

CASE STUDY - Painting/ Spraying

TASK TITLE: Painting/Spraying

Task Description:	<p>Painting involves the use of a paint applicator such as a roller, or paint spray gun. Painting can be performed on a variety of surfaces and/or objects.</p> <p>Typical jobs in which painting is performed include:</p> <ul style="list-style-type: none">• construction• aircraft maintenance• vehicle maintenance <p>Painting may be performed on vertical, horizontal, overhead, or floor surface, and on or under a variety of different surfaces/shapes.</p>
Job Performance Measures Most Often Impacted by Painting:	<p>Coverage and surface finish.</p> <p>Task completion on schedule.</p>
Typical Employee Comments about Painting:	<p>The most common reports of discomfort have been of the hand/wrist, shoulder and neck. The concentration can vary with the method used for paint application.</p> <p>Primary concerns are: shoulder/neck, hand/wrist/arm</p> <p>Secondary concerns are: back/torso, legs/feet</p>
Suggested Level II Analysis:	Grip Force Measurement, Dynamic Task 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"> Work location is too high Painting is performed on flat work surface (see Figure 1.1) 	103. Provide extensions for tools <ul style="list-style-type: none"> provide extensions on roller to improve arm posture while painting overhead or on high walls 	✓	✓	med	high	high
		123. Raise the person <ul style="list-style-type: none"> use a step stool or ladder provide a platform or scaffolding provide painter's stilts 		✓ ✓ ✓	med high med	med med med	med high high
		103. Provide extensions for tools <ul style="list-style-type: none"> provide extensions on roller to improve arm posture while painting overhead 		✓	med	med	med
	<ul style="list-style-type: none"> Orientation of parts or spray technique requires a top to bottom (spraying from high to low) pattern 	136. Rotate work piece <ul style="list-style-type: none"> change from vertical to horizontal orientation to allow side-to-side spray pattern (arms move, wrists stay straight). 	✓	✓	low to med	high	med
		13. Encourage ergonomic work techniques <ul style="list-style-type: none"> spray in a side-to-side pattern 	✓		low	med	med



Figure 1.1

- Orientation of parts or spray technique requires a top to bottom (spraying from high to low) pattern

Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes	Cost	Impact On		
			✓ Minor Modification	✓ Major Change	Quality	Productivity	
2. Arm forces: Repeated contraction of the muscles of the arm or holding/carrying materials	<ul style="list-style-type: none"> Pulling hoses and carts used for spray paint systems <ul style="list-style-type: none"> • Poor housekeeping • Poor floor condition • Poor wheel maintenance • Poor wheel design 	<p>17. Improve floor condition</p> <ul style="list-style-type: none"> • keep floor free of debris • repair cracks or gaps in floor <p>19. Improve wheel condition</p> <ul style="list-style-type: none"> • repair wheels • provide wheels that are roll more easily <p>67. Provide a powered cart</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"/>	low low to med low high	med med med med med	med med med med high
3. High speed, sudden shoulder movements	<ul style="list-style-type: none"> • Rarely occurs 	N/A					
4. Head/neck bent or twisted	<ul style="list-style-type: none"> • Work location is too high (see Figure 1.2) 	<p>114. Provide support for the head</p> <ul style="list-style-type: none"> • provide a head and neck support which rests on the shoulders for continuous overhead work <p>123. Raise the person</p> <ul style="list-style-type: none"> • provide a fixed platform • provide scaffolding <p>32. Lower the work piece/work surface</p> <ul style="list-style-type: none"> • reduce height of existing table • provide an adjustable height work table <p>103. Provide extensions for rollers</p>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	low med high med	med med med med	med med med med	

Figure 1.2

Hands/Wrists/Arms

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"> • Using wrist movements to paint with a brush or spray gun. • Part is in an inappropriate orientation • Work location is too high causing awkward wrist positions 	<p>13. Encourage ergonomic work techniques</p> <ul style="list-style-type: none"> • encourage person to use arm movements rather than wrist movements while painting • spray in a side-to-side pattern rather than an up-and down-pattern <p>106. Provide powered assistance for a manual activity</p> <ul style="list-style-type: none"> • use a roller or a paint gun instead of a paint brush whenever large surfaces are being painted <p>136. Rotate work piece (bench work)</p> <ul style="list-style-type: none"> • provide a fixture to allow the work piece to be rotated • rotate the work piece manually <p>103. Provide extensions for tools</p> <ul style="list-style-type: none"> • to access tight locations <p>123. Raise the person</p> <ul style="list-style-type: none"> • use a step stool or a ladder • provide a fixed platform or scaffolding • provide painter's stilts 	✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓	low low low to med med med low med med	med med med med med med med med med

Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes	Cost	Impact On	
			✓ Minor Modification	✓ Major Change	Quality	Productivity
6. Repeated manipulations with fingers	<ul style="list-style-type: none"> Rarely occurs 	N/A				
7. Hyperextension of finger/thumb or repeated single finger activation	<ul style="list-style-type: none"> Use of painting gun with single finger trigger 	<p>62. Provide a multi-finger trigger</p> <ul style="list-style-type: none"> provide a tool with a two finger or a four finger trigger extend trigger on existing tool (if feasible and safe) <p>10. Eliminate need to constantly hold trigger</p> <ul style="list-style-type: none"> provide a tool with a toggle switch that allows continuous operation without holding the trigger down 		✓ ✓ ✓	med med med	med med med

Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes ✓ Minor Modification	✓ Major Change	Cost	Impact On	
						Quality	Productivity
8. Hand/grip forces	<ul style="list-style-type: none"> • Part must be manually supported, held or steadied • Tool is too heavy 	<p>118. Provide support for work piece</p> <ul style="list-style-type: none"> • provide a fixture which places the work piece at the appropriate height and (as needed) allows the work piece to be manipulated. <p>113. Provide support for the cable or hose</p> <ul style="list-style-type: none"> • provide a hook to hang spray in gun hose • support air hose with a belt clip <p>76. Provide a tool which requires minimal force to use</p> <ul style="list-style-type: none"> • provide a swivel attachment for air hose on paint gun • support air hose with a tool balancer or belt clip <p>116. Provide support for the tool</p> <ul style="list-style-type: none"> • provide a tool balancer for bench work • provide a mobile tool balancer that can be hung overhead for field work <p>59. Provide a lighter weight tool</p> <ul style="list-style-type: none"> • Provide lighter weight housing for spray gun 			med	med	med

Hands/Wrists/Arms (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	• Tool handle has hard edges	9. Eliminate exposure to hard edges <ul style="list-style-type: none"> • provide a handle which is round and smooth with no ridges or edges • provide a handle of at least 5" (12.7 cm) in length (provide adequate clearance for gloves) 		✓ ✓	med med	med med
11. Hands and fingers exposed to cold temperatures	• Rarely occurs to any significant degree	N/A				

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"> Work location is too low (see Figure 1.3) 	124. Raise the work piece/ surface <ul style="list-style-type: none"> provide a fixed table to support part provide an adjustable table for part angle part using a wooden frame fixture 31. Lower the person <ul style="list-style-type: none"> provide a chair/stool to sit on 	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	low to med high med	med med high med med med
13. Twisting of the lower back	<ul style="list-style-type: none"> Work location is in an inappropriate orientation Work space or access is limited (such as under a structure) 	136. Rotate work piece (bench work) <ul style="list-style-type: none"> turn the work piece manually provide a fixture to allow the work piece to be rotated 63. Provide a padded, compressible surface to lay on 124. Raise the work surface <ul style="list-style-type: none"> use a hoist/lift device to raise the structure to create improved access 	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	low med low high	med med med med
14. High speed, sudden movements	<ul style="list-style-type: none"> Rarely occurs 	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"> • Work location is too low 	<p>124. Raise the work piece/work surface</p> <ul style="list-style-type: none"> • provide a fixed table to support part • provide an adjustable table for work piece <p>8. Distribute intensive activities throughout the process</p> <ul style="list-style-type: none"> • perform the most awkward painting tasks intermittently if possible 	✓ ✓ ✓	✓ ✓ med	low to med high med med	med med med	med med med
16. Lifting forces	<ul style="list-style-type: none"> • Rarely occurs 	<ul style="list-style-type: none"> • N/A 					
17. Pushing or pulling	<p>Pulling hoses and carts</p> <ul style="list-style-type: none"> • Poor housekeeping • Poor floor condition • Poor wheel maintenance • Poor wheel design 	<p>17. Improve floor condition</p> <ul style="list-style-type: none"> • keep floor free of debris • repair cracks or gaps in floor <p>19. Improve wheel condition</p> <ul style="list-style-type: none"> • repair wheels • provide wheels that are roll more easily <p>67. Provide a powered cart</p>	✓ ✓ ✓	✓ ✓ med to high	low med med med	med med med med	med med med med
18. Whole body vibration	<ul style="list-style-type: none"> • 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"> Standing surface is hard (see Figure 1.4) 	96. Provide appropriate shoe inserts	✓		low	med	med
20. Exposure to hard edges on legs, knees, and feet	<ul style="list-style-type: none"> Kneeling causes external pressure to the knee 	95. Provide appropriate knee protection <ul style="list-style-type: none"> provide knee pads provide a cushion to kneel on 	✓ ✓	low low	med med	med med	

Legs/Feet (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes	Cost	Impact On		
			✓ Minor Modification	✓ Major Change	Quality Productivity		
21. Awkward leg postures	<ul style="list-style-type: none"> • Work location is too low 	<p>124. Raise the work piece/work surface</p> <ul style="list-style-type: none"> • provide a fixed table to support work piece • provide an adjustable table for work piece <p>31. Lower the person</p> <ul style="list-style-type: none"> • provide knee pads • provide a chair/stool to sit on • provide a pad or cushion to kneel on 	✓ ✓ ✓	✓ ✓ ✓	low to med high low low low to med	med med med	med med med
22. Standing foot pedal	<ul style="list-style-type: none"> • Rarely occurs 	N/A					

Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
23. Difficult to see/light levels too low/too high	<ul style="list-style-type: none"> Glare directly from a light source: looking towards an overhead light Glare from an overhead light reflected off equipment or worksurface. Glare directly from a light source: looking towards an uncovered window Glare from an uncovered window reflected off equipment or worksurface. Glare directly from a light source: looking towards a task light Glare from a task light reflected off equipment or worksurface. 	<p>109. Provide protection from glare from overhead lights/task lights</p> <ul style="list-style-type: none"> position work between overhead lights. remove glossy or shiny surfaces from work area place the work station so that it faces a wall or partition. install parabolic louvers to direct light down on the surface. <p>108. Provide protection from glare from natural light</p> <ul style="list-style-type: none"> orient work station so that the person faces perpendicular to the window. adjust window coverings provide window coverings <p>109. Provide protection from glare from overhead lights/task lights</p> <ul style="list-style-type: none"> adjust the task light to reduce glare. turn off the task light. shield task light to prevent it from shining into eyes. 	✓ ✓ ✓ ✓ ✓	✓ ✓ ✓ ✓ ✓	low low med high	med med med med med	med med med med med

Head/Eyes (cont'd)

Job Factor	Potential Causes	Corrective Action	✓	✓	Cost	Impact On	
			Minor Modification	Major Change		Quality	Productivity
	<ul style="list-style-type: none"> • Light levels too high. • Light levels too low. • Uncorrected visual disorders cause the person to lean forward to see work • Text too small to read. • Text is difficult to read (poor quality) 	<p>27. Lower the light levels</p> <ul style="list-style-type: none"> • 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. <p>22. Increase light levels</p> <ul style="list-style-type: none"> • provide task light • increase overall light levels to meet the needs of tasks <p>14. Encourage person to have visual disorders corrected</p> <p>18. Improve visual access to work</p> <ul style="list-style-type: none"> • increase size of text • increase the legibility of text 		✓	low to med	med	med
24. Intensive visual tasks, staring at work objects for long periods	<ul style="list-style-type: none"> • Length of work task without a change of position for the eyes. 	<p>8. Distribute intensive activities throughout the process</p> <ul style="list-style-type: none"> • perform intensive visual tasks for short periods throughout the day (as opposed to in one continuous session). 	✓		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"> • periodically look away from screen. 	✓		low	med