

SECTION TWO

TASK 3.0 – REVISION OF LEVEL I ERGONOMIC ASSESSMENT USER’S GUIDE AND CHECKLISTS

2.0 USER'S GUIDE

This User's Guide will enable you to complete all aspects of the Level I Ergonomics Assessment and Problem-Solving Methodology. This guide is applicable to both the Administrative Area Assessments and the Maintenance/Warehouse/Service Assessments. After the first few uses of the Guide, you will be able to efficiently identify job and/or task-specific ergonomics risk factors in all types of work areas addressed in the methodology. Most importantly, however, you will be able to control employee exposure to those risk factors by matching practical and effective solutions to the problems that you identify.

2.0.1 When to Use this Guide.

There are three situations for which use of the Level I Methodology is intended:

- Users responding to an Occupational Illness Investigation form
- Pro-active problem-solving based on results of the Job Requirements/Physical Demands (JR/PD) Survey
- In response to a supervisor request regarding a particular job

For responding to an Occupational Illness Investigation, the methodology can be used to identify a potential job or task-based source of a work-related musculoskeletal disorder (WMSD). For pro-active problem solving, the methodology can be used to conduct a systematic evaluation of an Ergonomics Problem Area (EPRA)-designated shop. In both situations, the purpose is to specify which specific tasks may be the source of ergonomics hazards, and to identify and prioritize Corrective Actions for those tasks.

2.0.2 Five Step Process.

A five step process is provided to keep your work focused and efficient:

- Step 1: Preparation
- Step 2: Risk Factor Identification
- Step 3: Prioritization of Hazards
- Step 4: Hazard Control Selection
- Step 5: Recommendations

The remainder of this section will demonstrate how you can apply the process for both situations.

2.1 STEP 1 - PREPARATION

Item(s) Required: Occupational Illness Investigation form; or JR/PD Survey Summary Report
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The purpose of Step 1 is to help prepare you for the shop visit. It is recommended that you complete Steps 2, 3, and 4 while you are in the shop, and Step 5 after you have returned to the BEF office. After applying the Methodology several times, you can decide what works best for you.

2.1.1 Logistics.

In order to prepare for the shop visit and Steps 2, 3, and 4, you will need:

- An appointment with the work center supervisor
- At least one copy of the Level I Ergonomics Assessment Checklist
- At least one copy of the Ergonomics Summary Report
- The relevant Case Study Problem-Solving Matrices (see Note on Case Study Pre-Selection, below)
- A pencil or pen
- A calculator
- The Occupational Illness Investigation form or results of the JR/PD Survey, depending on the situation

It will be helpful for you to have a desk or work surface near the workstation for which you are conducting the assessment. You should plan on spending up to one and one half hours in the shop. Some visits will take less time. Others may take more time depending upon the situation and how long you will need to remain in the shop to observe all aspects of the job.

Note on Case Study Pre-Selection:

There are currently 78 Case Studies that apply to the various work areas. For Administrative tasks, please refer to the list on page 2 of the Administrative Ergonomics Assessment form; for Maintenance/Warehouse/Service tasks, please refer to page 2 of the Ergonomics Assessment form for these tasks.

For the first few assessments that you complete, it is recommended that you review the Case Studies of the type of tasks that are performed in the shop before the shop visit.

2.1.2 Review of Relevant Data and Job Selection. If you are using the Guide as part of an Occupational Illness investigation, proceed directly to Section 2.2, Step 2 - Risk Factor Identification.

If you are using the Guide to conduct pro-active problem solving in an EPRA-designated shop, complete the following steps:

- Step 1a. Obtain the JR/PD Survey Summary Report for shop from PHF. This Summary Report was used by the installation EWG to determine the work center's EPRA status.
- Step 1b. Review Step 7 on page 2 of the JR/PD Summary Report. Listed in this section are the types of work (e.g., palletizing, picking/stocking) which were reported by over 20 percent of the employees. Your objective is to target the Level I Ergonomics Assessment and Problem-Solving Methodology on those jobs or job classifications (e.g., driving, monitoring, lifting, etc.) that include these types of work or tasks.
- Step 1c. Review the Comments provided for Steps 8, 9, and 10 on page 3 of the JR/PD Summary Report. These Comments, which summarize the comments and suggestions that participants in the survey completed, may identify very specific sources of ergonomics problems and/or improvement opportunities.
- Step 1d. Identify the job classification(s) (e.g., AFSC or civilian job series) that include the types of work identified in Step 1b. When you go to the shop, your first task will be to determine how many employees from each job classification you will need to include in your investigation.

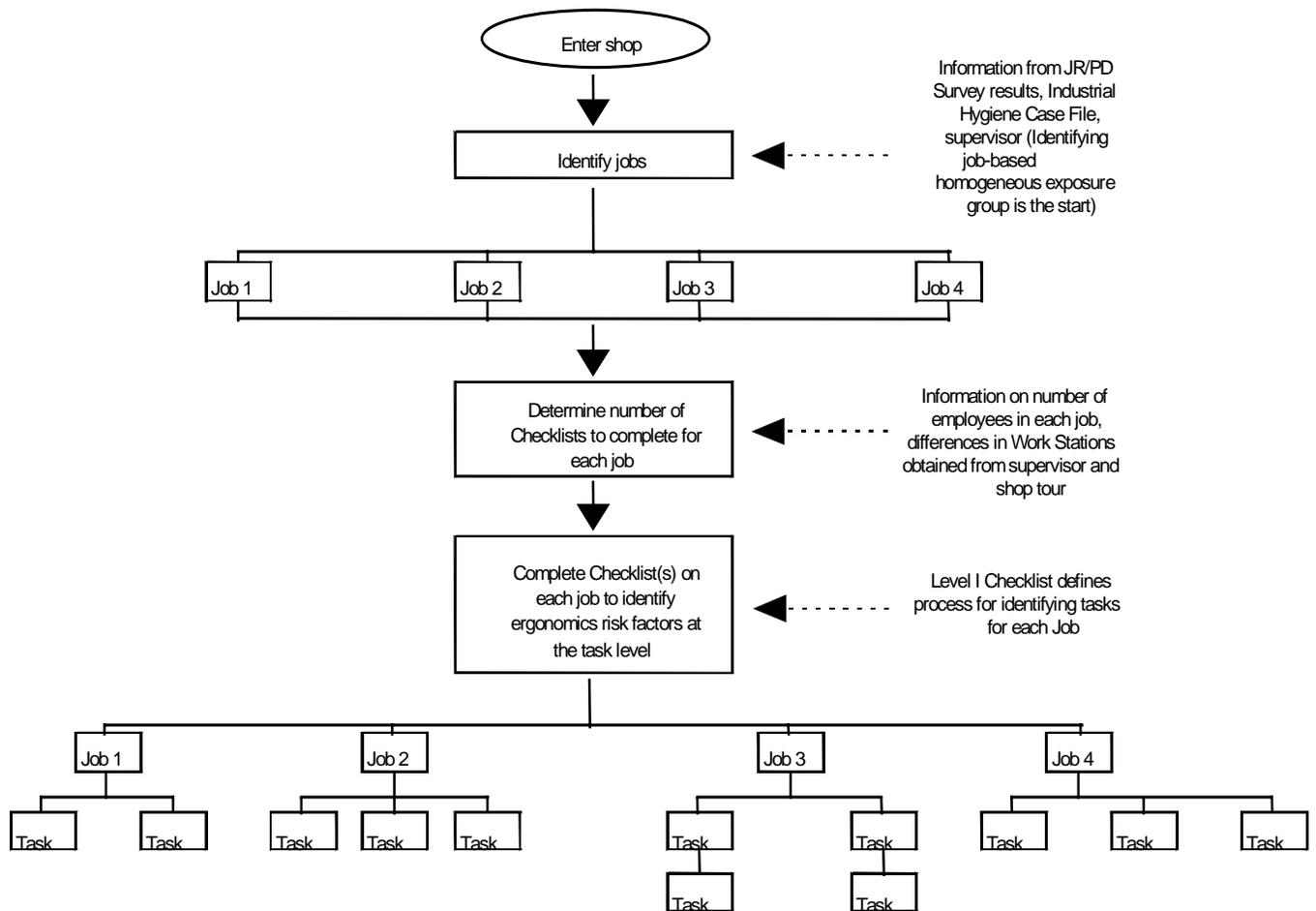
2.2 STEP 2 - RISK FACTOR IDENTIFICATION

Item(s) Needed: Level I Ergonomics Assessment Checklist

The purpose of Step 2 is to identify work-related risk factors to which the employee is exposed. You will use the Level I Ergonomics Assessment Checklist to complete Step 2.

If you are responding to an Occupational Illness Investigation, proceed to Step 2d.

If you are using the Guide to conduct pro-active problem solving in an EPRA-designated shop, complete the following steps. You may also refer to Figure 2.1 to see how an ergonomics assessment proceeds from entering the shop to performing the actual assessment.



**Figure 2.1
Selecting Jobs and Performing the Assessment**

- Step 2a. After entering the shop and introducing yourself to the shop supervisor, explain the purpose and method for completing the Level I Ergonomics Assessment Checklist.
- Step 2b. Make reference to the Industrial Hygiene Case File and previous attempts to identify the primary jobs in the shop. Verify these jobs with the supervisor and ask the supervisor how many employees perform each one of the jobs. (Note: This approach makes your starting point a job instead of an individual employee - unless you are responding to an Occupational Illness investigation.)
- Step 2c. Determine how many employees you need to observe and/or how many checklists you will need to complete for each job.

There is no firm rule on how many employees make up a representative sample of a job classification or homogeneous exposure group. A homogeneous group is a group of employees and/or their jobs that have similar characteristics (similar tools, equipment, work situations, and critical task distributions). You may want to begin by including 20 percent of the population or 3 employees, whichever number is greater. Or, if there are 3 or fewer employees in a job category, include all of the employees.

The following factors typically determine the number of checklists that are required:

- The number of different work situations in which the job occurs (e.g., performed on aircraft, performed on bench)
- The number of different types of tools or equipment, or devices used
- The distribution of critical tasks in the job

Take the example of the job "Molding" in a plastic shop. Say that there are two common parts that must be molded, Molding A and Molding B. If both moldings are made at the workstation, if the same equipment and tools are used during the process, if there is the same amount of grinding, sanding, trimming, etc. for each molding, and if the designs do not require the employee to use a completely different work procedure (e.g., one is done standing, one is done sitting), then the Moldings A and Molding B jobs can be considered the same job. The checklist(s) completed for Molding A also applies to Molding B. If the distribution of critical tasks is appreciably different (e.g., sanding makes up 80% of Molding A repair but only 20% of Molding B repair), you will need to conduct the Level I Assessment separately for each molding job. Also consider posture and movement. For instance, Molding A may be on a part 18 inches tall, while Molding B may be on a part 6 inches tall. If both jobs are performed on a bench, additional factors need to be considered. These factors include reaching overhead to sand the Molding A part.

To complete the appropriate number of checklists for each job type, follow the steps below:

- Complete a checklist for the first work situation, noting the tools, equipment, and tasks performed.
- Go to the next work situation in which the job is being done.
- If there are no significant differences in the tools, equipment, or distribution of critical tasks, then there is no need to complete another checklist. Simply observe the job/tasks to make sure that the risk factor exposure is not significantly different.
- If there are significant differences in the tools, equipment, or distribution of critical tasks, then complete a new checklist for that work situation.
- Repeat this process for all work situations that make up the representative sample for the job classification. Develop recommendations for each checklist. These recommendations will apply (in general) to all work situations in the homogeneous group evaluated by that checklist.

2.2.1 Format.

The Level I Ergonomics Assessment Checklist is comprised of a cover page and four parts:

- Cover Page
- Part I: Work Content (Description of Tasks Performed)
- Part II: Job Factors Checklist
- Part III: Environmental Factors Checklist
- Part IV: Employee Suggestions

2.2.2 Cover Page.

The purpose of the cover page is to identify the work center (shop), location of the work, the name of the job, etc. You will have one cover page for each job. If you complete multiple Checklists for the same job, you should use the same cover page.

Step 2d. Collect the information for the cover page from the supervisor and/or the employee and record in appropriate spaces.

2.2.3 Part I: Work Content (Description of Tasks Performed).

Part I helps you get the employee to describe, in a standardized way, the individual tasks which comprise his or her job. The different task types are listed in the “Task Key List,” one for Administrative areas and one for Maintenance/Warehouse/Service areas. These task types are consistent with the task types listed in Part III of the JR/PD Survey. For both analysis tools, the task types were selected as representative of the most common types of administrative, maintenance, warehouse, and service tasks. Additional space is provided to record other tasks that the employee may describe.

In order to identify appropriate jobs to assess, you must help the employee (or supervisor) try to think about the jobs and tasks that are the most fatiguing or difficult on the body. Any information from the employee (e.g., “doing dishes”, etc.) may help you identify several initial targets for your assessment. The second question will help you get an idea from the employee about those jobs that are done on a regular basis. Your goal is to identify the job (e.g., keying/mousing) that will become the focus of your Level I Assessment. Then, you can proceed to the Work Content Matrix with a specific job in mind.

The Work Content Matrix is designed to allow one of three responses under the “Task Frequency” heading. The frequencies (e.g., low, moderate, high) allow you to categorize the tasks by the amount of time devoted to the task when the job is performed. A gray shaded area is superimposed in the matrix to make a distinction between routine tasks and tasks which represent a less significant part of the job. The gray shaded area includes tasks that make up more than 10% of the job (moderate or high frequency). The gray shaded area also includes lifting/exertion tasks. All instances of lifting or exertion are considered critical tasks and should be included in the assessment.

Information provided in the completed matrix is very important. First, it enables you to break a potentially complex job down into smaller components or “tasks” that can be easily analyzed. Second, it enables you to maximize the value of the subsequent assessment by focusing problem-solving efforts on the routine tasks - referred to for the remainder of the assessment as “critical tasks.”

Performance measures are also recorded to help you justify the need for ergonomics improvement. For example, if the employee’s performance is judged according to the quality of the surface finish on an aircraft component, and the current work area arrangement makes the surface more difficult to grind, you may be able to obtain support to fabricate a height-adjustable holding fixture. The rationale behind the suggested corrective action is to help the employee do a better job, do the work faster, and also reduce the potential for a shoulder WMSD.

Obtain the following information directly from the employee:

- Step 2e. Turn to Page 1, *Part I - Work Content* (Description of Tasks Performed).
- Step 2f. Verify with the employee that the job you are targeting (you identified this job for investigation in Step 2b.) is performed on a regular basis (or occurs most frequently) in the shop. Note: If the employee mentions jobs that you do not have in the Industrial Hygiene Case File or that were not mentioned by the supervisor, you may wish to add these jobs to your list of target jobs for the Level I Assessment.
- Step 2g. Ask each employee to explain the *purpose of the job*. The objective is to develop a complete understanding of why the job exists and the type of work done by the employee. As you talk with the employee, refer to page 2, Work Content (Description of Tasks Performed). Circle those tasks which the employee mentions. If a task is not listed on page 2 of the assessment, use the blank lines to write in the task names (e.g., meeting with others) and mark the appropriate time estimate.
- Step 2h. *Fill out the Work Content Matrix*. Write the tasks on page 1, the Work Content Matrix. Ask the employee to indicate the task frequency and mark the appropriate circle. Also note if Lifting/Exertion occur while completing the task.
- Step 2i. *Ask about performance measures*. Ask the employee to describe the performance measures used to measure success in that job. Some employees may not be able to provide this type of information if their performance has not been formally measured in the past. When this is the case, simply ask the employee, "How would you know whether a person doing your job was doing a good job? - What would you look for?" Record the responses in the *Work Performance* box on the bottom of page 1.

Figure 2.2 illustrates a completed Work Content Matrix.

Task	<u>Lifting/ Exertion</u> Occur in Task	<u>Task Frequency</u> (Check one)		
		(Low) 0-9%	(Moderate) 10-50%.	(High) 51-100%
1. Baking	X	<input type="radio"/>	X	<input type="radio"/>
2. Dishwashing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	X
3.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

 = Critical tasks are indicated by the shaded boxes in the Work Content Matrix. Critical tasks are tasks which occur greater than 10% of the job time or which involve lifting or high forces.

**Figure 2.2
Work Content Matrix**

2.2.4 Part II: Job Factors Checklist.

The format of the checklist enables you to perform an ergonomics analysis for each of the critical tasks. The tasks are analyzed individually to identify the specific source of exposure to ergonomic risk factors. It is not usually the “job” that causes fatigue or discomfort; rather, it is the individual tasks that are the source. You may not be able to change the task. However, it may be possible to address the part of the job that requires prolonged repetitive work or awkward body posture. Figure 2.3 shows one page of the Job Factors Checklist.

The *Job Factors* questions have been grouped into five “body zones”:

- Shoulder/Neck
- Hand/Wrist/Arm
- Back/Torso
- Legs/Feet
- Head/Eyes

The body zones are consistent with those used in the JR/PD Survey. The questions are representative of the types of ergonomic risk factors that are most likely to be found in Air Force Administrative, Maintenance, Warehouse, and Service work areas.

Part II - Checklist, Legs/Feet

Job Factors

For each Job Factor, select the appropriate Job Factor Frequency score in the appropriate Task Frequency column using the following guidelines:

Frequently (F): Job Factor occurs more than 50% of the task time

Sometimes (S): Job Factor occurs for 10-50% of the task time

Infrequently/Never (N): Job Factor occurs less than 10% of the task time or does not apply

Critical Tasks

Job Factor	Task Name:	Task Name:		Task Name:		Comments		
		Task Frequency		Task Frequency			Task Frequency	
		Moderate 10-50%	High 51-100%	Moderate 10-50%	High 51-100%		Moderate 10-50%	High 51-100%
 4.1 Standing in a fixed position (especially on hard floor surfaces)	F S N 1 1 0	F S N 4 1 0	F S N 1 1 0	F S N 4 1 0	F S N 1 1 0	F S N 4 1 0		
 4.2 Exposure to hard edges or surfaces (e.g., edge of chair presses into back of leg, task requires leaning against the hard edge of a table)	F S N 1 1 0	F S N 4 1 0	F S N 1 1 0	F S N 4 1 0	F S N 1 1 0	F S N 4 1 0		
 4.3 Awkward leg postures (e.g. kneeling, squatting, crawling, etc.)	F S N 1 1 0	F S N 4 1 0	F S N 1 1 0	F S N 4 1 0	F S N 1 1 0	F S N 4 1 0		
Task Scores = (column total)								

Figure 2.3
Administrative Job Factors Checklist

The questions were designed to ensure that each general risk factor type discussed in the scientific literature (e.g., posture, force, repetition, etc.) was reflected for each body region. The questions and illustrations were also designed to prevent the need for you to repeatedly refer to a glossary when completing the checklist. However, a glossary is provided to assist you the first few times you use the checklist. No measurements are required to complete the checklist. All of the questions may be answered based on observing the employee at work.

For each question, you can assess the employee's exposure to the Job Factor as *Frequently*, *Sometimes*, or *Infrequently/Never*. First, you will indicate whether or not the task is a "moderate" or "high" frequency component within the overall job. You will then circle the appropriate Job Factor responses under that column. If the Job Factor occurs greater than 50% of the task time (e.g., the employee is exposed to awkward leg postures "more" rather than "less" of the time) and the task is a "high" task, you circle the *Frequently* (F=4) response. If the Job Factor occurs between 10% to 50% of the task time and the task is a "high" task, circle the *Sometimes* (S=1) response. If the job factor occurs for less than 10% of the task, or the Job Factor does not occur, or the question is not applicable to the task, circle the *Infrequently/Never* (N=0) response.

The three response choices are provided for each of the "Moderate" and "High" categories to maximize the consistency of assessment results between users and to minimize the need for interpretation and estimating actual time. It is significantly easier to decide if a Job Factor occurs "more" or "less" than 1/2 the time than it is to make a consistent distinction between 1/3, 2/3, etc. In addition, many warehouse and assembly jobs include Job Factors that occur, but to a much lesser extent (e.g., <10%). Users of previous versions of the guide will note that the "Infrequently" response choice has been combined with the "Never" response choice. This was designed to recognize and account for risk factors that will be observed, but will not be observed anywhere near the 50% level. The numerical ratings provided for each response were determined based on the relative contribution of the Job Factor type to WMSDs as well as the impact of exposure duration. Providing a numerical rating for each response allows the scoring process to be relatively fast and easy.

A numerical Task Score is calculated for each task by adding the numbers in the column. The Task Score represents the degree to which the task exposes the employee to ergonomic risk factors. The score is compared to evaluation criteria (0-3/Low, 4-7/Medium, and 8+/High) which allows you to establish priorities for problem solving.

After obtaining a job description and a basic task frequency breakdown from the employee, you are ready to begin *Part II - Ergonomics Checklist/Job Factors*.

In some cases, the employee will not be performing all of the critical tasks at the time of your observation. When this is the case, ask the employee to demonstrate each of the critical tasks. Complete the checklist for each task during the demonstration.

- Step 2j. Turn to Page 2, Part II - Checklist, Shoulder/Neck and review the definition for Frequently (F), Sometimes (S), and Infrequently/ Never (N).
- Step 2k. From Page 1 of the checklist, note the tasks from the marked circles in the gray area and write the task(s) on the blank lines under Critical Tasks. If there are more than 3 tasks, put the additional tasks on another checklist.
- Step 2l. In the work Content Matrix, you identified the tasks rated as moderate (10%-50%) or high (51%-100%). Note the tasks that occur less than 10% of the time are excluded from the assessment.
- Step 2m. Next, answer each question for *each* task by circling (F), (S), or (N) in the appropriate Task Frequency column.
- Step 2n. After you have answered *every* question for each task, compute the *Task Scores* (add each column and total at the bottom). The Comments box in the far right column is for additional notes regarding the tasks.
- Step 2o. Repeat the identical process four more times. Review each critical task again for Hands/Wrist/Arm; Back/Torso; Legs/Feet; and Head/Eyes. Record the all of the results in the same way as for Shoulder/Neck.

2.2.5 Part III: Environmental Factors.

Four criteria are provided to assess potential exposure to general environmental factors/stressors (restricted space, temperature, noise, and indoor air quality). Responses are based on five levels of potential exposure (strongly disagree to strongly agree) and are scored on a 4-point scale. This section of the assessment is completed either by asking the employee to rate each one of the factors or by referring to environmental data in the BEF case files or the Command Core System (CCS). See the Glossary for descriptions of each Environmental Factor. Figure 2.4 shows the Environmental Factors.

Part III - Environmental

Environmental Factors	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
	1	2	3	4	5
1. Restricted space	0	0	0	1	4
2. Extreme temperatures - heat/cold	0	0	0	1	4
3. Noise and/or distractions	0	0	0	1	4
4. Air quality concerns	0	0	0	1	4

Environmental Score =

Environmental Rating	Low	Med	High
Environmental Score	0-3	4-7	8+

**Figure 2.4
Environmental Factors**

This data indicates employee exposure to environmental factors that may be impacting the way the employee performs the job/tasks. For example, working in a restricted space may be one of the reasons why the employee must reach or lean forward. The environmental rating is not used to determine the overall job priority score or priority scores for individual tasks. It is, however, accounted for during the problem-solving process.

Complete the following:

- Step 2p. Turn to page 7, *Part III - Environmental* and answer the questions relating to Environmental Factors and circle the appropriate number.
- Step 2q. Total the numbers and write the score in the Environmental Score box and circle the appropriate rating *High, Medium, or Low*.

2.2.6 **Part IV: Employee Suggestions.**

Employee involvement is critical in the problem identification and problem solving processes. Employees who have previously completed the JR/PD Survey may have already provided feedback on improvement opportunities. Your questions for the employee in Part IV should have a slightly different focus. The JR/PD Survey asked about general improvement opportunities for the shop. Part IV enables you to record any comments or suggestions that the employee may have on how to improve the specific job. Employee suggestions must be thoughtfully considered and evaluated along with the controls provided in the Case Study Problem-Solving Matrices when you develop the final list of recommendations in Step 5.

- Step 2r. Ask the employee for any suggestions for Corrective Actions that he/she may have. *The employee may have provided you with improvement suggestions during the initial interview.* Record all employee comments.

The on-site part of the Level I Ergonomics Assessment Checklist is now finished.

Detailed information on question interpretation and research references is contained in the Checklist Glossary.

2.3 STEP 3 - PRIORITIZATION OF HAZARDS

Item(s) Needed: Completed Level I Ergonomics Assessment Checklist Checklist Scoring Summary
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The purpose of this step is to “score” the Level I Checklist in order to determine the employee’s exposure to ergonomics risk factors from the individual tasks and from the job overall. You will use the Checklist Scoring Summary Form to determine the exposure.

2.3.1 The Checklist Scoring Summary Design.

The *Checklist Scoring Summary* design resulted from a combination of findings from the literature review as well as the consensus judgment from experienced ergonomists at ADL. In the literature, there is a lack of validated methods for determining a “threshold” between “ergonomic problem/risk of WMSD” and “no ergonomic problem/no risk of WMSD.” Therefore, the scoring concept and results generated by the assessment are designed to *prioritize* the need for Corrective Actions based on the highest exposure to ergonomic hazards. In other words, a *High* rating *means that exposure to risk factors which have been associated with WMSDs is high*. **It does not mean that the risk for injury is high.** When interpreting results, you should focus problem-solving efforts on any job, task, or body region that is rated *High* or *Medium*.

Priority scores are generated for each body region, for each task, and for the overall job. Priority ratings are provided for body regions, tasks, and overall priority based on the highest score in that data. Figure 2.5 shows the Scoring Checklist Summary.

Technician

Date _____

Job Description

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Scoring Summary: Transfer scores from individual scoring sheets.

Body Region	Task Scores					Priority Score by Body Region	Priority Rating by Body Region
	Task Name:	Task Name:	Task Name:	Task Name:		Add across row and divide by # of tasks for average	High: 8+ Med: 4-7 Low: 0-3
<u>Shoulder/Neck</u>					=		High Med Low
<u>Hand/Wrist/Arm</u>					=		High Med Low
<u>Back/Torso</u>					=		High Med Low
<u>Legs/Feet</u>					=		High Med Low
<u>Head/Eyes</u>					=		High Med Low
Select the highest body region score for each task then circle below for High, Med, Low	Highest Score	Highest Score	Highest Score	Highest Score		Environmental Rating	
High: 8+ Med: 4-7 Low: 0-3	High Med Low	High Med Low	High Med Low	High Med Low		High Med Low	
Overall							
						Highest Priority Score by Body Region	Overall Priority Rating High Med Low

**Figure 2.5
Checklist Scoring Summary**

2.3.1.1 Body Region Score. Body Region scores for each task are determined by totaling the responses to the Job Factor questions for each task. Body Region scores for the job as a whole are determined by averaging scores across tasks. The averaging process was selected to reflect the beneficial impact of task variety. Consider the following example jobs:

- Job A is comprised of just one task: palletizing. This task exposes the shoulder/neck to a High level of ergonomic risk factors (Body Part Score = 8). Since there is only one task, the Body Region Priority Score = 8, which is a High rating.
- Job B is comprised of two tasks: palletizing and scanning. This palletizing task, which is performed for five hours per day, exposes the shoulder/neck to a High level of ergonomics risk factors (Body Part Score = 8). The scanning task, which is performed for three hours per day, exposes the shoulder/neck to a Low level of ergonomics risk factors (Body Part Score = 2). The Body Region Score is derived by adding the “8” for palletizing and the “2” for scanning, and dividing by the number of critical tasks ($8 + 2 = 10 / 2 = 5$). Therefore, the average Body Region Priority Score = 5, which is a Medium rating.

Comparison of the Body Region Priority Score for the two tasks suggests that Job B is easier on the shoulder/neck than Job A. The Medium rating on Job B suggests that, since the employee spends part of the day performing a task (scanning) which provides some relief to the shoulder/neck, the overall potential for a shoulder/neck problem is reduced. This is consistent with the ergonomics research literature that indicates that a job designed with task variety should reduce the overall potential for WMSD development. Also, since the rating system still indicates that when palletizing is performed the shoulder/neck is at High priority, you are directed to identify controls which reduce exposure to ergonomics risk factors that impact the shoulder/neck during palletizing.

While averaging may not always reflect the precise daily physical experience of the employee, it provides you with a standardized method for determining the impact of overall daily exposure. Averaging can also help focus problem-solving efforts over a broad spectrum of jobs in order to achieve the desired impact on employee health and safety.

2.3.1.2 Task Score.

The individual Task Score is determined by selecting the highest numerical body region score for that task. The highest numerical body region score is converted into a High, Medium, or Low rating. No score averaging is done since the feeling of fatigue or pain, which are often precursors to WMSD development, is not “averaged” throughout the body by the employee. For example, if exposure to a high level of risk factors causes an employee’s shoulder to hurt, the employee

does not think, “my shoulder hurts, but the rest of my body is OK, so I must be OK.” Rather, the employee reports a shoulder problem because that part of the body hurts. Therefore, if the shoulder is exposed to a high level of ergonomic risk factors, the Task Score reflects that most significant exposure.

2.3.1.3 Overall Job Priority Score.

The Overall Job Priority Score (*High, Medium, or Low*) is determined by selecting the highest Body Region Priority Score. The basis for this scoring concept is identical to that which was described for the Scoring Summary. The Overall Priority Rating is used to determine which jobs present the most risk for WMSDs and require attention first.

2.3.1.4 Use of the Scores and Ratings.

While the Overall Job Priority Rating/Score is used to determine which *jobs* to address first, Task Ratings/Scores are used to determine which *task(s) within the job* need to be the focus of problem-solving efforts. The Body Region Scores for each task are used to identify controls for the body parts that are exposed to the highest level of ergonomics hazards.

In summary, there are three major steps to completing the prioritization of hazards:

Step 3a. Complete the top entries on the form (date, name, etc.).

Step 3b. Complete the Scoring Summary.

- The first step is to transfer the names of the *critical tasks* selected for the Level I Ergonomics Assessment Checklist (e.g., calling, palletizing) to the *Task Scores* columns.
- Next, transfer the *task scores* (column total) from each individual checklist (e.g., *Shoulder/Neck, Hand/Wrist/Arms*) to the appropriate task column. Once you have transferred *all* task scores for *each* critical task it is time to select the highest body region score (per task).
- Next, select the *highest* Body Region Score from each task and write the number in the *Highest Score* box at the bottom of each Task Name column. Then circle the appropriate box below for *High, Medium, or Low* for that task.
- Now add across the rows and calculate the *average* to obtain a *Priority Score by Body Region*. (To obtain the average, add across the row and divide by the number of tasks.) Be sure to calculate the average for all Body Regions (e.g., *Shoulder/Neck, Back/Torso*, etc.) and then circle the appropriate response (High, Medium, or

Low) for that body region in the *Priority Rating by Body Region* column.

- From page 7 of the Level I Ergonomics Assessment Checklist transfer *High, Medium, or Low* Environmental Rating to the *Environmental Rating* box.
- Finally, at the bottom/right of the page, complete the *Overall* box. Into this box, transfer the highest average body region score from the *Priority Score by Body Region* column above and circle *High, Medium, or Low*.

2.4 STEP 4 - HAZARD CONTROL (Selection of Corrective Actions)

Item(s) Needed:	Completed Checklist Scoring Summary Case Study Problem-Solving Matrices Corrective Actions List
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Step 4 represents the start of the pattern-matching process.

2.4.1 Case Study Selection

The purpose of this step is to select the Case Studies that “match” the critical tasks identified during the scoring process in Step 3. This is the main connection between the checklist results and the Case Study Problem-Solving Matrices. It is the foundation of pattern matching. Select the case studies that match the critical tasks that you identified for this job. Figure 2.6 shows a combined case study selection list from Administrative and Maintenance/Warehouse/Service Ergonomics Assessments.

2.4.2 Case Study Design and Use.

Seventy-eight (78) Case Study Problem-Solving Matrices have currently been developed and more will be added over time. The task types that were the basis for the case studies were selected by the Air Force and are consistent with “Types of Work” listed in Section III of the JR/PD Survey.

Each of the case studies presents the Job Factors commonly associated with the task type. For each Job Factor (e.g., *reaching*), the causes of the Job Factor (e.g., *the work is located too far from the employee*), and a menu of controls that reduce or eliminate the Job Factor (e.g., *remove obstructions between the work location and the employee*) are provided.

The content of the Case Studies is based, in part, on a review of representative Air Force administrative, maintenance, warehouse, and service tasks. The Potential Causes and Corrective Actions were also extracted from the results of years of practical applications work completed by experienced ergonomists. The content has been generalized such that they may be applied to *any* USAF administrative, maintenance, warehouse, or service job.

The information is organized in the following sections:

Task Title: In most cases the task title is simply a restatement of the case study name.

COMBINED CASE STUDY LIST	
1. Abrading	41. Media Blasting – Blast Cabinet
2. Assembling/Disassembling – Internal Components	42. Media Blasting - High Pressure Gun
3. Assembling/Repairing – Benchwork	43. Melting
4. Bagging	44. Molding
5. Baking	45. Monitoring (of displays)
6. Bolting/Screwing	46. Nailing
7. Calling (Telephone Use)	47. Opening/Closing Heavy Doors
8. Chipping	48. Ordnance Disposal
9. Cleaning by Hand	49. Packing
10. Cleaning with High Pressure Equipment	50. Packing/Shipping
11. Coating/Immersing	51. Painting/Spraying
12. Commissary/Meat Cutting	52. Palletizing
13. Cooking (Food Preparation)	53. Patient Handling
14. Cooking (Short Order Grill)	54. Paving
15. Copying/Sorting	55. Picking/Stocking
16. Crimping	56. Prying
17. Cutting/Shearing	57. Pumping
18. Dishwashing	58. Riveting/Bucking
19. Drafting/CAD System Use	59. Sanding
20. Drilling	60. Sawing
21. Driving (Vehicles)	61. Scanning Groceries/Tendering
22. Excavating/Shoveling	62. Scanning/Bar Code Reading (Hand-held)
23. Filing/General Administrative	63. Sewing
24. Flame Cutting	64. Soldering
25. Folding/Fitting	65. Stapling
26. Food Serving	66. Stripping/Depainting by Hand
27. Fork Lift Truck Operating (sitting)	67. Stripping/Depainting by Mechanical Methods
28. Fork Lift Truck Operating (standing)	68. Transporting Loads on Non-powered Carts
29. Forming	69. Turning Valves
30. Gluing/Laminating (Doping)	70. Tying/Twisting/Wrapping
31. Grinding	71. Using a Calculator/Numeric Key Pad
32. Hammering	72. Using a Computer
33. Hose Handling	73. Using a Microscope
34. Inspecting and Repairing Support Equipment	74. Visual Inspection
35. Lifting	75. Welding
36. Loading/Unloading	76. Wiring
37. Lubricating	77. Wrenching/Ratcheting
38. Machining	78. Writing/Illustrating
39. Masking	
40. Masoning	

Figure 2.6
Case Study Selection List

Task Description: The task description provides details on the type of equipment that is typically used to perform the task (e.g., manual or power tools, etc.), the length of time over which the task is typically performed, and other materials that may be used. Also provided is a list of typical jobs in which the task is performed. This information also helps you determine if you are looking at the most appropriate case study(ies) for the job.

Job Performance Measures: This section indicates which performance measures (e.g., productivity, quality, etc.) are typically impacted by implementing ergonomic improvements. This information, in addition to the job-specific performance measures obtained when completing the Level I Ergonomics Assessment Checklist, could be used by the technician to justify the need for change.

Typical Employee Comments: The information in this section is provided to help you judge whether or not employee comments obtained with the checklist are consistent with problems or concerns that employees typically report for the task type. In other words, if an employee, whose job involves continuous dishwashing, comments about stiffness in the neck and shoulders, you can check the “Typical Employee Comments” section of the Dishwashing case study to see if the discomfort is common for employees who wash dishes.

Suggested Level II Analysis. If you are unable to identify the causes or source of the ergonomic concerns, or if you feel that a more detailed analysis is required (e.g., complex job) each case study recommends the type of Level II Analysis that may provide additional information to evaluate and control WMSDs.

Job Factor, Potential Causes, Corrective Actions. The case study design enables you to make a direct match between the Job Factor present in the task, and that same Job Factor in the Problem-Solving Matrix. Figure 2.7 shows part of a Case Study.

For example, if you observed that the job required the employee to *use repeated reaching or arms held away from the body while unsupported*, it is possible to match that Job Factor with the same Job Factor in the left hand column of the matrix. For each Job Factor, the guide has identified the most common *Potential Causes* or aspects of the work procedure that, if not designed or adjusted properly, can cause the Job Factor to be present.

As shown in Figure 2.7, if you determined that the reach distance for pulling trays from the conveyor caused the reaching observed in the job, you can then refer to the Corrective Actions list to see what types of controls are available to address the problem. For this example, three choices are provided: Move close to the work location (relocate the worker to the end of the conveyor); move the work piece closer to the person (reduce the reach-over width of the sort area), and

provide appropriate tools (provide a “rake” type tool to pull dishes). You must decide which of the Corrective Actions would best control or eliminate the Job Factor.

<u>Shoulder/Neck</u>							
Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
Repeated reaching of arms held away from the body while unsupported: below shoulder level (15-90 degrees away from body) above shoulder level (>90 degrees away from body)	<ul style="list-style-type: none"> Reach distance for pulling tray from conveyor 	I13. Move closer to the work location <ul style="list-style-type: none"> Relocate the worker to the end of the conveyor to avoid reaching across intervening surface 	✓		low	med	med
		I14. Move work piece closer to body <ul style="list-style-type: none"> Reduce the reach-over width of the sort area design conveyor to flow directly to personnel with little or no intervening counter G7. Provide appropriate tools <ul style="list-style-type: none"> Provide a “rake” type tool to pull dishes 		✓ ✓ ✓	med to high med to high low to med	med high low	med med low

Figure 2.7
Example Problem-Solving Matrix

The case studies also include information that helps you choose the control options that result in the greatest reduction of strain on the body part for the least cost. For each control, the *Level of Changes* columns indicate if the control is typically a *Minor Modification* or *Major Change*. The controls that are listed as *Minor Modifications* involve little or no cost. In most cases, this level of control can be implemented by making adjustments to the current work area. Approximately 50 percent of the controls provided in the case studies are at this level. The *Major Change* category includes controls such as *provide a lighter weight tool*. The distinguishing characteristic of major changes is that the shop will usually need to buy something. They may need to identify a product in a catalogue (e.g., chair, anti-fatigue mat, tool balancer, etc.), have the product

delivered for trial, and make a purchase if they find a true benefit. If controls listed in this category are appropriate, they may need to be planned as a long-term change since they may be expensive.

Information on cost is provided only in general categories; *Low, Medium, and High*. This broad categorization was intentional and was based on USAF guidance because each base may have a different idea about what represents *Low, Medium, or High* cost.

The case studies also provide information on how implementation of the control is expected to impact quality and/or productivity (“Impact On” columns). This information was compiled based on a consensus decision of experienced ergonomists at ADL who have seen similar results in their own application work. You may use this information as further justification for change.

2.4.3 Corrective Actions.

The next step in the pattern-matching process is to select the Corrective Actions in a case study that “match” the problems. As you identify an appropriate Corrective Action in a case study, you will check off that selection on the Corrective Actions List. See Figure 2.8 for an example of possible Corrective Action List choices.

In the Corrective Actions List, all of the controls from all of the Case Study Problem-Solving Matrices have been provided. For instance, in the previous example, if you had identified that the job required *Repeated reaching of arms held away from the body while unsupported*; and that the cause was *Reach distance for pulling trays from conveyor*; and determined that *Move closer to the work location* was the appropriate solution, you would then make a “check” mark in the “Action Selected” box for the corrective action *Move closer to the work location*.

The Corrective Action numbers on the list are the same numbers in the case studies. This allows you to quickly locate and mark the control when using the case studies. Two response columns are provided: Minor (modifications and adjustments), and Major (major changes). The columns have been blocked such that the check mark is placed in the column that represents the level of control indicated in the case studies. This distinction is made in the Corrective Actions List to minimize the amount of time required for developing the final recommendations.

There is one additional column: “Implementation Reference.” In this column you have been provided with a reference to the Modifications and Design Criteria Section. The referenced pages include additional detail that you may use to “implement” the corrective action. This information will be particularly important

as you develop your final recommendations in Step 5, especially for major change.

Group Letter	Group Title	Number	Corrective Action	Action Selected		Implementation Reference
				Minor	Major	
I	Work Surfaces					
		I1	Provide adequate work space			
		I2	Provide a larger work surface			
		I3	Angle the worksurface to bring the work closer to the body and the eye			I.4.4
		I4	Provide an auxiliary table			
		I5	Provide a work surface that is height adjustable			
		I6	Reduce the angle a person has to turn to transfer an item			
		I7	Remove obstructions			
		I8	Re-design the work space			
		I9	Raise the person			
		I10	Raise the work piece/work surface			I.4
		I11	Lower the person			
		I12	Lower the work piece/work surface			I.4
		I13	Move closer to the work location			I.3.1/3.2

Figure 2.8
Corrective Actions List – (Partial List)

In summary, there are seven major steps in completing the Hazard Control selection.

Step 4a. Review the information in the Checklist Scoring Summary to select the Case Study Problem-Solving Matrices most appropriate for identifying controls. Select the case study or studies that match each of the Critical Tasks whose Task Score is a high or medium.

You may also choose to review case studies for “low” rated tasks at your discretion. Place a check mark in the appropriate box (or boxes) and then turn to the corresponding Case Study Problem-Solving Matrix (or Matrices) in the Case Study Problem-Solving Manual.

Now that you have identified the appropriate Case Study Matrix or Matrices, you need to identify Corrective Actions. For this, you will need the Level I Ergonomics Assessment, the relevant Case Study Problem-Solving Matrices, and the Corrective Actions List for reference. Ideally, you should be near the workstation when identifying appropriate Corrective Actions, if possible.

- Step 4b. Turn to page 1 of the Corrective Actions List.
- Step 4c. Next, locate the appropriate case study that you selected for a task with a *High* or *Medium* rating (e.g., *Dishwashing*).
- Step 4d. Open the Level I Ergonomics Assessment Checklist to Page 2, *Shoulder/Neck*. Look in the task column for *Dishwashing*. Note any of the Job Factor questions that are answered with *F* or *S*.
- Step 4e. Select an appropriate Corrective Action by placing a check mark in the appropriate box on the Corrective Actions List.

For example, if Question 1, *Reaching* scored *F* or *S*, then you need to suggest a *Corrective Action*. To select a *Corrective Action*, turn back to the *Shoulder/Neck* section of the *Dishwashing* case study and look for Criteria 1.1 - *Repeated reaching* under the *Job Factor column*. Review the *Potential Causes* that apply and select the appropriate *Corrective Action*. On the Corrective Actions List, record the appropriate Corrective Action. Examine the work area to make sure the Corrective Action selected will be appropriate.

- Step 4f. Repeat Steps 4d and 4e for each Job Factor Question in the checklist until you have completed the pattern-matching (Hazard Control Selection) process for the task.
- Step 4g. Complete Steps 4a through 4f for each of the remaining *High* or *Medium* rated tasks. You do not need to continue with problem solving on tasks that were rated *Low*.

2.5 STEP 5 - RECOMMENDATIONS

Item(s) Needed:	Completed Checklist Scoring Summary Completed Corrective Actions List Level I Ergonomics Assessment Summary and Recommendations
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The purpose of Step Five is to summarize all of the information from Steps 1 - 4 in a way that will enable you to communicate the key problems, causes, and recommendations to the shop supervisor for reducing and/or eliminating employee exposure to ergonomic risk factors. A Level I Ergonomics Assessment Summary and Recommendations form was developed to serve as the basis for a concise report. A copy of the form is presented as Figure 2.9.

The intent of the report is for you to summarize the findings of the Level I Ergonomics Assessment Checklist and record if the findings are consistent with previous findings from the Occupational Illness Investigation form or the JR/PD Survey results, as appropriate. The report also allows you to indicate to the shop supervisor which tasks need to be the focus of problem solving.

The intent is for the supervisor to use the report for planning and implementing Corrective Actions. Since this is a summary, you should transfer only the most important information from the Checklist Scoring Summary and the Corrective Actions List.

- Step 5a. Fill in the information on date, workplace identifier, base, etc., on the top of the Level I Ergonomics Assessment Summary and Recommendations form.
- Step 5b. In the *Critical Tasks in Priority Order* table, write in the task name(s) of any of the Critical Tasks that had a Task Score of *high* or *medium*. The highest rated task goes in row 1, the next highest in row 2, etc. Note: if the Checklist Scoring Summary indicated that one or more of the Critical Tasks was rated low, do not list the task(s) in this table.
- Step 5c. For each task, circle the *Task Rating (high or medium)*. Then, circle the appropriate *Rating* for each *Body Region (high or medium)*.
- Step 5d. Circle the *Overall Job Rating (high or medium)*. Circle the appropriate Priority Body Region (e.g., *Shoulder/Neck, Back/Torso, etc.*).

Step 5e. Indicate whether or not your results and findings are consistent with results from the JR/PD Survey (yes or no). If your investigation was not prompted by the JR/PD Survey or one was not available, check “N/A”. Comment as appropriate. For example, one comment could be: “This job may contribute to the high risk factor and discomfort ratings for the shoulder/neck region reported for the shop.”

Step 5f. Indicate if the results are consistent with Occupational Illness Investigation findings (yes or no). If your investigation was not prompted by an Occupational Illness investigation, check “N/A”. Comment as appropriate. An example comment could be “Each of the tasks performed by the employee exposes the employee to high to medium levels of ergonomic risk factors in the hands/wrists/arms region. This finding is consistent with employee-reported hand/wrist discomfort.”

Step 5g. Provide recommendations for follow-up.

The Recommendations for Follow-up section is the final list of Corrective Actions that you wish to present and discuss with the shop supervisor. The list should be based on thoughtful consideration of the appropriateness of each of the controls that you marked in the Corrective Actions List. The idea is not to restate all of the controls. The idea is to suggest Corrective Actions that you believe should be implemented and that represent the best strategy for affecting workplace changes.

Provide recommendations for *Modifications and Adjustments*. Refer to the Corrective Actions List and look for the controls marked in the “minor” column. Evaluate each of the controls for appropriateness (e.g., will implementing the control reduce employee exposure to ergonomics hazards?) and practicality (e.g., is it realistic?). To evaluate the control, refer to the “Implementation Reference” page number provided for the Corrective Actions. In the section “Implementing Minor Modifications,” you can obtain additional detail or suggestions on how to implement the control. (Note: Not all corrective actions need further explanation than is provided in the case study. For these actions, no reference is provided). List the controls in priority order. Indicate whether or not you expect to see benefits to employee health/safety and/or productivity/quality.

Provide recommendations for *Major Changes and/or Purchases*. Refer to the Corrective Actions List and look for the controls marked in the *major* column. Again, evaluate each of the controls for appropriateness. Also include those controls that you think should be included in the shop’s long-term planning or budgeting process for the following period. By indicating whether or not you expect to see benefits to productivity/quality, in addition to employee

health/safety, a shop supervisor or manager may be open to hearing more about a potentially major purchase.

When an Implementation Reference is provided, refer to the “Using Design Criteria to Implement Major Purchases” section. In cases where you recommend the purchase of equipment (e.g., lifting device, chair, etc.), information in this section will help you select the appropriate choice based on ergonomics criteria.

The last step is to present the Summary and Recommendations to the shop supervisor and schedule a date for follow-up to measure the results of workplace improvements.

Date (YYMMDD)		Workplace Identifier:	
<i>(use this space for mechanical imprint)</i>	Base	Organization	
	Workplace		
	Bldg. No./Location	Room/Area	
	AFSC/Job Series	Job Name:	

CRITICAL TASKS IN PRIORITY ORDER						
Task Name	Task Rating	Body Regions and Ratings (Circle one for each region)				
		Shoulder/Neck	Hands/Wrists/Arms	Back/Torso	Legs/Feet	Head/Eyes
	High Med	High Med	High Med	High Med	High Med	High Med
	High Med	High Med	High Med	High Med	High Med	High Med
	High Med	High Med	High Med	High Med	High Med	High Med
	High Med	High Med	High Med	High Med	High Med	High Med

OVERALL JOB RATING	
RATING: High Medium (Circle one)	PRIORITY BODY REGION: (circle one) SHOULDER/NECK HAND/WRIST/ARMS LEGS/FEET BACK/TORSO HEAD/EYES

•Findings are consistent with results from Job Requirements and Physical Demands Survey (JR/PD):

Yes No N/A

Comment: _____

•Findings are consistent with Occupational Illness Investigation: Yes No N/A

Comment: _____

RECOMMENDATIONS FOR FOLLOW-UP	
Modifications and Adjustments Expected Benefits (Check all that apply) <input type="checkbox"/> Health/Safety <input type="checkbox"/> Productivity/Quality	Major Changes and/or Purchases Expected Benefits (Check all that apply) <input type="checkbox"/> Health/Safety <input type="checkbox"/> Productivity/Quality
BEF (sign) _____	

Figure 2.9
Level I Ergonomics Assessment Summary and Recommendations