

**Section 5: Identifying Root Causes**

Examples of completed forms are shown in Figures 5.7 and 5.8. By including all three items on the same form, it is easier to determine that each causal factor has root causes and recommendations associated with it and vice versa.

Causal Factor #7	Paths Through Root Cause Map™	Recommendations
<p>Three large pumps' shafts were warped</p> <p><b>Background</b></p> <p>The shafts for three large pumps were warped because the shafts were not rotated while they were in storage in the warehouse. The shafts for most large rotating equipment have been routinely rotated while in the warehouse, but these three pumps were not included on the list of equipment requiring rotation.</p> <p>The company has a procedure for periodic rotation of large rotating equipment shafts. However, there is no company procedure or process for adding equipment to the shaft rotation list.</p> <p>There is no policy related to periodic rotation of large pieces of rotating equipment, such as pumps, turbines, and compressors.</p>	<ul style="list-style-type: none"> <li>• Equipment/Software Issue (2)</li> <li>• Material/Product Issue (9)</li> <li>• Material/Parts and Product Issue (79)</li> <li>• Product Control and Acceptance Issue (87)</li> <li>• Storage Issue (92)</li> <li>• Company Standards, Policies, and Administrative Controls (SPAC) Issue (225)</li> <li>• No SPAC or Issue Not Addressed in SPAC (226)</li> </ul> <p>The three pumps failed while in storage.</p> <ul style="list-style-type: none"> <li>• Equipment/Software Issue (2)</li> <li>• Material/Product Issue (9)</li> <li>• Equipment Reliability Program Issue (28)</li> <li>• Periodic Maintenance Issue (33)</li> <li>• Implementation Issue (36)</li> <li>• Company Standards, Policies, and Administrative Controls (SPAC) Issue (225)</li> <li>• No SPAC or Issue Not Addressed in SPAC (226)</li> </ul> <p>The pump shafts were not rotated while in storage.</p> <ul style="list-style-type: none"> <li>• Equipment/Software Issue (2)</li> <li>• Material/Product Issue (9)</li> <li>• Equipment Reliability Program Issue (28)</li> <li>• Equipment Reliability Program Design Issue (29)</li> <li>• No or Inappropriate Maintenance Selected (31)</li> <li>• Company Standards, Policies, and Administrative Controls (SPAC) Issue (225)</li> <li>• No SPAC or Issue Not Addressed in SPAC (226)</li> </ul> <p>The pumps were not included on the list of equipment to be rotated.</p> <ul style="list-style-type: none"> <li>• Equipment/Software Issue (2)</li> <li>• Material/Product Issue (9)</li> <li>• Procedure Issue (122)</li> <li>• Correct Procedure Not Used (123)</li> <li>• No Procedure for Task/Operation (124)</li> <li>• Company Standards, Policies, and Administrative Controls (SPAC) Issue (225)</li> <li>• No SPAC or Issue Not Addressed in SPAC (226)</li> </ul> <p>There is no procedure for adding equipment to the shaft rotation list.</p>	<p>Repair the three pumps that have warped shafts. (Level 1)</p> <p><b>Implementation responsibility:</b> Mechanical maintenance supervisor</p> <p>Review the existing equipment in the warehouse to ensure all large pieces of rotating equipment are included in the shaft rotation preventive maintenance procedure. (Level 3)</p> <p><b>Implementation responsibility:</b> Warehouse supervisor</p> <p>Develop a procedure for the receipt inspection process to add all large rotating pieces of equipment to the shaft rotation prevention maintenance procedure. (Level 4)</p> <p><b>Implementation responsibility:</b> Warehouse supervisor</p>

**FIGURE 5.7: Example Root Cause Summary Table Form**