

## CASE STUDY - Abrading

### TASK TITLE: Abrading

<b>Task Description:</b>	<p>Abrading involves the use of a manual (sandpaper, file, etc.) or powered (pneumatic/hydraulic hand sanders) tools to remove or shape material. Additionally, the parts can be fixed (in a vise) or supported (mounted on a structure).</p> <p>Typical jobs in which abrading 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></ul>
<b>Job Performance Measures Most Often Impacted by Abrading:</b>	<ul style="list-style-type: none"><li>• Surface finish</li><li>• Speed of task completion.</li></ul>
<b>Typical Employee Comments about Abrading:</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, or legs/feet.</p> <p>The primary body parts affected are typically: shoulders/neck, hands/wrists/arms and back/torso The secondary body parts affected are typically: legs/feet.</p>
<b>Suggested Level II Analysis:</b>	Grip Force Measurement, Postural Analysis, Dynamic Task Analysis



## 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 piece must be manually supported, held, or steadied</li> <li>• Abrading tool power supply hose/cord must be manually supported, held or steadied</li> <li>• Work location is too far away (see Figure 1.1 )</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>32. Lower the work piece/work surface</p> <p>118. Provide support for the work piece</p> <ul style="list-style-type: none"> <li>• provide a clamp to place work piece at the desired height and orientation</li> </ul> <p>113. Provide support for the cable or hose</p> <ul style="list-style-type: none"> <li>• provide a hook to hang cable in work area</li> </ul> <p>38. Move closer to the work location</p> <ul style="list-style-type: none"> <li>• remove obstructions</li> <li>• get on top of the work (and provide knee pads)</li> </ul> <p>41. Move work piece closer to body</p>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	med high	med med	med high
					med	low	med

**Figure 1.1**

## Shoulder/Neck (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 blocked or is in an inappropriate orientation</li> <li>• Abrading is performed on a flat work surface</li> </ul>	<p>136. Rotate the work piece</p> <ul style="list-style-type: none"> <li>• rotate the work piece manually</li> <li>• provide a fixture to allow the work piece to be rotated</li> </ul> <p>136. Rotate the work piece</p> <ul style="list-style-type: none"> <li>• turn the work piece to an upright or angled position</li> </ul> <p>77. Provide a tool with an appropriate handle angle</p> <ul style="list-style-type: none"> <li>• provide a tool with a grip which is oriented vertically while the tool is in use</li> </ul>	✓	✓	low med	med med	med med
2. Arm forces: Repeated contraction of the muscles of the arm or holding/carrying materials	<ul style="list-style-type: none"> <li>• Worker must apply downward pressure</li> </ul>	<p>133. Replace abrasive/cutting material frequently</p> <p>34. Maintain hand tool/power tools</p> <ul style="list-style-type: none"> <li>• minimize force</li> </ul> <p>66. Provide a power tool</p> <ul style="list-style-type: none"> <li>• provide a tool with the capacity to handle the required work without causing the operator to over exert</li> </ul>	✓	✓	low med med	high med med	high med med

## Shoulder/Neck (Cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
3. High speed, sudden shoulder movements	• Rarely occurs	N/A					
4. Head/neck bent or twisted	<ul style="list-style-type: none"> <li>• Work surface is too high</li> <li>• Work surface is too low</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>32. Lower the work piece/work surface</p> <p>124. Raise the workpiece/worksurface</p> <ul style="list-style-type: none"> <li>• raise part with a hoist</li> <li>• raise on adjustable table</li> </ul> <p>32. Lower the worker</p> <ul style="list-style-type: none"> <li>• provide a stool (see Figure 1.2 )</li> </ul> 	✓  ✓  ✓  ✓	✓  ✓  ✓  ✓	med high  med  med  med	med med  med  med  med	med high  med  med  med

Figure 1.2

## **Hands/Wrist/Arm**

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

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
7. Hyper - extension of finger/thumb or repeated single finger activation	<ul style="list-style-type: none"> <li>• Use of tool with single trigger concentrates stress</li> </ul>	<p>62. Provide a multi-finger trigger</p> <ul style="list-style-type: none"> <li>• provide a tool with a two-finger or a four-finger trigger</li> <li>• extend trigger on existing tool (if feasible and safe)</li> </ul>	✓	✓	med med	med med	med med
8. Hand/grip forces	<ul style="list-style-type: none"> <li>• The type of tool is not appropriate for the amount of material that must be removed</li> <li>• Tool or work piece must be manually supported, held or steadied</li> </ul>	<p>133. Replace abrasive/cutting material frequently</p> <p>34. Maintain hand tools/power tools</p> <p>66. Provide a power tool</p> <ul style="list-style-type: none"> <li>• provide a tool with the capacity to handle the required work without causing the operator to overexert</li> </ul> <p>118. Provide support for the work piece</p> <ul style="list-style-type: none"> <li>• provide a fixture or clamp which places the work piece at the appropriate height and (as needed) allows the work piece to be manipulated.</li> </ul> <p>54. Provide a high friction gripping surface</p> <ul style="list-style-type: none"> <li>• provide a tool handle with a compressible, high friction surface</li> </ul>	✓  ✓  ✓  ✓	low low med med	high med med med	high 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
	<ul style="list-style-type: none"> <li>• Tool is too heavy</li> <li>• Handle diameter is too large</li> </ul>	<ul style="list-style-type: none"> <li>• wrap tool handle</li> <li>59. Provide a lighter weight tool</li> <li>88. Provide an appropriate handle diameter</li> <li>• provide a tool with an appropriate handle diameter between 1"-1.5".</li> </ul>	✓	✓	low	med	med
9. High speed hand/wrist/arm movements or vibration, impact, or torque to the hand	<ul style="list-style-type: none"> <li>• The tool has not received proper maintenance</li> <li>• Abrading tools produce hand/arm vibration</li> </ul>	<p>34. Maintain hand tools/power tools</p> <ul style="list-style-type: none"> <li>• perform periodic maintenance on all tools</li> </ul> <p>74. Provide a tool that minimizes exposure to vibration/impact/torque</p> <ul style="list-style-type: none"> <li>• provide a tool which minimizes exposure to vibration</li> <li>• provide a tool with vibration absorbing materials built into the handles</li> </ul>	✓	✓	low	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
	<ul style="list-style-type: none"> <li>Lack of clamping device increases employee contact with vibrating surface</li> </ul>	118. Provide support for the work piece <ul style="list-style-type: none"> <li>provide a fixture or jig to hold the work piece</li> </ul>		✓	med	med	med
10. Exposure to hard edges	<ul style="list-style-type: none"> <li>Tool handle has hard edges</li> <li>Work station has hard or sharp edges</li> </ul>	9. Eliminate exposure to hard edges <ul style="list-style-type: none"> <li>provide a handle which is round and smooth with no ridges or edges</li> <li>provide a handle of at least 5"(12.7cm) in length</li> <li>wrap the tool handle</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> </ul>	✓	✓ ✓	med med low	med med med	med med med
11. Hands and fingers exposed to cold temperatures	<ul style="list-style-type: none"> <li>Work area is too cold</li> <li>Air tool exhaust blows on wrist</li> </ul>	105. Provide portable heaters 93. Provide appropriate gloves 7. Direct cold air away from the hands <ul style="list-style-type: none"> <li>modify the existing tool/add an air diverter</li> <li>provide a tool which does not direct air to the hands</li> </ul>	✓	✓ ✓	med med med med	med med med med	med med med med

## Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
12. Repeated forward or sideways bending movements	<ul style="list-style-type: none"> <li>Rarely occurs (Refer to question 15)</li> </ul>	N/A					
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 inappropriate</li> </ul>	117. Provide support for the upper body <ul style="list-style-type: none"> <li>provide a pad/mat</li> <li>provide a device to support the upper part of the body</li> </ul> 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>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	low med	med med	med med
14. High speed, sudden movements	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					

## Back/Torso (Cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
15. Static, awkward back postures	<ul style="list-style-type: none"> <li>Work surface is too low (see Figure 1.3)</li> </ul>  <p><b>Figure 1.3</b></p> <ul style="list-style-type: none"> <li>Inadequate lower back support</li> <li>Inappropriate chair adjustment.</li> <li>Inappropriate chair design</li> </ul>	<p>124. Raise the work piece/work surface</p> <ul style="list-style-type: none"> <li>use a hoist</li> <li>raise the worktable with blocks or risers</li> </ul> <p>31. Lower the worker</p> <ul style="list-style-type: none"> <li>provide a stool for low work locations</li> </ul> <p>115. Provide support for the lower back</p> <ul style="list-style-type: none"> <li>adjust back rest to support lower back while seated</li> <li>pull chair forward and lean back while working</li> <li>attach a small pillow to back rest to support lower back</li> <li>provide a chair with adequate lower back support</li> </ul>	✓ ✓ ✓	✓ ✓ ✓	med low  med  low  low  low  med	med med  med  med  med  med	med med  med  med  med  med

### Back/Torso (Cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
16. Lifting forces	• Rarely occurs	N/A					
17. Pushing or pulling	• Rarely occurs	N/A					
18. Whole body vibration	• Rarely occurs	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 (see Figure 1.4)</li> </ul> 	86. Provide an appropriate anti-fatigue mat 96. Provide appropriate shoe inserts 52. Provide a footrail or footrest	✓ ✓ ✓	✓ ✓ ✓	med low med	med low low
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> </ul>	✓		low	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 <ul style="list-style-type: none"> <li>use a hoist</li> </ul> 31. Lower the worker <ul style="list-style-type: none"> <li>provide a stool</li> </ul>		✓ ✓	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>• Light levels too high.</li> <li>• Light levels too low:</li> <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>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> <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 to med med med med med	med med med med med	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>	✓		low	med	med

### Head/Eyes (Cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		20. Incorporate rest pauses <ul style="list-style-type: none"> <li>• periodically look away from screen.</li> </ul>	✓		low	med	med

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