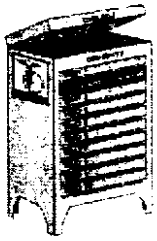


TRAY 2
SETTING THE STAGE FOR ACTION

SETTING THE STAGE FOR ACTION

Step 2 of the main text, Setting the Stage for Action, acknowledged three points. First, actions taken to define and control ergonomic hazards can be treated as part of a company's overall workplace safety and health program. Thus, approaches found successful in controlling other forms of workplace hazards should have value in coping with ergonomic problems as well. The second and third points made this clear by emphasizing the importance of management commitment and the value of employee participation in such undertakings. Noted below in Tray 2–A are literature references elaborating on these three points. The following NIOSH report discusses much of the available data contained in the other listed sources:

> NIOSH [1994]. Participatory ergonomic interventions in meatpacking plants. DHHS (NIOSH) Publication No. 94–124, National Institute for Occupational Safety and Health, 4676 Columbia Parkway, Cincinnati, OH 45226.

This report can be obtained by calling 1–800–35–NIOSH (1–800–356–4674).

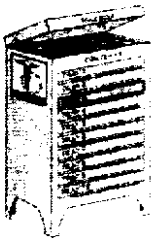
Tray 2–A. Literature References to Successful OS&H Program Practices, Management Commitment, and Worker Involvement

Cohen A [1977]. Factors in successful occupational safety programs. J Safety Res *9*(4):168–178. (Available from the National Safety Council, 112 Spring Lake Drive, Itasca, IL 60143–3201.)

Peters RH [1989]. Review of recent research on organizational and behavioral factors associated with mine safety. Information Circular 9232, Bureau of Mines, U.S. Department of the Interior, 2401 E Street N.W., Washington, DC 20241.

Lawler EE Jr. [1991]. High involvement management—participative strategies for improving organizational performance. Jossey-Bass, 350 Sansome Street, San Francisco, CA 94104.

Noro K, Imada AS [1991]. Participatory ergonomics. Taylor & Francis Inc., 1900 Frost Road, Suite 101, Bristol, PA 19007.



TRAY 3
TRAINING—BUILDING IN-HOUSE EXPERTISE

TRAINING—BUILDING IN-HOUSE EXPERTISE

Employee training complements efforts to address workplace safety and health problems, including those focused on ergonomic hazards and related concerns. As presented in the main text (Step 3), ergonomics training may take different forms for various categories of employees. It can range from awareness training for all employees, especially those in suspected problem jobs, to more specialized, intensive training for those expected to undertake job analyses and problem-solving work. The ergonomics primers and manuals listed at the end of this document (see Tray 10–A) provide material for use in this training. Information on videotapes, publications, databases, and other resources that can be helpful in developing a training plan are also available from NIOSH (call 1–800–35–NIOSH or 1–800–356–4674).

Training Elements

The effectiveness of training greatly depends on the way it is designed and delivered to the target audience. A 1988 OSHA publication (Training Requirements in OSHA Standards and Training Guidelines. Washington, DC: U.S. Department of Labor, OSHA Publication No. 2254) offers a model or set of steps to follow in these efforts. The steps are as follows:

1. **Determine if training is needed.** If the evidence gathered from checking health records and results of the job analysis indicates a need to control ergonomic risk factors, then employees must be provided with the training necessary for them to gain the knowledge to implement control measures.

2. **Identify training needs.** As already mentioned, different categories of employees will require different kinds of ergonomics instruction.

3. **Identify goals and objectives.** The important point here is that the objectives of training must be defined in clear, directly observable, action-oriented terms.

4. **Develop learning activities.** Whatever the mode of training—live lectures, demonstrations, interactive-video programs, use of varied instructional aids—learning activities should be developed that will help employees demonstrate that they have acquired the desired knowledge or skill.

5. **Conduct training.** Training should take into account the language and educational level of the employees involved. Trainees should be encouraged to ask questions that address their particular job concerns, and hands-on learning opportunities should be encouraged.

6. **Evaluate training effectiveness.** A common tool for training evaluations is the use of questions about whether they found the instruction interesting and useful to their jobs and if they would recommend it to others. More important, however, are measures of the knowledge gained or improvements in skills, as may be specified in the course objectives. Knowledge quizzes, performance tests, and behavioral observations can be used for this purpose. One exercise recommended here is for the class to propose improvements in workplace conditions on the basis of information learned in class for presentation to management for their review. This relates to another level of evaluation which is whether the training produces some overall change at the workplace. The latter measure is complicated by the fact that such results require time before they are apparent, and training may be one of several factors responsible for such results.

7. **Improving the program.** If the evaluations indicate that the objectives of the training were not achieved, a review of the elements of the training plan would be in order and revisions should be made to correct shortcomings.

For a discussion of ergonomics training issues, see the following reference:

Kuorinka I, Forcier L, eds. [1995]. Work-related musculoskeletal disorders (WMSDs): a reference book for prevention. Chapter 8. WMSD-related training. Taylor and Francis (1900 Frost Road, Suite 101, Bristol, PA 19007).

Although the above-mentioned steps can help employers develop ergonomics training activities without having to hire outside help, much depends on the existing capabilities of the staff. If in-house expertise in ergonomics is limited, start-up activities could necessitate the use of consultants or outside special training for those employees who would ultimately assume responsibility for ergonomic activities within the workplace. Continuing education courses at NIOSH Educational Resource Centers, located throughout the United States, can furnish this instruction. Their addresses are listed in Tray 3–A. Each year NIOSH publishes schedules for ergonomics courses and other offerings from these Centers. Copies can be obtained free of charge by calling 1–800–35–NIOSH (1–800–356–4674). NIOSH Educational Resource Centers, according to their charter, are expected to offer outreach services in addressing occupational safety and health problems in their respective regions. Contacting them could be a source for gaining help on ergonomic matters. A list of university locations where NIOSH is supporting ergonomics training projects is located in Tray 3–B. These too may be sources for obtaining assistance. In addition, regional offices of OSHA offer free consultation on ergonomic problems as do State agencies concerned with occupational safety and health issues.

Tray 3–A. NIOSH Educational Resource Centers for Continuing Education Courses (1997 listing)

Deep South Center for Occupational Safety and Health
University of Alabama
School of Public Health MJH117
Birmingham, Alabama 35294–2010
Phone: 205–934–7178; Fax: 205–975–7179

Southern California Educational Resource Center
Institute of Safety and Systems Management
927 West 35th Place, Room 102
Los Angeles, California 90089–0021
Phone: 213–740–3995; Fax: 213–740–8789

Johns Hopkins Educational Resource Center
School of Hygiene and Public Health
615 Wolfe Street, Room 6001
Baltimore, Maryland 21205
Phone: 410–955–0423; Fax: 410–614–4986

Michigan Educational Resource Center
Center for Occupational Health and Safety Engineering
University of Michigan
1205 Beal, IOE Building
Ann Arbor, Michigan 48109–2117
Phone: 313–936–0148; Fax: 313–764–3451

New York/New Jersey Educational Resource Center
EOHSI Centers for Education and Training
45 Knightsbridge Road, Brookwood II
Piscataway, New Jersey 08854–3923
Phone: 908–235–5062; Fax: 908–235–5133

University of Cincinnati Educational Resource Center
P.O. Box 670056
Cincinnati, Ohio 45267–0056
Phone: 513–558–1730; Fax: 513–558–1756

Rocky Mountain Center for Occupational Safety and Health
Building 512—University of Utah
Salt Lake City, Utah 84112
Phone: 801–581–4055; Fax: 801–585–5275

Northern California Center for Occupational Safety and Environmental Health
1310 South 46th Street, Building 102
Richmond, California 94804
Phone: 510–231–5645; Fax: 510–231–5648

Great Lakes Center for Occupational and Environmental Health and Safety
School of Public Health
2121 Taylor Street, Room 216A
Chicago, Illinois 60612–7260
Phone: 312–996–6904; Fax: 312–413–7369

Harvard Educational Resource Center
Harvard School of Public Health
Office of Continuing Education
677 Huntington Avenue
Boston, Massachusetts 02115
Phone: 617–432–1171; Fax: 617–432–1969

Minnesota Educational Resource Center
Midwest Center for Occupational Health and Safety
640 Jackson Street
St. Paul, Minnesota 55101
Phone: 612–221–3992; Fax: 612–292–4773

North Carolina Educational Resource Center
109 Connor Drive, Suite 1101
Chapel Hill, North Carolina 27514
Phone: 919–962–2101; Fax: 919–966–7579

Southwest Center for Occupational Safety and Health
P.O. Box 20186, RAS W1026
Houston, Texas 77225–0186
Phone: 713–500–9463; Fax: 713–500–9442

Northwest Center for Occupational Health and Safety
Department of Environmental Health
University of Washington
4225 Roosevelt Way NE, Suite 100
Seattle, Washington 98105–6099
Phone: 206–543–1069; Fax: 206–685–3872

Tray 3–B. NIOSH Ergonomic Training Project Grant Locations (1997 listing)

University of Massachusetts—Lowell
Department of Work Environment
One University Avenue
Lowell, Massachusetts 01854
Phone: 508–934–3272; Fax: 508–934–3050

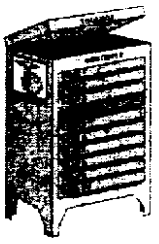
University of Miami
Department of Industrial Engineering
1251 Memorial Drive
Coral Gables, Florida 33146
Phone: 305–284–4154; Fax: 305–284–5441

Texas A & M University
Nuclear Engineering Department
College Station, Texas 77843–3133
Phone: 409–845–5574; Fax: 409–845–6443

Texas Tech University
Department of Industrial Engineering
Mail Stop 3061
Lubbock, Texas 79409–3061
Phone: 806–742–3543; Fax: 806–742–3411

Virginia Polytechnic Institute and State University
Department of Industrial and Systems Engineering
302 Whittermore Hall
Blacksburg, Virginia 24061–0118
Phone: 540–231–6656; Fax: 540–231–3322

West Virginia University
Department of Industrial and Management
Systems Engineering
727 Engineering Sciences Building
P.O. Box 6107
Morgantown, West Virginia 26506–6107
Phone: 304–293–3693, Ext. 707; Fax: 304–293–5024



TRAY 4
DATA GATHERING—MEDICAL AND HEALTH INDICATORS

DATA GATHERING—MEDICAL AND HEALTH INDICATORS

Determining whether work-related musculoskeletal problems are apparent and whether job conditions exist that pose a significant risk for such disorders involves different but interrelated data collection methods. As noted in the main text, entries of musculoskeletal problems in company medical records and OSHA Form 200 logs can be tallied for use in calculating incidence and prevalence measures. These measures, in turn, may be compared with those from other departments or those reported for the industry as a whole in making judgments concerning excess cases. The incidence rate (IR) is defined as the number of *new* cases per 100 worker years (which is equivalent to 200,000 work hours). It may be computed for all musculoskeletal disorders and by disorders of body part (i.e., disorders specific to the wrist, back, shoulders, etc.) The following formula is used in these IR calculations:

$$\mathbf{IR} = \frac{\text{Number of new cases during a time period} \times 200{,}000 \text{ hr}}{\text{Total hours worked by all workers for the time period}}$$

The prevalence rate (PR) calculation is similar, except that all *existing* numbers of cases for a given time period are used in the formula. Hence,

$$\mathbf{PR} = \frac{\text{Number of all cases during a time period} \times 200{,}000 \text{ hr}}{\text{Total hours worked by all workers for the time period}}$$

Examples of computations of IR and PR are shown in Tray 4–A.

Tray 4–A. Examples of IR and PR Calculations

A manufacturer of small electronic products employed an average of 125 full-time production employees—75 working on circuit board assembly tasks and 50 on product assembly tasks. A check of the company medical records in 1994 indicated a total of 20 workers had entries reflecting hand/wrist disorders; 14 of these cases were workers engaged in circuit board wiring; 6 were in assembly work. Medical records for 1995 indicated 5 new cases—4 in circuit wiring board and 1 in product assembly.

Calculating the IRs: Five new cases for the total plant were reported in 1995. Time sheets for the workforce indicated a total of 250,000 hours of work time for that year. Thus, the IR for the total plant is:

$$\frac{5 \text{ (new cases)} \times 200{,}000}{250{,}000} = \frac{1{,}000{,}000}{250{,}000} = 4.0$$

Calculating the PRs: The existing 20 cases of WMSDs noted in 1994 and the 5 new cases for 1995 would indicate a total of 25 cases for the 2-year time period. The total number of work hours time expended by the workforce, based on time sheets for the 2-year time period, equaled 500,000 hours. Thus the PR for the total plant for the 2-year period would be:

$$\frac{25 \text{ (existing + new cases)} \times 200{,}000}{500{,}000} = \frac{5{,}000{,}000}{500{,}000} = 10.0$$

Several different decision rules concerning what constitutes excessive numbers of musculoskeletal problems have been proposed. The following reference suggests that more than one work-related case of musculoskeletal disorders per 200,000 hours or more than a twofold difference in either IR or PR between departments indicates a need for evaluations to determine the basis for the problem:

> Kuorinka I, Forcier L eds. [1995]. Health and risk factor surveillance for work-related musculoskeletal disorders. Chapter 5. Work-related musculoskeletal disorders (WMSDs): a reference book for prevention. Taylor and Francis (1900 Frost Road, Suite 101, Bristol, PA 19007).

California is in the process of enacting an ergonomic rule which would require interventions when at least two workers doing the same job develop similar forms of musculoskeletal disorders within a 12-month period (Occupational Safety and Health Standard, Title 8, Chapter 4, Group 15, Article 106, Section 5110, Ergonomics, California Occupational Safety and Health Board, Sacramento, CA, October 1, 1996). For a discussion of decision rules, see Chapter 5 above.

Evidence that excessive numbers of cases of musculoskeletal problems are due to workplace factors will invariably require other forms of data collection. As noted in the main text (Step 4), interviews and questionnaire surveys can furnish added information about the onset and nature of such problems as related to the worker's job. Symptom surveys and special tests can also offer a means for detecting problems that may be missed in more general medical exams and reports.

Workers completing a symptom survey form such as shown in Tray 4–B can identify parts of their bodies that are experiencing increased levels of discomfort as a result of poor job design. Although this survey is fairly easy to administer, the following procedures should be followed for best results:

- No names should be required on the forms, and the collection process should ensure anonymity.
- Survey participation should be voluntary in nature.
- Workers should fill out the form on their own (but if needed, the surveys should be administered to groups by a trained person offering explanations).
- The survey should be conducted on work time.

Unless the company is prepared to act on the results of a symptom survey, it should not be conducted. Analysis of the information from a symptom survey is complex. One of the major difficulties is deciding what responses on the questionnaire indicate a problem that may need further evaluation. One approach for scoring results from a survey of this type is to rank-order the number and severity of complaints by body part from the highest to the lowest in frequency and severity. Those jobs linked with the body part showing the most complaints or the highest severity ratings would become the primary candidates for followup efforts at analyzing job risk factors and determining needs for risk reduction measures. A second survey, using the same form, completed after ergonomic changes have been made to correct problem jobs, can indicate whether the intended benefits have been achieved. Comparisons of the worker survey data gathered before and after ergonomic changes can furnish this information. One caution here is to allow sufficient time after the intervention to permit the workers to become accustomed to the job change and allow other novelty effects to subside. The second survey should be made no less than 2 weeks (and preferably 1 month) after the changes and should be made at the same time and day of the week as the initial survey. Comparisons of Monday morning results with those obtained on Friday afternoon may give faulty results because of differences in employee motivation.

The health care professional providing medical services to an employer may use special tests for medical screening or more in-depth diagnostic purposes to confirm suspected cases of musculoskeletal disorders. These may involve the worker moving his or her limbs through a range of motions or various maneuvers, with or without resistance applied by the examiner, to determine whether distinctive signs of pain occur. By pressing their fingers against a body part, examiners can also determine areas of tenderness. Range of motion tests for upper extremity disorders are described in the articles listed in the Health Care Management section of the Toolbox (Tray 8–A).

Tray 4–A. Symptoms Survey Form

Symptoms Survey: *Ergonomics Program*

Date _____/_____/_____/

_____ Plant _____ Dept #

Job Name _____

_____ Shift

_____ Hours worked/week

_____ years _____ months Time on THIS Job

Other jobs you have done in the last year (for more than 2 weeks)

_____ Plant _____ Dept # _____ Job Name _____ months _____ weeks Time on THIS Job

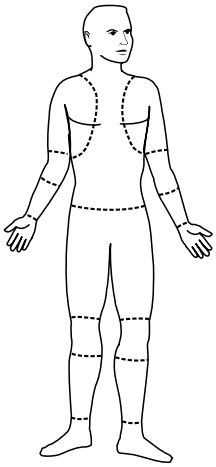
_____ Plant _____ Dept # _____ Job Name _____ months _____ weeks Time on THIS Job

(If more than 2 jobs, include those you worked on the most)

Have you had any pain or discomfort during the last year?

☐ Yes ☐ No (If NO, stop here)

If YES, carefully shade in area of the drawing which bothers you the MOST.



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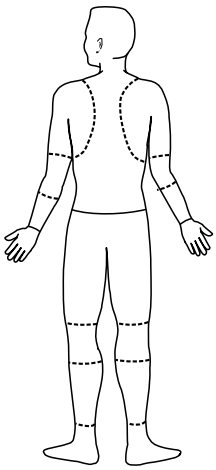


Back

(Continued)

Tray 4–A (Continued).

(Complete a separate page for each area that bothers you)

Check Area: ☐ Neck ☐ Shoulder ☐ Elbow/Forearm ☐ Hand/Wrist ☐ Fingers
☐ Upper Back ☐ Low Back ☐ Thigh/Knee ☐ Low Leg ☐ Ankle/Foot

1. Please put a check by the words(s) that best describe your problem

☐ Aching ☐ Numbness (asleep) ☐ Tingling
☐ Burning ☐ Pain ☐ Weakness
☐ Cramping ☐ Swelling ☐ Other
☐ Loss of Color ☐ Stiffness

2. When did you first notice the problem?_____ (month)_____ (year)

3. How long does each episode last? (Mark an X along the line)

_____/_____/_____/_____/_____/
1 hour 1 day 1 week 1 month 6 months

4. How many separate episodes have you had in the last year?_____

5. What do you think caused the problem?_____

_____

6. Have you had this problem in the last 7 days? ☐ Yes ☐ No

7. How would you rate this problem? (mark an X on the line)

NOW

_____
None Unbearable

When it is the WORST

_____
None Unbearable

8. Have you had medical treatment for this problem? ☐ Yes ☐ No

8a. If NO, why not?_____

8a. If YES, where did you receive treatment?

☐ 1. Company Medical Times in past year _____

☐ 2. Personal doctor Times in past year _____

☐ 3. Other Times in past year _____

Did treatment help? ☐ Yes ☐ No _____

9. How much time have you lost in the last year because of this problem?____ days

10. How many days in the last year were you on restricted or light duty because of this problem?
____ days

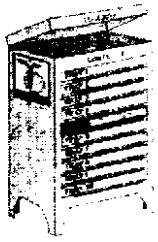
11. Please comment on what you think would improve your symptoms

_____

_____

_____

_____



TRAY 5
DATA GATHERING—JOB RISK FACTORS

DATA GATHERING—JOB RISK FACTORS

Tying indications of musculoskeletal disorders to identifiable job risk factors is important to establish work relatedness and to define the basis for a control plan. As described in Step 4, walk-through observational surveys of the work facilities, interviews with workers and supervisors, and checklists can all be useful for identifying risk factors. Checklists can offer an orderly procedure for screening jobs for risk factors of consequence to musculoskeletal disorders, although there is scientific debate over the ability of checklists to differentiate hazardous from non-hazardous tasks or conditions. Indeed, some checklist items, as written, are vague or call for judgments that defy simple observations for a lack of concrete references (e.g., Are materials moved over minimum distances? "What are minimum distances?"). Common practice is to follow up checklist observations with more precise techniques to confirm problem risk factors.

When using checklists or other more in-depth job analysis techniques, it is important to observe several workers doing a particular job to see if workers of different body sizes use different postures or practices to accomplish the task. One worker will not provide a representation of the way all workers perform the task or of the potential risk factors present.

Various forms and types of checklists exist. The University of Utah Research Foundation has published several on their ERGOWEB Internet site (http://ergoweb.mech.utah.edu/). One of these checklists is for undertaking a general ergonomic risk analysis to identify basic categories of job demands and workplace conditions that may pose a problem. An adaptation of this general checklist form is included in Tray 5–A. "Yes" answers given to questions within each category determine which areas may require followup, using more detailed types of analyses. NIOSH staff has also used a general checklist as a first means for localizing potential problems. It is described in Tray 5–B and focuses on primary job activities.

No one checklist can fit all situations, and it is suggested that checklists be customized for use with different job tasks or types of work so that problems will not be overlooked. Five additional checklists are included, each focusing on different workplace conditions and job task factors. The checklists cover:

Workstation Layout (Tray 5–C)
Task Analysis (Tray 5–D)
Handtool Analysis (Tray 5–E)
Materials Handling (Tray 5–F)
Computer Workstation (Tray 5–G)

One or more of the checklists or items within several checklists can be used or combined to compose a form that is most appropriate for the particular work situation. These five checklists

are written so that a "No" response indicates potential problem areas deserving more investigation.

Other versions of checklists are located in the following references:

Lifshitz Y, Armstrong T [1986]. A design checklist for control and prediction of cumulative trauma disorders in hand intensive manual jobs. Vol. 2. Proceedings of the 30th Meeting of the Human Factors Society, Daytona, Florida, pp. 837–841.

Bhattacharya A, McGlothlin JD, eds. [1996]. Occupational ergonomics. Appendix B. New, York, NY: Marcel Dekker, Inc., pp. 783–802.

Keyserling WM, Brouwer M, Silverstein BA [1992]. A checklist for evaluating ergonomic risk factors resulting from awkward postures of the legs, trunk and neck. Int J Ind Ergonomics *9*:283–301.

Keyserling WM, Stetson BA, Silverstein BA, Brouwer ML [1993]. A checklist for evaluating ergonomic risk factors assocated with upper extremity disorders. Ergonomics *36*(7):807–831.

Checklists can help provide an initial identification of problem jobs or tasks which in some cases may be solved with quick fixes by easy-to-make workstation changes (e.g., the removal of a barrier that may be causing awkward twisting and lifting postures in handling materials). However, the checklist findings must be viewed as a whole to see if individual problem signs do not suggest the same underlying root cause. Targeting interventions to the basic cause in this situation, as opposed to addressing each problem sign, offers a much more effective solution.

Most frequently, followup activities obtain more definitive information on the suspect problems first identified through use of a checklist. As explained in the main text (see Step 4, Identifying Risk Factors in Jobs), added data collection can include (1) time-motion studies to furnish job task and cycle data, (2) measures of workstation layouts, (3) measures of tool handle sizes, weights, and vibration levels, (4) measures of exposures to whole-body vibration and thermal conditions, and (5) biomechanical and physiological determinations. Time-motion study and analyses remain a fundamental procedure in assessing potential problem jobs, and videotaping is typically used for this purpose. Tray 5–H describes a protocol used by NIOSH in videotaping jobs. Its aim is to assure sufficient job cycles, adequate angles of viewing, and variations in worker characteristics so as to offer a representative picture of the work situation for analyses. The analyses of the videotape itself requires special techniques, and much judgment can be needed in determining whether the job conditions present an increased risk of WMSDs. Analytical procedures can be prescribed for rating repetitiveness, force, and postural factors, but it is advisable that persons knowledgeable and experienced be consulted about doing this work.

Tray 5–A. General Ergonomic Risk Analysis Checklist*

Check the box (❑) if your answer is "yes" to the question. A "yes" response indicates that an ergonomic risk factor may be present which requires further analysis.

Manual Material Handling

- ❑ Is there lifting of loads, tools, or parts?
- ❑ Is there lowering of tools, loads, or parts?
- ❑ Is there overhead reaching for tools, loads, or parts?
- ❑ Is there bending at the waist to handle tools, loads, or parts?
- ❑ Is there twisting at the waist to handle tools, loads, or parts?

For further analysis, refer to checklist 5–F.

Physical Energy Demands

- ❑ Do tools and parts weigh more than 10 lb?
- ❑ Is reaching greater than 20 in.?
- ❑ Is bending, stooping, or squatting a primary task activity?
- ❑ Is lifting or lowering loads a primary task activity?
- ❑ Is walking or carrying loads a primary task activity?
- ❑ Is stair or ladder climbing with loads a primary task activity?
- ❑ Is pushing or pulling loads a primary task activity?
- ❑ Is reaching overhead a primary task activity?
- ❑ Do any of the above tasks require five or more complete work cycles to be done within a minute?
- ❑ Do workers complain that rest breaks and fatigue allowances are insufficient?

For further analysis, refer to checklist 5–F.

Other Musculoskeletal Demands

- ❑ Do manual jobs require frequent, repetitive motions?
- ❑ Do work postures require frequent bending of the neck, shoulder, elbow, wrist, or finger joints?
- ❑ For seated work, do reaches for tools and materials exceed 15 in. from the worker's position?
- ❑ Is the worker unable to change his or her position often?
- ❑ Does the work involve forceful, quick, or sudden motions?
- ❑ Does the work involve shock or rapid buildup of forces?
- ❑ Is finger-pinch gripping used?
- ❑ Do job postures involve sustained muscle contraction of any limb?

For further analysis, refer to checklists 5–C, 5–D, and 5–E.

Computer Workstation

- ❑ Do operators use computer workstations for more than 4 hours a day?
- ❑ Are there complaints of discomfort from those working at these stations?
- ❑ Is the chair or desk nonadjustable?
- ❑ Is the display monitor, keyboard, or document holder nonadjustable?
- ❑ Does lighting cause glare or make the monitor screen hard to read?
- ❑ Is the room temperature too hot or too cold?
- ❑ Is there irritating vibration or noise?

For further analysis, refer to checklist 5–G.

*Adapted from The University of Utah Research Foundation "Checklist for General Ergonomic Risk Analysis," available from the ERGOWEB Internet site (http://ergoweb.com/).

Tray 5–A (Continued). General Ergonomic Risk Analysis Checklist

Environment

- ❑ Is the temperature too hot or too cold?
- ❑ Are the worker's hands exposed to temperatures less than 70 degrees Fahrenheit?
- ❑ Is the workplace poorly lit?
- ❑ Is there glare?
- ❑ Is there excessive noise that is annoying, distracting, or producing hearing loss?
- ❑ Is there upper extremity or whole body vibration?
- ❑ Is air circulation too high or too low?

General Workplace

- ❑ Are walkways uneven, slippery, or obstructed?
- ❑ Is housekeeping poor?
- ❑ Is there inadequate clearance or accessibility for performing tasks?
- ❑ Are stairs cluttered or lacking railings?
- ❑ Is proper footwear worn?

Tools

- ❑ Is the handle too small or too large?
- ❑ Does the handle shape cause the operator to bend the wrist in order to use the tool?
- ❑ Is the tool hard to access?
- ❑ Does the tool weigh more than 9 lb?
- ❑ Does the tool vibrate excessively?
- ❑ Does the tool cause excessive kickback to the operator?
- ❑ Does the tool become too hot or too cold?

For further analysis, refer to checklist 5–E.

Gloves

- ❑ Do the gloves require the worker to use more force when performing job tasks?
- ❑ Do the gloves provide inadequate protection?
- ❑ Do the gloves present a hazard of catch points on the tool or in the workplace?

Administration

- ❑ Is there little worker control over the work process?
- ❑ Is the task highly repetitive and monotonous?
- ❑ Does the job involve critical tasks with high accountability and little or no tolerance for error?
- ❑ Are work hours and breaks poorly organized?

Tray 5–B. Ergonomic Hazard Identification Checklist

Answer the following questions based on the primary job activities of workers in this facility.

Use the following responses to describe **how frequently** workers are exposed to the job conditions described below:

Never (worker is never exposed to the condition)
Sometimes (worker is exposed to the condition less than 3 times daily)
Usually (worker is exposed to the condition 3 times or more daily)

	Never	**Sometimes**	**Usually**	**If *USUALLY*, list jobs to which answer applies here**
1. Do workers perform tasks that are externally paced?				
2. Are workers required to exert force with their hands (e.g., gripping, pulling, pinching)?				
3. Do workers use handtools or handle parts or objects?				
4. Do workers stand continuously for periods of more than 30 min?				
5. Do workers sit for periods of more than 30 min without the opportunity to stand or move around freely?				
6. Do workers use electronic input devices (e.g., keyboards, mice, joysticks, track balls) for continuous periods of more than 30 min?				
7. Do workers kneel (one or both knees)?				
8. Do workers perform activities with hands raised above shoulder height?				

Tray 5–B (Continued).

	Never	Sometimes	Usually	If *USUALLY*, list jobs to which answer applies here
9. Do workers perform activities while bending or twisting at the waist?				
10. Are workers exposed to vibration?				
11. Do workers lift or lower objects between floor and waist height or above shoulder height?				
12. Do workers lift or lower objects more than once per min for continuous periods of more than 15 min?				
13. Do workers lift, lower, or carry large objects or objects that cannot be held close to the body?				
14. Do workers lift, lower, or carry objects weighing more than 50 lb?				

GLOSSARY OF TERMS

Facility: The location to which employees report each day for work. For situations in which employees do not report to any fixed location on a regular basis but are subject to common supervision, the facility may be defined as a central location where other OSHA records are maintained. (Note: Synonymous with establishment, as defined in OSHA recordkeeping requirements.)

Primary job activities: Job activities that make up a significant part of the work or are required for safety or contingency. Activities are not considered to be primary job activities if they make up a small percentage of the job (i.e., take up less than 10% of the worker's time), are not essential for safety or contingency, and can be readily accomplished in other ways (e.g., using equipment already available in the facility).

Externally paced activities: Work activities for which the worker does not have direct control of the rate of work. Externally paced work activities include activities for which (1) the worker must keep up with an assembly line or an independently-operating machine, (2) the worker must respond to a continuous queue (e.g., customers standing in line, phone calls at a switchboard), or (3) time standards are imposed on workers.

Tray 5–C. Workstation Checklist

"No" responses indicate potential problem areas which should receive further investigation.

1.	Does the work space allow for full range of movement?	❑ yes	❑ no
2.	Are mechanical aids and equipment available?	❑ yes	❑ no
3.	Is the height of the work surface adjustable?	❑ yes	❑ no
4.	Can the work surface be tilted or angled?	❑ yes	❑ no
5.	Is the workstation designed to reduce or eliminate		
	bending or twisting at the wrist?	❑ yes	❑ no
	reaching above the shoulder?	❑ yes	❑ no
	static muscle loading?	❑ yes	❑ no
	full extension of the arms?	❑ yes	❑ no
	raised elbows?	❑ yes	❑ no
6.	Are the workers able to vary posture?	❑ yes	❑ no
7.	Are the hands and arms free from sharp edges on work surfaces?	❑ yes	❑ no
8.	Is an armrest provided where needed?	❑ yes	❑ no
9.	Is a footrest provided where needed?	❑ yes	❑ no
10.	Is the floor surface free of obstacles and flat?	❑ yes	❑ no
11.	Are cushioned floor mats provided for employees required to stand for long periods?	❑ yes	❑ no
12.	Are chairs or stools easily adjustable and suited to the task?	❑ yes	❑ no
13.	Are all task elements visible from comfortable positions?	❑ yes	❑ no
14.	Is there a preventive maintenance program for mechanical aids, tools, and other equipment?	❑ yes	❑ no

Tray 5–D. Task Analysis Checklist

"No" responses indicate potential problem areas which should receive further investigation.

1. Does the design of the primary task reduce or eliminate		
bending or twisting of the back or trunk?	❑ yes	❑ no
crouching?	❑ yes	❑ no
bending or twisting the wrist?	❑ yes	❑ no
extending the arms?	❑ yes	❑ no
raised elbows?	❑ yes	❑ no
static muscle loading?	❑ yes	❑ no
clothes wringing motions?	❑ yes	❑ no
finger pinch grip?	❑ yes	❑ no
2. Are mechanical devices used when necessary?	❑ yes	❑ no
3. Can the task be done with either hand?	❑ yes	❑ no
4. Can the task be done with two hands?	❑ yes	❑ no
5. Are pushing or pulling forces kept minimal?	❑ yes	❑ no
6. Are required forces judged acceptable by the workers?	❑ yes	❑ no
7. Are the materials		
able to be held without slipping?	❑ yes	❑ no
easy to grasp?	❑ yes	❑ no
free from sharp edges and corners?	❑ yes	❑ no
8. Do containers have good handholds?	❑ yes	❑ no
9. Are jigs, fixtures, and vises used where needed?	❑ yes	❑ no
10. As needed, do gloves fit properly and are they made of the proper fabric?	❑ yes	❑ no
11. Does the worker avoid contact with sharp edges when performing the task?	❑ yes	❑ no
12. When needed, are push buttons designed properly?	❑ yes	❑ no
13. Do the job tasks allow for ready use of personal equipment that may be required?	❑ yes	❑ no
14. Are high rates of repetitive motion avoided by		
job rotation?	❑ yes	❑ no
self-pacing?	❑ yes	❑ no
sufficient pauses?	❑ yes	❑ no
adjusting the job skill level of the worker?	❑ yes	❑ no
15. Is the employee trained in		
proper work practices?	❑ yes	❑ no
when and how to make adjustments?	❑ yes	❑ no
recognizing signs and symptoms of potential problems?	❑ yes	❑ no

Tray 5–E. Handtool Analysis Checklist

"No" responses indicate potential problem areas which should receive further investigation.

1.	Are tools selected to limit or minimize		
	exposure to excessive vibration?	❑ yes	❑ no
	use of excessive force?	❑ yes	❑ no
	bending or twisting the wrist?	❑ yes	❑ no
	finger pinch grip?	❑ yes	❑ no
	problems associated with trigger finger?	❑ yes	❑ no
2.	Are tools powered where necessary and feasible?	❑ yes	❑ no
3.	Are tools evenly balanced?	❑ yes	❑ no
4.	Are heavy tools suspended or counterbalanced in ways to facilitate use?	❑ yes	❑ no
5.	Does the tool allow adequate visibility of the work?	❑ yes	❑ no
6.	Does the tool grip/handle prevent slipping during use?	❑ yes	❑ no
7.	Are tools equipped with handles of textured, non-conductive material?	❑ yes	❑ no
8.	Are different handle sizes available to fit a wide range of hand sizes?	❑ yes	❑ no
9.	Is the tool handle designed not to dig into the palm of the hand?	❑ yes	❑ no
10.	Can the tool be used safely with gloves?	❑ yes	❑ no
11.	Can the tool be used by either hand?	❑ yes	❑ no
12.	Is there a preventive maintenance program to keep tools operating as designed?	❑ yes	❑ no
13.	Have employees been trained		
	in the proper use of tools?	❑ yes	❑ no
	when and how to report problems with tools?	❑ yes	❑ no
	in proper tool maintenance?	❑ yes	❑ no

Tray 5–F. Materials Handling Checklist

"No" responses indicate potential problem areas which should receive further investigation.

1.	Are the weights of loads to be lifted judged acceptable by the workforce?	❑ yes	❑ no
2.	Are materials moved over minimum distances?	❑ yes	❑ no
3.	Is the distance between the object load and the body minimized?	❑ yes	❑ no
4.	Are walking surfaces		
	level?	❑ yes	❑ no
	wide enough?	❑ yes	❑ no
	clean and dry?	❑ yes	❑ no
5.	Are objects		
	easy to grasp?	❑ yes	❑ no
	stable?	❑ yes	❑ no
	able to be held without slipping?	❑ yes	❑ no
6.	Are there handholds on these objects?	❑ yes	❑ no
7.	When required, do gloves fit properly?	❑ yes	❑ no
8.	Is the proper footwear worn?	❑ yes	❑ no
9.	Is there enough room to maneuver?	❑ yes	❑ no
10.	Are mechanical aids used whenever possible?	❑ yes	❑ no
11.	Are working surfaces adjustable to the best handling heights?	❑ yes	❑ no
12.	Does material handling avoid		
	movements below knuckle height and above shoulder height?	❑ yes	❑ no
	static muscle loading?	❑ yes	❑ no
	sudden movements during handling?	❑ yes	❑ no
	twisting at the waist?	❑ yes	❑ no
	extended reaching?	❑ yes	❑ no
13.	Is help available for heavy or awkward lifts?	❑ yes	❑ no
14.	Are high rates of repetition avoided by		
	job rotation?	❑ yes	❑ no
	self-pacing?	❑ yes	❑ no
	sufficient pauses?	❑ yes	❑ no
15.	Are pushing or pulling forces reduced or eliminated?	❑ yes	❑ no
16.	Does the employee have an unobstructed view of handling the task?	❑ yes	❑ no
17.	Is there a preventive maintenance program for equipment?	❑ yes	❑ no
18.	Are workers trained in correct handling and lifting procedures?	❑ yes	❑ no

Tray 5–G. Computer Workstation Checklist

"No" responses indicate potential problem areas which should receive further investigation.

1. Does the workstation ensure proper worker posture, such as

horizontal thighs?	❑ yes	❑ no
vertical lower legs?	❑ yes	❑ no
feet flat on floor or footrest?	❑ yes	❑ no
neutral wrists?	❑ yes	❑ no

2. Does the chair

adjust easily?	❑ yes	❑ no
have a padded seat with a rounded front?	❑ yes	❑ no
have an adjustable backrest?	❑ yes	❑ no
provide lumbar support?	❑ yes	❑ no
have casters?	❑ yes	❑ no

3. Are the height and tilt of the work surface on which the keyboard is located adjustable?	❑ yes	❑ no
4. Is the keyboard detachable?	❑ yes	❑ no
5. Do keying actions require minimal force?	❑ yes	❑ no
6. Is there an adjustable document holder?	❑ yes	❑ no
7. Are arm rests provided where needed?	❑ yes	❑ no
8. Are glare and reflections avoided?	❑ yes	❑ no
9. Does the monitor have brightness and contrast controls?	❑ yes	❑ no
10. Do the operators judge the distance between eyes and work to be satisfactory for their viewing needs?	❑ yes	❑ no
11. Is there sufficient space for knees and feet?	❑ yes	❑ no
12. Can the workstation be used for either right- or left-handed activity?	❑ yes	❑ no
13. Are adequate rest breaks provided for task demands?	❑ yes	❑ no

14. Are high stroke rates avoided by

job rotation?	❑ yes	❑ no
self-pacing?	❑ yes	❑ no
adjusting the job to the skill of the worker?	❑ yes	❑ no

15. Are employees trained in

proper postures?	❑ yes	❑ no
proper work methods?	❑ yes	❑ no
when and how to adjust their workstations?	❑ yes	❑ no
how to seek assistance for their concerns?	❑ yes	❑ no

Tray 5–H. Protocol for Videotaping Jobs for Risk Factors

The following is a guide to preparing a videotape and related task information for facilitating job analyses and assessments of risk factors for work-related musculoskeletal disorders.

Materials needed:

Video camera and blank tapes
Spare batteries (at least 2) and battery charger
Clipboard, pens, paper, blank checklists
Stopwatch, strain gauge (optional) for weighing objects

Videotaping Procedures:

1. To verify the accuracy of the video camera to record in real time, videotape a worker or job with a stopwatch running in the field of view for at least 1 min. The play-back of the tape should correspond to the lapsed time on the stopwatch.
2. Announce the name of the job on the voice channel of the video camera before the taping of any job. Restrict running time comments to the facts. Make no editorial comments.
3. Tape each job long enough to observe all aspects of the task. Tape 5 to 10 min for all jobs, including at least 10 complete cycles. Fewer cycles may be needed if all aspects of the job are recorded at least 3 to 4 times.
4. Hold the camera still, using a tripod if available. Don't walk unless absolutely necessary.
5. Begin taping each task with a whole-body shot of the worker. Include the seat/chair and the surface the worker is standing on. Hold this for 2 to 3 cycles, then zoom in on the hands/arms or other body parts which may be under stress due to the job task.
6. It is best to tape several workers to determine if workers of varying body size adopt different postures or are affected in other ways. If possible, try to tape the best and worst case situations in terms of worker "fit" to the job.
   The following suspected upper body problems suggest focusing on the parts indicated:

   — wrist problems/complaints . . . . . hands/wrists/forearms
   — elbow problems/complaints . . . . . arms/elbows
   — shoulder problems/complaints . . . . . arms/shoulders

   For back and lower limb problems, the focus would be on movements of the trunk of the body and leg, knee, and foot areas under stress due to task loads or other requirements.
7. Video from whatever angles are needed to capture the body part(s) under stress.
8. Briefly tape the jobs performed before and after the one under actual study to see how the targeted job fits into the total department process.
9. For each taped task, obtain the following information to the maximum extent possible:

   — if the task is continuous or sporadic
   — if the worker performs the work for the entire shift, or if there is rotation with other workers
   — measures of work surface heights and chair heights and whether adjustable
   — weight, size and shape of handles and textures for tools in use; indications of vibration in power tool usage
   — use of handwear
   — weight of objects lifted, pushed, pulled, or carried
   — nature of environment in which work is performed–(too cold or too hot?)