessment. The employer must then give it to the employee and make sure the plan is

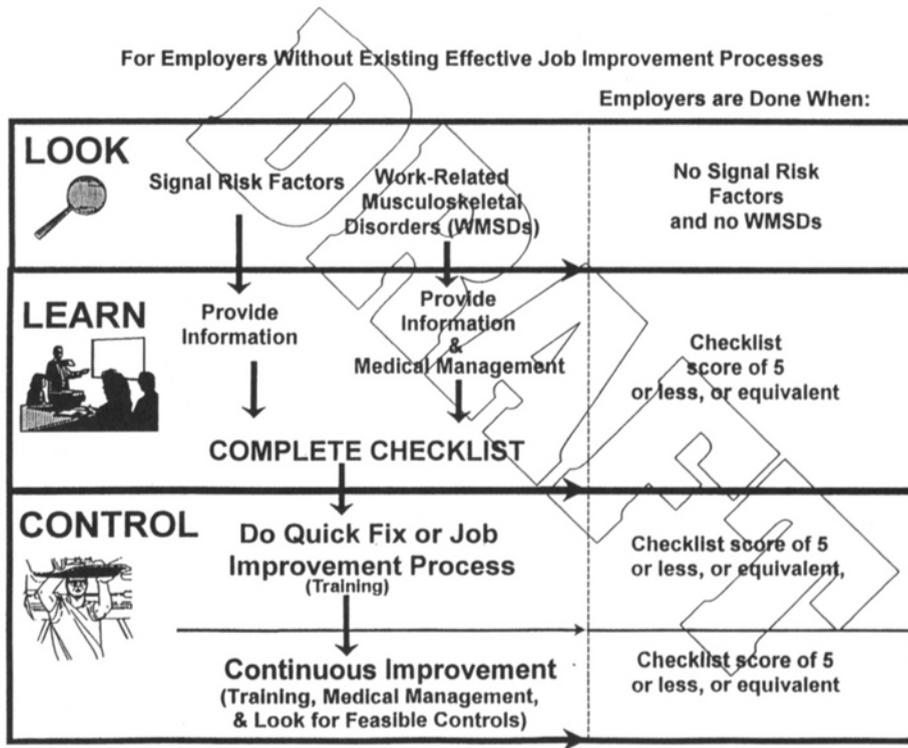
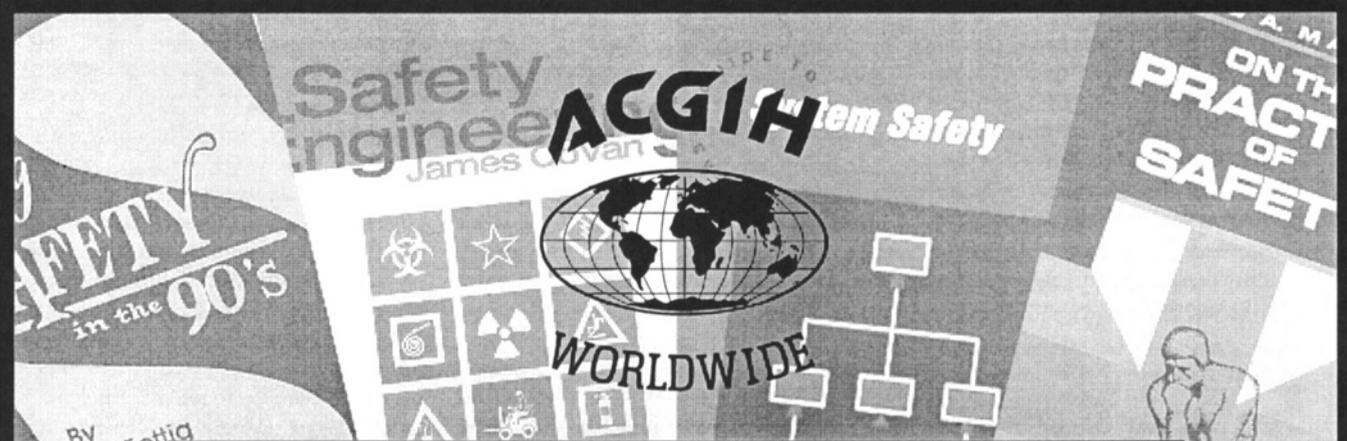


FIGURE 1. Ergonomic protection standard.



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Instructions for Completing the Risk Factor Checklists

These general risk factor checklists offer a quick method for identifying some important risk factors that contribute to work-related musculoskeletal disorders (MSDs). This checklist is used to identify jobs that require a quick fix or more thorough job analysis:

- **CHECKLIST A** is used to score risk factors for upper extremities (hands, wrists, arms, shoulders, neck).
- **CHECKLIST B** is used to score risk factors for the back and lower extremities.
- **CHECKLIST C** is used to assess manual handling tasks. Scores from this checklist are used in Checklist B.

To calculate risk factor scores, complete the following steps:

- STEP 1.** Fill in the general information—date of analysis, job, department, name of employee, name of analyst, and any comments—on each checklist. Read the description of each risk factor carefully.
- STEP 2.** If the employee performs more than one major task, list each task in the space provided.
- STEP 3.** Assess the amount of time the employee spends performing the job described. If the job consists of more than one task, you will need to estimate the hours the employee spends performing each task, then estimate the hours for each risk factor associated with the task (see example below). For force and awkward postures, estimate the time spent in both static and repetitive activities.
- STEP 4.** Circle the risk factor score in either Column C or Column D on Checklists A and B. If the employee performs tasks that involve the risk factor for more than 8 hours a day, circle the score in column D and add 0.5 point for each additional hour the employee experiences that risk factor; record the total in Column E.
- STEP 5.** Enter the score circled in Column C or D (also add the values in Column E) in the space provided in Column F.
- STEP 6.** Complete this process for all of the risk factors in Checklists A and B.
- STEP 7.** Complete Checklist C and record the score in the box provided for the manual handling score at the bottom of Checklist B.
- STEP 8.** Add the risk factor scores for a total score for each checklist. Record each total in the boxes provided.
- STEP 9.** If either Checklist A or Checklist B has a score higher than 5, the job is a problem job. Do not add the scores from Checklists A and B.

Task	Estimated Time (Hours)	Risk Factors	Time/Risk Factor (Hours)
Assembly	6 hours	Repetition	5 hours
		Awkward shoulder posture	5 hours
		Pinch force	2 hours
		Neck bend	2 hours
Microscope work	1 hour	Neck bend	1 hour

FIGURE 1. Part 2.

A

Upper Extremity Risk Factors

Date: _____
 Job: _____
 Department: _____
 Employee: _____
 Analyst: _____
 Comments: _____

Task	Risk Factor	Total Time

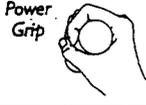
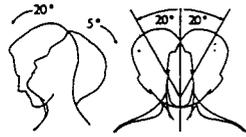
UPPER EXTREMITY RISK FACTOR SCORES						Page 1
A	B	C	D	E	F	
RISK FACTOR CATEGORY	RISK FACTORS	TIME			SCORE	
		2 to 4 Hours <i>Circle the score</i>	4+ to 8 Hours	8+ Hours Add 0.5 per hour		
Repetition (Finger, Wrist, Elbow, Shoulder, or Neck Motions)	1. Identical or Similar Motions Performed Every Few Seconds <i>Motions or motion patterns that are repeated every 15 seconds or less. (Keyboard use is scored below as a separate risk factor.)</i>	1	3			
	2. Intensive Keying <i>Scored separately from other repetitive tasks in the repetition category and includes steady pace as in data entry.</i>	1	3			
	3. Intermittent Keying <i>Scored separately from other repetitive tasks. Keyboard or other input activity is regularly alternated with other activities for 50 to 75 percent of the work.</i>	0	1			
Hand Force (Repetitive or Static)	1. Grip More Than 10-Pound Load <i>Holding an object weighing more than 10 pounds or squeezing hard with hand in a power grip.</i>		1	3		
	2. Pinch More Than 2 Pounds <i>Pinch force of 2+ pounds as in the pinch used to open a small binder clip with the tips of fingers.</i>		2	3		
Awkward Postures	1. Neck: Twist/Bend <i>Twisting neck to either side more than 20°, bending neck forward more than 20° as in viewing a monitor, or bending neck backward more than 5°.</i>		1	2		

FIGURE 1. Part 3.

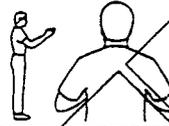
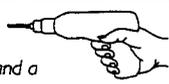
UPPER EXTREMITY RISK FACTOR SCORES						Page 2
A	B	C	D	E	F	
RISK FACTOR CATEGORY	RISK FACTORS	TIME			SCORE	
		2 to 4 Hours <i>Circle the score</i>	4+ to 8 Hours	8+ Hours Add 0.5 per hour		
Awkward <i>continued</i>	2. Shoulder: Unsupported Arm or Elbow Above Mid-Torso Height <i>Arm is unsupported if there is not an arm rest when doing precision finger work, or when the elbow is above mid-torso height.</i> 	2	3			
	3. Rapid Forearm: Rotation <i>Rotating the forearm or resisting rotation from a tool. An example of forearm rotation is using a manual screwdriver.</i>	1	2			
	4. Wrist: Bend/Deviate <i>Consider wrist bends that are more than 20 degrees flexion (bend wrist palm down) or more than 30 degrees extension (bending wrist back). Bending can occur during manual assembly and data entry.</i>	2	3			
	5. Fingers <i>Forceful gripping to control or hold an object, such as click-and-drag operations with a computer mouse or deboring with a knife.</i>	0	1			
Contact Stress	1. Hard/Sharp Objects Press Into Skin <i>Includes contact of the palm, fingers, wrist, elbow, or armpit.</i>	1	2			
	2. Using the Palm of the Hand as a Hammer	2	3			
Vibration	1. Localized Vibration (Without Vibration Dampening) <i>Vibration from contact between the hands and a vibrating object, such as a power tool.</i> 	1	2			
	2. Sitting/Standing on Vibrating Surface (Without Vibration Dampening) 	1	2			
Environment	1. Lighting (Poor Illumination/Glare) <i>Inability to see clearly (e.g., glare on a computer monitor).</i>	0	1			
	2. Cold Temperature <i>Hands exposed to air temperature of less than 60°F for sedentary work, 40°F for light work, 20°F for moderate/heavy work; cold exhaust blowing on hands.</i>	0	1			
Control Over Work Pace	1. No Control Over Pace <i>Machine paced, piece rate, constant monitoring, or daily deadlines. Enter 1 if one control factor is present or 2 if two or more control factors are present.</i>					
TOTAL UPPER EXTREMITY SCORE FOR CHECKLIST A (sum of both page 1 and page 2)						

FIGURE 1. Part 4.

B

Back and Lower Extremity Risk Factors

Date: _____
 Job: _____
 Department: _____
 Employee: _____
 Analyst: _____
 Comments: _____

Task	Risk Factor	Total Time

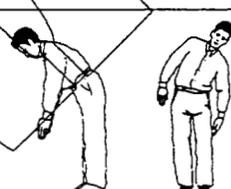
BACK AND LOWER EXTREMITY RISK FACTOR SCORES						Page 1
A	B	C	D	E	F	
RISK FACTOR CATEGORY	RISK FACTORS	TIME FACTOR			SCORE	
		2 to 4 Hours <i>Circle the score</i>	4+ to 8 Hours	8+ Hours <i>Add 0.5 per hour</i>		
Awkward Postures (Repetitive or Static)	1. Mild Forward or Side Bending of Torso More Than 20° But Less Than 45° 	-	-			
	2. Severe Forward Bending of Torso More Than 45°	2	3			
	3. Backward Bending of Torso	1	2			
	4. Twisting Torso	2	3			
	5. Prolonged Sitting Without Adequate Back Support <i>Back is not firmly supported by a back rest for an extended period.</i>	1	2			
	6. Standing Stationary or Inadequate Foot Support While Seated <i>Stand in one place (on assembly line or check stand) without sit/stand option or walking, or feet are not firmly supported when sitting.</i>	0	1			
	7. Kneeling/Squatting	2	3			
	8. Repetitive Ankle Extension/Flexion <i>Using a foot pedal to start or stop a machine cycling (as in sewing machine operations).</i>	1	2			

FIGURE 1. Part 5.

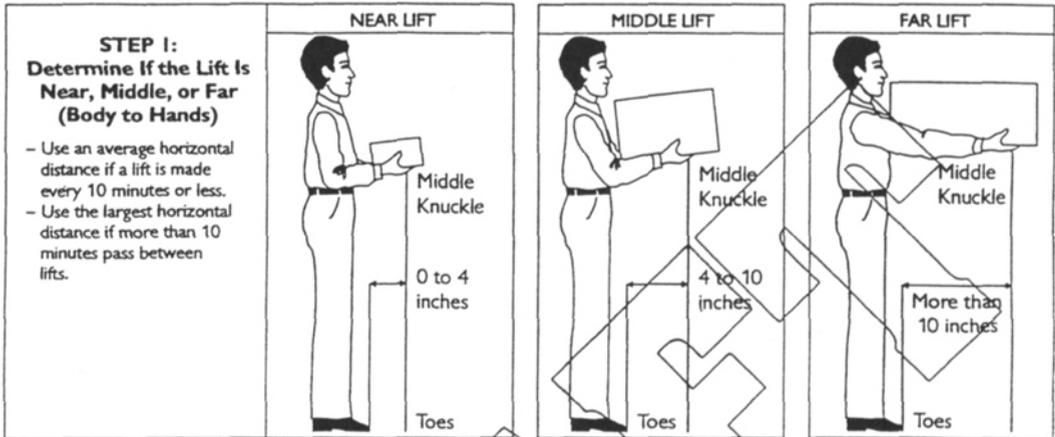
BACK AND LOWER EXTREMITY RISK FACTOR SCORES						Page 2
A	B	C	D	E	F	
RISK FACTOR CATEGORY	RISK FACTORS	TIME FACTOR			SCORE	
		2 to 4 Hours <i>Circle the score</i>	4+ to 8 Hours	8+ Hours Add 0.5 per hour		
Contact Stress	1. Hard/Sharp Objects Press Into Skin <i>Includes contact against the leg.</i>	1	2			
	2. Using the Knee as a Hammer or Kicker	2	3			
Vibration	1. Sitting/Standing on Vibrating Surface (Without Vibration Dampening)	1	2			
Push/Pull	1. Moderate Load <i>Force needed to push/pull a shopping cart full of apples.</i>	1	2			
	2. Heavy Load <i>Force needed to push/pull a two-drawer, full file cabinet across a carpeted room.</i>	2	3			
Control Over Work Pace	1. No Control Over Pace <i>Machine paced, piece rate, constant monitoring, or daily deadlines. Enter 1 if one control factor is present or 2 if two or more control factors are present.</i>					
MANUAL HANDLING SCORE (from CHECKLIST C)						
TOTAL BACK AND LOWER EXTREMITY SCORE FOR CHECKLIST B (sum of both pages 1 and 2 of CHECKLIST B)						

1. Moderate load = 20 pounds of initial force needed to push/pull an object, such as a shopping cart loaded with five 40-pound bags of dog food (200 pounds).
2. Heavy load = 50 pounds of initial force needed to push/pull an object, such as a two-drawer, full file cabinet across a carpeted floor.

FIGURE 1. Part 6.

C

Manual Handling



STEP 2: Estimate the Weight Lifted (Pounds)

- Use an average weight if a lift is made every 10 minutes or less.
- Use the heaviest weight if more than 10 min. pass between lifts.
- Enter 0 in the total score if the weight is 10 lb. or less.

	NEAR LIFT	MIDDLE LIFT	FAR LIFT
DANGER ZONE	More Than 51 lb 5* Points	More Than 35 lb 6 Points	More Than 28 lb 6 Points
CAUTION ZONE	17 to 51 lb 3 Points	12 to 35 lb 3 Points	10 to 28 lb 3 Points
SAFE ZONE	Less Than 17 lb 0 Points	Less Than 12 lb 0 Points	Less Than 10 lb 0 Points

*If lifts are performed more than 15 times per shift, use 6 points.

STEP 2 SCORE:

STEP 3: Determine the Points for Other Risk Factors

- Use occasional lifts if more than 10 minutes pass between lifts.
- Use the more than 1 hour points if the risk factor occurs with most lifts and lifting is performed for more than 1 hour.

FACTOR	OCCASIONAL LIFTS PERFORMED FOR 1 HOUR OR LESS IN TOTAL PER SHIFT	LIFTS PERFORMED FOR MORE THAN 1 HOUR IN TOTAL PER SHIFT
Twist torso during lift	1	1
Lift one-handed	1	2
Lift unstable loads (people, liquids, or loads that shift around or have unequal weight distribution)	1	2
Lift between 1 to 5 times per minute	1	1
Lift 5 or more times per minute	2	3
Lift above the shoulder	1	2
Lift below the knuckle	1	2
Carry objects 10 to 30 feet	1	2
Carry objects farther than 30 feet	2	3
Lift while seated or kneeling	1	2

STEP 3 SCORE:

TOTAL SCORE	Add scores from Steps 2 and 3. Enter total score on Checklist B.	TOTAL: <input type="text"/>
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FIGURE 1. Part 7.

TABLE 1. Explanation and Examples of Signal Risk Factors

Signal Risk Factor	Explanation	Examples
Performance of the same motion or motion pattern every few seconds for 2 hours continuously, or more than a total of 4 hours, including scheduled breaks.	The job requires rapid repetition of the same movements, which stresses the body parts performing the motion. Different parts of the body may be affected, depending on the motion: fingers, arms, neck, knees, or ankles.	Inserting and tightening four bolts in 15 seconds on a moving conveyor line. Intensive data entry requiring rapid repeated keying activities. Climbing stairs.
Unsupported fixed or awkward work posture for more than 1 hour continuously, or a total of 4 hours, including scheduled breaks.	<p>Unsupported fixed postures involve holding the arms, back, or feet in the same position without support.</p> <p>Awkward postures become a risk factor when the wrist or neck is noticeably bent; the elbow is away from the body (indicates shoulder movement); the back is bent forward, backward, or to the side; or the knee is bent to kneel or squat.</p>	<p>Keying with the fingers, with no arm movement and no forearm support.</p> <p>Working in a constrained posture. Sitting without back support. Sitting with the feet dangling. Bending the neck back to see while painting a ceiling. Reaching to get items more than 20 inches away from the worker. Working overhead.</p> <p>Operating a foot pedal while standing. Picking/weeding crops near the ground (not raised beds) by hand or with short-handled tools.</p>
Use of vibrating or impact tools or equipment for more than 1 hour of continuous use, or more than a total of 2 hours, including scheduled breaks.	<p>Jobs that involve vibration exposure from hand tools such as sanders, grinders, and chain saws.</p> <p>Whole-body vibration occurs when standing or sitting while operating a truck or other heavy machinery without vibration dampening over rough or uneven surfaces.</p>	<p>Polishing metal parts to a high luster.</p> <p>Grinding burrs from machined parts.</p> <p>Cutting out window and door openings with a power saw. Removing mineral deposits with a chipping hammer.</p> <p>Operating an excavator, forestry tractor, or forklift on uneven ground.</p>
Using forceful hand exertions for more than a total of 2 hours, including scheduled breaks.	<p>Holding an object that weighs 10 pounds or more in the hand.</p> <p>Pinching an object with 2 or more pounds of force.</p>	<p>Holding a gallon of whole milk in a plastic container. Holding a gallon can of paint.</p> <p>Pinching open a small binder clip.</p>
Unassisted frequent or forceful manual handling	<p>Lifting more than 35 pounds in an awkward posture.</p> <p>Lifting more than 35 pounds near the body more than 25 times.</p> <p>Lifting 15 pounds or more 2 feet in front of the body more than 25 times.</p> <p>Repeated lifting of more than 10 pounds for more than 1 hour.</p> <p>Pushing or pulling with more than 20 pounds of force for more than 1 hour.</p>	<p>Lifting, pushing, or pulling adult patients.</p> <p>Repeatedly lifting a case with 4 gallons of water. Repeatedly lifting 20-pound items from the trunk of a car. Pushing a shopping cart loaded with 5 (40 pound) bags of dog food, stopping and starting for more than 1 hour.</p>

The presence of signal risk factors is intended to be a quick mental assessment made by people familiar with the job's requirements. It does not require a precise count of minutes or a time/motion study.

Forceful hand exertions: Taking hold of an object in one hand that weighs 10 or more pounds by closing the fingers and thumb around it (power grip) or pinching with one finger (or two) and the thumb with 2 or more pounds of force.

Frequent manual handling: Lifting more than 35 pounds more than 25 times in a work shift. Pushing or pulling that requires more than 20 pounds of force for more than a total of 1 hour in a work shift. The push/pull force referred to in this definition is the initial force to start the object in motion and is not the weight of the load or the force to keep an object moving.

Forceful manual handling: Lifting conditions that require more than 35 foot-pounds. Foot-pounds are the product of the distance away from the back and the weight of the object or force needed to move the object. For example, lifting a 35-pound box 1 foot from the back (or ankles) is 35 foot-pounds, and 17.5 pounds 2 feet from the back (or ankles) equals 35 foot-pounds. The distance is measured from the ankles (or back) to the middle of the hand (middle knuckle). Note that for convenience 0.5 feet (6 inches) can be used to estimate the distance between the back and the front of the body, so if the distance is measured from the hands to the front of the body, add 0.5 feet.

followed during the employee's recovery period.

Record Keeping

Records must be kept of: problem jobs (for 5 years), the job improvement process (5 years), training (5 years), and medical management (employment plus 5 years). These records should be available (within 15 days) to the employee upon request and, with authorization, to his or her designated representatives.

Appendices

Appendix A is nonmandatory (except for the representative sampling scheme) and contains the risk factor checklists. Appendix B is a nonmandatory guidance document on control of workplace risk factors. Appendix C provides nonmandatory medical management guidelines. Appendix D is a nonmandatory appendix with training guidelines.

Copies of the entire text (without illustrations) can be downloaded from the

Department of Labor Computer Bulletin Board (202-219-4784). Copies can also be downloaded through the Internet from Ergoweb at <http://ergoweb.mech.utah.edu>. Paper copies can be obtained from local OSHA area offices. The text has also been published in the BNA Occupational Safety and Health Reporter(v.24 #42)(cost is \$27). Please send comments to OSHA at: OSHA Docket Office, U.S. Department of Labor, 200 Constitution Avenue, NW, Washington, DC 20210.

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