

## CASE STUDY - Visual Inspection

### TASK TITLE: Visual Inspection

<b>Task Description:</b>	<p>Visual inspection involves an employee inspecting the surface of a material, component, or system to determine the presence of material or processing defects (cracks, incomplete welds, frayed cables, etc.). This task is often done after a prior task has been completed (e.g., visual inspection of rivet depth after riveting.). The employee may use a flashlight or magnifying glass to highlight the area of interest. Additionally, gloves may be worn if the employee is required to inspect the surface using the fingers. Because visual inspection is required for the completion of many different tasks, the employees may be required to stand or sit by the work piece (e.g., riveting on an aircraft) or perform the tasks at a workbench (e.g., soldering electronic components).</p> <p>Typical jobs in which visual inspection is performed include (not necessarily limited to):</p> <ul style="list-style-type: none"><li>• aircraft maintenance</li><li>• sheet metal repair</li><li>• facility maintenance</li><li>• model shop</li><li>• radio repair</li></ul>
<b>Job Performance Measures Most Often Impacted by Visual Inspection:</b>	<ul style="list-style-type: none"><li>• Quality of surface (consistency)</li><li>• Speed of task completion</li><li>• Error detection</li></ul>
<b>Typical Employee Comments about Visual Inspection:</b>	<p>Due to the wide variety of work situations, employees may complain about discomfort or stiffness in any of the following areas: shoulders/neck, hands/wrists/arms, back/torso, legs/feet, or head/eyes.</p> <p>The primary body parts affected are typically: shoulders/neck, back/torso and head/eyes</p> <p>The secondary body parts affected are typically: legs/feet, and hands/wrists/arms</p>
<b>Suggested Level II Analysis:</b>	Postural Analysis, Light Measurement

## Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes	Cost	Impact On	
			✓ Minor Modification	✓ Major Change	Quality	Productivity
1. Reaching	<ul style="list-style-type: none"> <li>• Work location is too high</li> <li>• Work location is too far away</li> </ul>	123. Raise the person <ul style="list-style-type: none"> <li>• provide a step stool</li> <li>• provide an adjustable platform</li> </ul> 32. Lower the work piece/work surface 38. Move closer to the work location <ul style="list-style-type: none"> <li>• remove obstructions</li> </ul> 41. Move work piece closer to body 112. Provide support for the arms <ul style="list-style-type: none"> <li>• rest arms on nearby surface</li> <li>• provide flexible arm supports</li> </ul>	✓   ✓  ✓  ✓  ✓	✓   ✓  ✓  ✓  ✓	med high  med  low  low  low  med med	med med  med  low  low  low  med med
2. Arm forces: Repeated arm muscle contraction or holding/ carrying materials	<ul style="list-style-type: none"> <li>• Rarely occurs</li> </ul>	N/A				
3. High speed, sudden shoulder movements	<ul style="list-style-type: none"> <li>• Rarely occurs</li> </ul>	N/A				

## Shoulder/Neck (cont'd)

## Hands/Wrist/Arm

Job Factor	Potential Causes	Corrective Action	Level of Changes	Cost	Impact On		
			✓ Minor Modification	✓ Major Change	Quality Productivity		
5. Bent wrists/repeated wrist movements or repeated forearm rotation	<ul style="list-style-type: none"> <li>• Work location is too high</li> </ul>	<p>123. Raise the person</p> <ul style="list-style-type: none"> <li>• provide a step stool</li> <li>• provide an adjustable platform</li> </ul> <p>38. Move closer to the work location</p> <p>136. Rotate the work piece</p> <ul style="list-style-type: none"> <li>• manually turn the work piece to an upright position</li> <li>• provide a fixture to allow the work piece to be rotated</li> </ul>	✓ ✓ ✓	✓ ✓ ✓	med high low low med	med med med med med	med high low med med
6. Repeated manipulations with fingers	<ul style="list-style-type: none"> <li>• Rarely occurs</li> </ul>	N/A					
7. Hyper-extension of finger/thumb or repeated single finger activation	<ul style="list-style-type: none"> <li>• Rarely occurs</li> </ul>	N/A					
8. Hand/grip forces	<ul style="list-style-type: none"> <li>• The material to be inspected must be held or supported</li> </ul>	<p>118. Provide support for the work piece</p> <ul style="list-style-type: none"> <li>• provide a fixture or jig to aide in holding the material</li> </ul>		✓	med med		med

## Hands/Wrist/Arm (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes	Cost	Impact On	
			✓ Minor Modification	✓ Major Change	Quality	Productivity
9. High speed hand/wrist/arm movements or vibration, impact or torque to the hand	• Rarely occurs	N/A				
10. Exposure to hard edges	• Work station has hard or sharp edges	9. Eliminate exposure to hard edges <ul style="list-style-type: none"> <li>• provide padding for edges</li> <li>• round off exposed edges</li> <li>• lay a blanket or cushion over hard edges</li> <li>• redesign work piece or component to eliminate hard edges</li> </ul>	✓ ✓ ✓	✓ ✓	low med low	low low low
11. Hands and fingers exposed to cold temperatures	• Work area is too cold	105. Provide portable heaters  23. Provide appropriate gloves	✓	✓	med to high med	med med

## Back/Torso

## Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes	Cost	Impact On	
			✓ Minor Modification	✓ Major Change	Quality	Productivity
13. Twisting of the lower back	<ul style="list-style-type: none"> <li>• Work space is cramped or access is limited</li> <li>• Work piece orientation is too awkward</li> </ul>	117. Provide support for the upper body 63. Provide a padded, compressible surface to lay on 136. Rotate the work piece <ul style="list-style-type: none"> <li>• turn the work piece manually</li> <li>• provide a fixture to allow the work piece to be rotated</li> </ul> 84. Provide an adjustable mirror <ul style="list-style-type: none"> <li>• provide better visual access</li> </ul>	✓ ✓ ✓	✓ ✓ ✓	high low low med	low low med med
14. High speed, sudden movements	<ul style="list-style-type: none"> <li>• Rarely occurs</li> </ul>	N/A				
15. Static, awkward back postures	<ul style="list-style-type: none"> <li>• Chair is inadequate</li> </ul>	87. Provide an appropriate chair/stool		✓	med	med

## Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes	Cost	Impact On	
			✓ Minor Modification	✓ Major Change	Quality	Productivity
	<ul style="list-style-type: none"> <li>• Work piece/surface is too low (see Figure 1.1)</li> </ul>  <p><b>Figure 1.1</b></p>	124. Raise the work piece/work surface	✓	low	low	low

## Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes	Cost	Impact On	
			✓ Minor Modification	✓ Major Change	Quality	Productivity
	<ul style="list-style-type: none"> <li>• Work location is too far away</li> </ul>	38. Move closer to the work location <ul style="list-style-type: none"> <li>• remove obstructions</li> </ul> 41. Move work piece closer to body 117. Provide support for the upper body 8. Distribute intensive activities throughout the process <ul style="list-style-type: none"> <li>• modify assembly/inspection process so that visual inspection occurs throughout the process rather than at the final stage</li> </ul> 84. Provide an adjustable mirror 60. Provide a magnifying glass	<ul style="list-style-type: none"> <li>✓</li> <li>✓</li> <li>✓</li> <li>✓</li> <li>✓</li> </ul>	<ul style="list-style-type: none"> <li>low</li> <li>low</li> <li>med</li> <li>low</li> <li>low</li> </ul>	<ul style="list-style-type: none"> <li>med</li> <li>med</li> <li>med</li> <li>med</li> <li>med</li> </ul>	<ul style="list-style-type: none"> <li>med</li> <li>med</li> <li>med</li> <li>med</li> <li>med</li> </ul>
16. Lifting forces	<ul style="list-style-type: none"> <li>• Rarely occurs</li> </ul>	N/A				
17. Pushing or pulling	<ul style="list-style-type: none"> <li>• Rarely occurs</li> </ul>	N/A				
18. Whole body vibration	<ul style="list-style-type: none"> <li>• Rarely occurs</li> </ul>	N/A				

## Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes	Cost	Impact On
			✓ Minor Modification	✓ Major Change	Quality Productivity
19. Fixed position, standing	<ul style="list-style-type: none"> <li>• Standing surface is hard</li> </ul>	86. Provide an appropriate anti-fatigue mat 96. Provide appropriate shoe inserts 52. Provide a footrail or footrest 87. Provide an appropriate chair/stool	✓ ✓ ✓	✓ low low med	med med med med med med
20. Exposure to hard edges on legs, knees, and feet	<ul style="list-style-type: none"> <li>• Work station has hard or sharp edges</li> </ul>	9. Eliminate exposure to hard edges <ul style="list-style-type: none"> <li>• provide padding for edges</li> <li>• round off exposed edges</li> <li>• lay a blanket or cushion over hard edges</li> </ul>	✓ ✓ ✓	med low low	med med med med
21. Awkward leg postures	<ul style="list-style-type: none"> <li>• Work surface is too low</li> </ul>	124. Raise the work piece/work surface		✓	med med med
22. Standing foot pedal	<ul style="list-style-type: none"> <li>• Rarely occurs</li> </ul>	N/A			

## Head/Eyes

## Head/Eyes (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Glare directly from a light source: looking towards a task light (see Figure 1.2)              </li> <li>Glare from a task light reflected off equipment or worksurface.</li> <li>Light levels too high.</li> <li>Light levels too low:</li> </ul>	<p>109. Provide protection from glare from overhead lights/task lights</p> <ul style="list-style-type: none"> <li>adjust the task light to reduce glare.</li> <li>turn off the task light.</li> <li>shield task light to prevent it from shining into eyes.</li> </ul> <p>27. Lower the light levels</p> <ul style="list-style-type: none"> <li>remove pairs of fluorescent light bulbs from overhead fixtures. Note: this should be done with the appropriate technical assistance and the agreement of co-workers in the area.</li> </ul> <p>22. Increase light levels</p> <ul style="list-style-type: none"> <li>provide task light</li> <li>increase overall light levels to meet the needs of tasks</li> </ul>	✓    ✓    ✓    ✓    ✓    ✓    ✓    ✓    	✓    ✓    ✓    ✓    ✓    ✓    ✓    ✓    	low low to med	med med med	med med med

## Head/Eyes (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes	Cost	Impact On	
			✓ Minor Modification	✓ Major Change	Quality	Productivity
	<ul style="list-style-type: none"> <li>• Uncorrected visual disorders cause the person to lean forward to see work</li> <li>• Text too small to read.</li> <li>• Text is difficult to read (poor quality)</li> </ul>	<p>14. Encourage person to have visual disorders corrected</p> <p>18. Improve visual access to work</p> <ul style="list-style-type: none"> <li>• increase size of text</li> <li>• increase the legibility of text</li> </ul>	✓	✓ ✓	low med med	med med med
24. Intensive visual tasks, staring at work objects for long periods	<ul style="list-style-type: none"> <li>• Length of work task without a change of position for the eyes.</li> </ul>	<p>8. Distribute intensive activities throughout the process</p> <ul style="list-style-type: none"> <li>• perform intensive visual tasks for short periods throughout the day (as opposed to in one continuous session).</li> </ul> <p>20. Incorporate rest pauses</p> <ul style="list-style-type: none"> <li>• periodically look away from screen.</li> </ul>	✓		low low	med med