

Root Cause Investigation Report Content and Format

| Cause Being Addressed | Corrective Action (CA) or Action Item (ACIT) | Owner | Due Date |
|---|--|--------------------|----------|
| Work Management procedure guidance is generic in nature and does not discuss dual function risk components. | 6. CA to create guidance that lists dual function risk components that if unavailable in conjunction with its redundant component would result in an orange or red condition. | A8851NESPR | 12/16/08 |
| | 7. CA to identify and designate dual function high-risk components that if unavailable in conjunction with its redundant component, would result in an orange or red risk condition in work management and/or clearance and tagging tools (Passport – Work Management, Equipment Tagout, Issue Reporting) to alert applicable personnel the potential risk significance. | A8840WC | 12/16/08 |
| | 8. ACIT to consider plant labeling of risk significant components such that people know that they may be affecting risk by manipulation. Take additional actions based this review. | A8810OP | 12/16/08 |
| OU-AP-104, Shutdown Safety Management Program Byron/Braidwood Annex, and OU-AA-101-1005, Exelon Nuclear Outage Scheduling are silent on opposite unit OLR considerations. | 9. ACIT to consider adding guidance to OU-AA-104 and / or OU-AA-101-1005 to evaluate the non-outage OLR when performing outage-scheduling activities. Take additional actions based on this review. | A8840OUT | 08/28/08 |
| Not Cause Related | 10. QREC to process report to meet records management retention requirements. | A8801RAPR | 08/28/08 |
| | 11. ACIT to identify other processes that operations personnel participate that may succumb to this type of root cause. | A8810OPSRM | 08/28/08 |
| | 12. ACIT to document department clock reset as defined by the causes identified by this investigation to applicable departments | A8810OP A8840WC | 08/28/08 |

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13. **EFFECTIVENESS REVIEWS (EFRS)**

| 13.1. CAPR / CA being addressed | Effectiveness Review Action | Owner | Due Date |
|---|--|--------------|-----------------|
| <p>CAPR to develop, implement, and reinforce expectations that include clear direction on roles, responsibilities and ownership regarding risk management for shift managers and shift supervisors.</p> <p>Closure criteria: Expectations created, implemented, and reinforced with all shift managers and supervisors.</p> | <p>EFR to review effectiveness of CAPR. CAPR will be deemed effective by the absence of any missed unplanned risk evaluation resulting in an adverse color change using CAP, NOS, or NSRB data.</p> <p>Ensure that procedure and training actions have been appropriately implemented.</p> | A8810OP | 03/11/09 |

14.

15. **PROGRAMMATIC/ORGANIZATIONAL ISSUES**

| Programmatic and Organizational Weaknesses | Corrective Action (CA) or Action Item (ACIT) | Owner | Due Date |
|---|--|--------------|-----------------|
| <p>1. Less than adequate site awareness of auxiliary building internal flooding with respect to affected processes and procedures.</p> <p>The site did not perform a review or response on generic letter 88-20 as it was performed at the corporate level. It is unclear, through existing documentation, what processes, programs, or procedures were reviewed.</p> <p>For example, as documented in AR 8412, Safety Evaluation Report for Individual Plant Examination of Generic Letter 88-20, the NRC noted that a potential vulnerability existed involving a dual Unit loss of</p> | <p>1. ACIT to review generic letter 88-20 for potential process, procedure changes or site communication. Document the results of the review and take additional actions as necessary.</p> | A8851NESPR | 12/16/08 |
| | <p>2. ACIT to review regulatory guide 1.200, An approach for determining the technical adequacy of probabilistic risk assessment results for risk informed decisions, to ensure adequate implementation.</p> | A8851NESPR | 12/16/08 |

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| Programmatic and Organizational Weaknesses | Corrective Action (CA) or Action Item (ACIT) | Owner | Due Date |
|---|--|-------------------|-----------------|
| <p>essential service water from flooding, and indicated that a modification was being addressed which will reduce the CDF from 1E-4/year to 1E-6/year.) In the SER cover letter, NRC requested that they be informed when the modification is complete so that the correct CDF may be attributed to Byron. The actual SER indicates that the modification is to a vent duct on the 330 ft. elevation of the Auxiliary Building.</p> <p>It further states that, in conjunction with a procedural change, this modification would result in the CDF contribution for dual loss of essential service water due to pipe breaks decreasing from 1E-4/yr to about 1E-6/yr.</p> <p>The procedural changes (SX procedures; OBOA PRI-8, Auxiliary Building Flooding, and BOP SX22, Essential Service Water Leak Isolation) have been completed, and have a measurable effect on flooding CDF because they are aimed at identifying and stopping the leak/flood.</p> <p>Two vent modifications were initiated, (Design Change Process (DCPs) 9700734 & 9700735 (Work Request (WR) 980005294 & 980005314). These modifications were presented and approved by PHC and PRC but have not been installed to date. This action remains open to notify the NRC on the decision not to install the modifications.</p> | <p>3. ACIT to status SX system modifications that would reduce OLR and review has PHC/PRC for high priority consideration. Document the results in this assignment and take additional actions as necessary.</p> | <p>A8851NESPR</p> | <p>12/16/08</p> |
| <p>2. Limited management oversight related to risk management process. (Extent of Cause)</p> <p>Majority of management focus is on the outage unit because of the massive amounts of activities being performed. Little</p> | <p>1. ACIT to consider adding a task into the FMS database for OLR/SDR activities. Take additional actions as necessary based on this review.</p> | <p>A8810OP</p> | <p>08/27/08</p> |

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| Programmatic and Organizational Weaknesses | Corrective Action (CA) or Action Item (ACIT) | Owner | Due Date |
|---|---|--|-----------------|
| <p>documented management observation of OLR/SDR activities.</p> <p>FMS data was queried for Byron from 01/01/08 to 07/01/08 that identified ~ 12300 fundamentals scored. A keyword search was performed using "risk" that identified 19 observations for either OLR or SDR. This represents ~ 0.15 % of the population. The median value for this population is 0.4% with the average value being 1.1%. Upon further review of FMS a task does not exist to assign OLR or SDR observations.</p> | <p>2. ACIT to identify opportunities to use the behavior observation process for documentation of OLR/SDR performance results. Set expectations on observation quantity and quality based on opportunities identified. Document opportunities identified and expectations on quantity and quality in this assignment.</p> | <p>A8810OPSRM A8840WC A8840OUT</p> | <p>08/27/08</p> |

16.

Root Cause Investigation Report Content and Format

17. OTHER ISSUES

| Other Issues identified during investigation | Corrective Action (CA) or Action Item (ACIT) | Owner | Due Date |
|---|--|-------------------|-----------------|
| <p>1. Safety of Equipment Operators when designated for dedicated manual operator actions related to 1SX033 and 1SX034 when both valves are incapable of closing from the main control room.</p> <p>IR 759929 – Clearance Order 57893 was cleared to Ops following the announcement of Orange for risk on U-2 for 1SX033 and 1SX034 not being able to be closed from the MCR. Credit was taken for local operation by an NLO in SX Pp rooms to manually close 1SX033 and 1SX034 in the event of flooding in the Aux. Bldg. and risk was restored to green. The NLO will be in the basement of the Aux. Bldg (lowest elevation) during a flood and will be directed to close 1SX033 and/or 1SX034. This will put the dedicated NLO in the line of fire and risk of his or her life. Credit should not be taken for putting someone in the line of fire. As this event pertains to OLR, crediting an operator solely to manually close either the 1SX033 or 1SX034 is an approved compensating action if these valves cannot be closed from the main control room. This IR will be addressed in the “Other Issues” of this report.</p> <p>IR 759455 – This IR documents the disagreement of the removal of a circuit breaker for the 1SX027A as it is a big part of the SX flowpath and provides interlock functions for the 1A SX pump, part of the start circuit for the reactor containment fan coolers (RCFCs), and containment chillers. With this breaker removed, the valve cannot be closed from the main control room if I needed to for leak/flood isolation. This issue was evaluated for Unit Two OLR and found that the level of risk remained green. No further actions are required for this IR. IR 759930 – This IR is in light of a response to IR 759929 where a persons safety was questioned</p> | <p>IRs 759929, 759455, and 759930 were reviewed related to safety of Equipment Operators when designated for dedicated manual operator actions related to 1SX033 and 1SX034 when both valves are incapable of closing from the main control room. SX procedure 0BOA PRI-8, Auxiliary Building Flooding, contains a caution related to wetted or submerged electrical equipment posing an electrocution hazard but does not provide alternative leak isolation. However, BOP SX-22, Essential Service Water Leak Isolation, does contain various options related to SX leak isolation. This procedure lists various SX lines and upstream/downstream isolation points most of which have redundant isolation points. Based on this review no further action is necessary for either of these two IRs.</p> | <p>A8810OPSRM</p> | <p>Complete</p> |

Root Cause Investigation Report Content and Format

COMMUNICATIONS PLAN

| Lessons Learned to be Communicated | Communication Plan Action | Owner | Due Date |
|---|--|--|---|
| <p>Licensed operator training learning objectives, lesson plan content does not address or reinforce the necessary knowledge of dual function high-risk components and their potential affect on OLR.</p> <p>Cycle Managers and Outage Risk Managers do not receive training for risk assessment activities nor is there a method to ensure that knowledge elements are appropriately transferred when personnel changes occur.</p> <p>Dual function high-risk components are not identified in rule-based guidance</p> <p>Less than adequate site awareness of auxiliary building internal flooding with respect to affected processes and programs.</p> <p>Limited management oversight related to risk management process. (Extent of Cause)</p> | <ol style="list-style-type: none"> 1. Revise NER to communicate event to the fleet 2. NNOE to communicate event to the industry 3. Provide an article to the site weekly communication. | <p>A8810OP 759945-09</p> <p>A8810OP 759945-11</p> <p>A8810OP 759945-24</p> | <p>08/20/08</p> <p>08/20/08</p> <p>08/21/08</p> |

Attachment 14

19. ROOT CAUSE INVESTIGATION REPORT QUALITY CHECKLIST
Page 1 of 2

| Critical Content Attributes | YES | NO |
|--|------------|-----------|
| Is the condition that requires resolution adequately and accurately identified? | X | |
| Are inappropriate actions and equipment failures (causal factors) identified? | X | |
| Are the causes accurately identified, including root causes and contributing causes? | X | |
| Are there corrective actions to prevent recurrence identified for each root cause and do they tie DIRECTLY to the root cause? AND, are there corrective actions for contributing cause and do they tie DIRECTLY to the contributing cause? | X | |
| Have the root cause analysis techniques been appropriately used and documented? | X | |
| Was an Event and Causal Factors Chart properly prepared? | X | |
| Does the report adequately and accurately address the extent of condition in accordance with the guidance provided in Attachment 4 of LS-AA-125-1003? | X | |
| Does the report adequately and accurately address plant specific risk consequences? | X | |
| Does the report adequately and accurately address behavioral, programmatic and organizational issues? | X | |
| Have previous similar events been evaluated? Has an Operating Experience database search been performed to determine useful lessons learned or insights for development of CAs? | X | |
| If required, does the report adequately address the NRC's Safety Culture Components in accordance with the guidance provided in Attachment 20? | X | |
| Important Content Attributes | Yes | No |
| Are all of the important facts included in the report? | X | |
| Does the report explain the logic used to arrive at the conclusions? | X | |
| If appropriate, does the report explain what root causes were considered, but eliminated from further consideration and the bases for their elimination from consideration? | X | |
| Does the report identify contributing causes, if applicable? | X | |
| Is it clear what conditions the corrective actions are intended to create? | X | |
| Are there unnecessary corrective actions that do not address the root causes or contributing causes? | X | |
| Is the timing for completion of each corrective action commensurate with the importance or risk associated with the issue? | X | |

Attachment 14

Root Cause Investigation Report Quality Checklist
Page 2 of 2

| Miscellaneous Items | YES | NO |
|---|------------|-----------|
| Did an individual who is qualified in Root Cause Analysis prepare the report? | X | |
| Does the Executive Summary adequately and accurately describe the significance of the event, the event sequence, root causes, corrective actions, reportability, and previous events? | X | |
| Do the corrective actions include an effectiveness review for corrective actions to prevent recurrence? | X | |
| Were ALL corrective actions entered and verified to be in Action Tracking? | | * |
| Are the format, composition, and rhetoric acceptable (grammar, typographical errors, spelling, acronyms, etc.)? | X | |
| Have the trend codes been added or adjusted in Passport to match the investigation results? | | * |

* Actions will be entered into passport and trend codes applied after MRC approval. This is tracked by assignment 759945-20.

20. **ATTACHMENT 1 – ROOT CAUSE INVESTIGATION CHARTER**
Page 1 of 1

IR Number: 759945

Sponsoring Manager: Bill Grundmann, Regulatory Assurance Manager

Qualified Root Cause Investigator: Robert Lloyd (verified in LMS)

Team Investigator(s):

| | | |
|----------------------|--------------|----------|
| Training | Gary Wolfe | 40 hours |
| Work Control | Dave Coltman | 24 hours |
| Engineering Programs | Joe Edom | 24 hours |

Scope:

Investigate the issues that led to an unplanned Unit 2 on-line risk (OLR) Orange Condition including:

- Training and qualification associated with how well the (a)(4) process is understood (i.e. as a Configuration Risk Management process) and of the level of understanding of risk and insights provided by the PRA, and review operator response actions to flooding,
- Technical review of risk evaluation sheets and other risk documents,
- Organizational and programmatic potential latent weaknesses associated with risk management,
- IRs related to operator response credited to mitigate flooding in the auxiliary building; 757507, 757930, 759455, 759929, and 759930.

The root cause methodologies used may include event and causal factor charting, TapRoot®, task analysis, and cause/effect analysis.

Interim Corrective Actions:

- OLR is evaluated on a daily basis after the updated outage schedule is released and any necessary adjustments are performed.
- Communication was made to all SROs to ensure that any configuration changes on EPNs listed on the risk evaluation sheet are questioned/communicated to the Cycle Manager such that risk can be reviewed if necessary.

Root Cause Report Milestones:

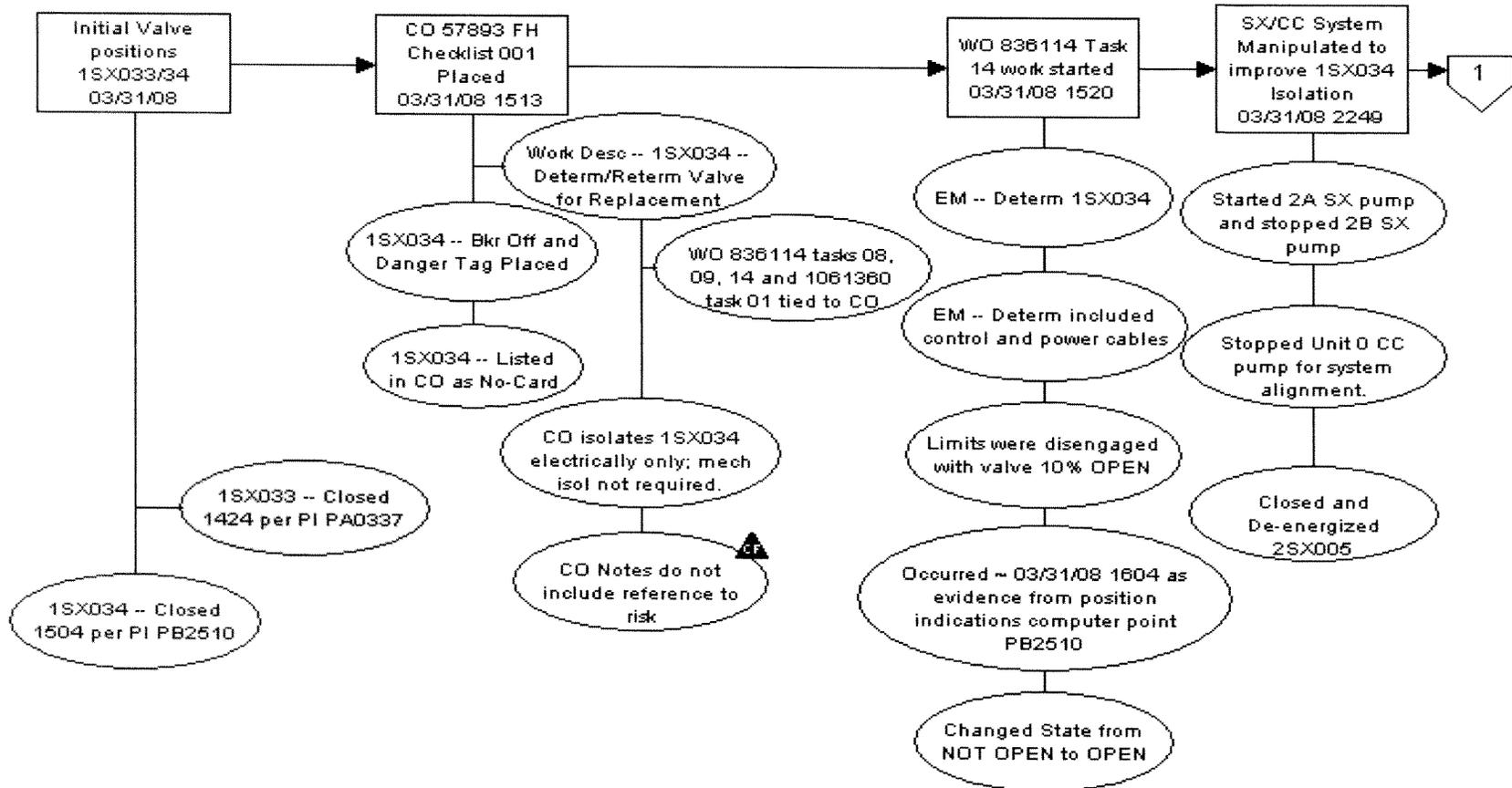
| | |
|--|----------|
| 1. Event Date | 04/06/08 |
| 2. Screening Date | 04/07/08 |
| 3. Completion of Charter | 04/10/08 |
| 4. Status Briefing for Charter | 04/14/08 |
| 5. Two Week Update | 04/20/08 |
| 6. Sponsoring Manager Report Approval | 05/14/08 |
| 7. Review by MRC | 05/21/08 |
| 8. Review by PORC | 05/21/08 |
| 9. Final Root Cause Investigation Due Date | 05/21/08 |

21.

ATTACHMENT 2 – EVENT AND CAUSAL FACTOR CHART

Page 1 of 6

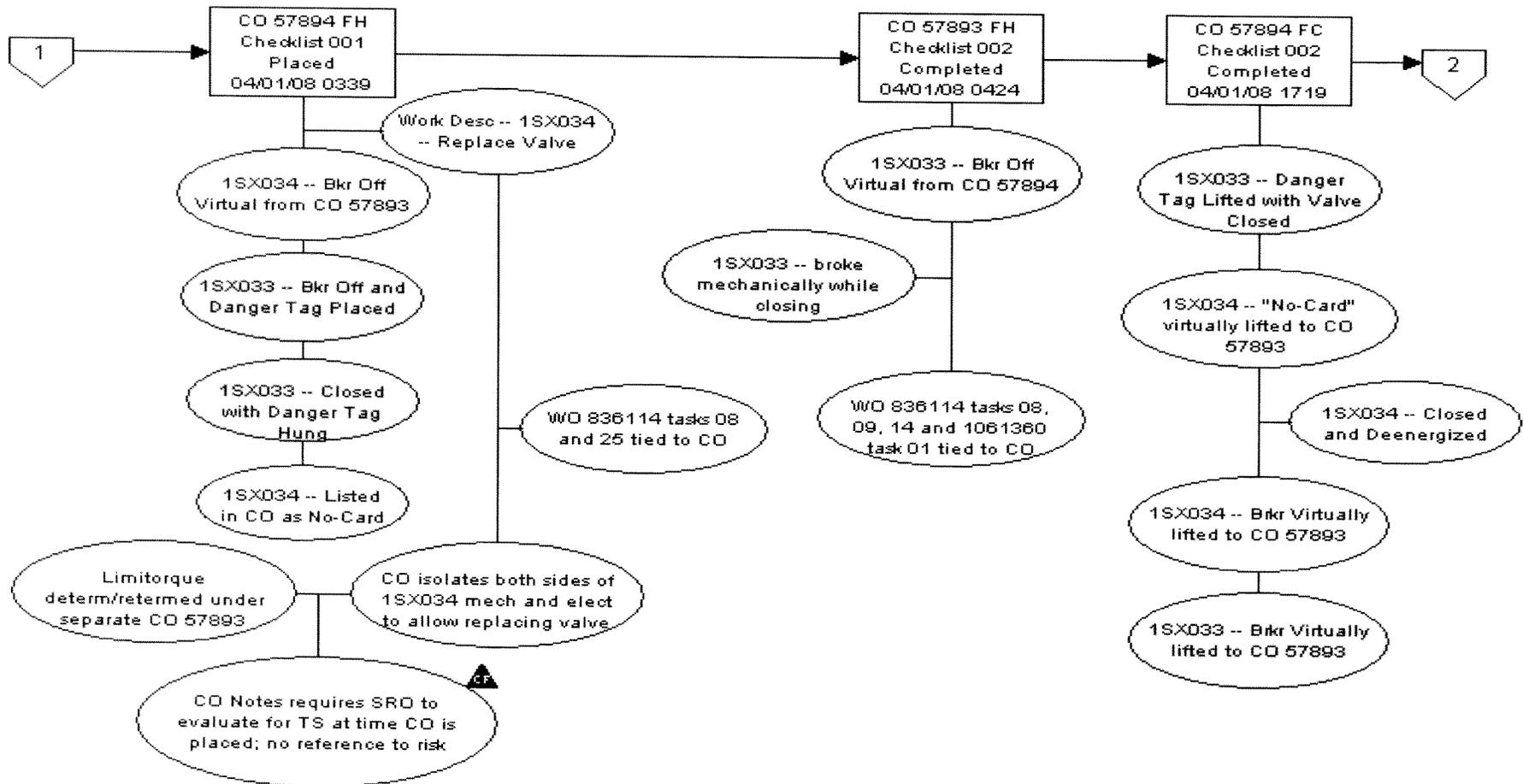
RCR 759945 -- Unplanned Unit 2 On-line Risk (OLR) Orange Condition



Attachment 2 – Event and Causal Factor Chart

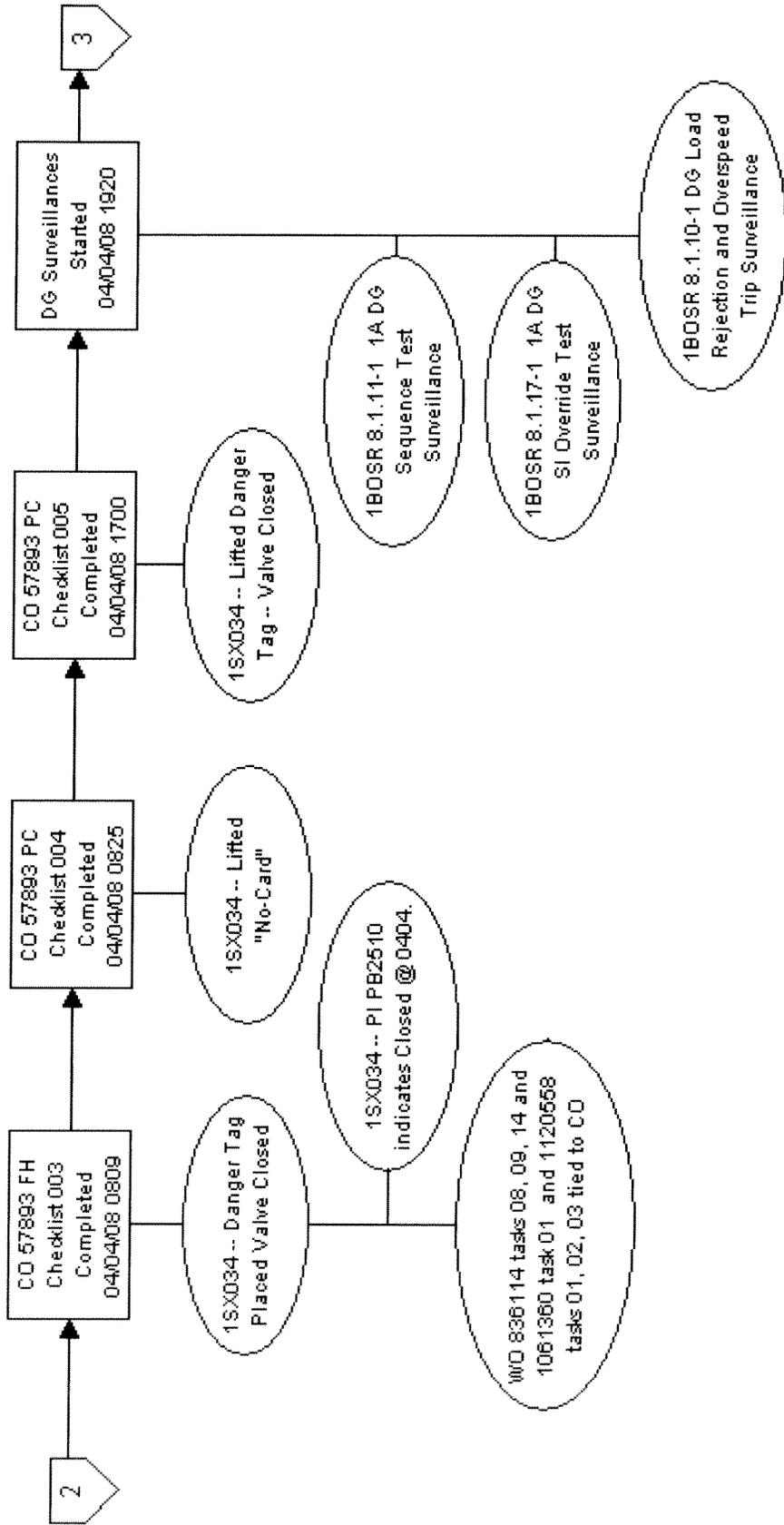
Page 2 of 6

RCR 759945 -- Unplanned Unit 2 On-line Risk (OLR) Orange Condition



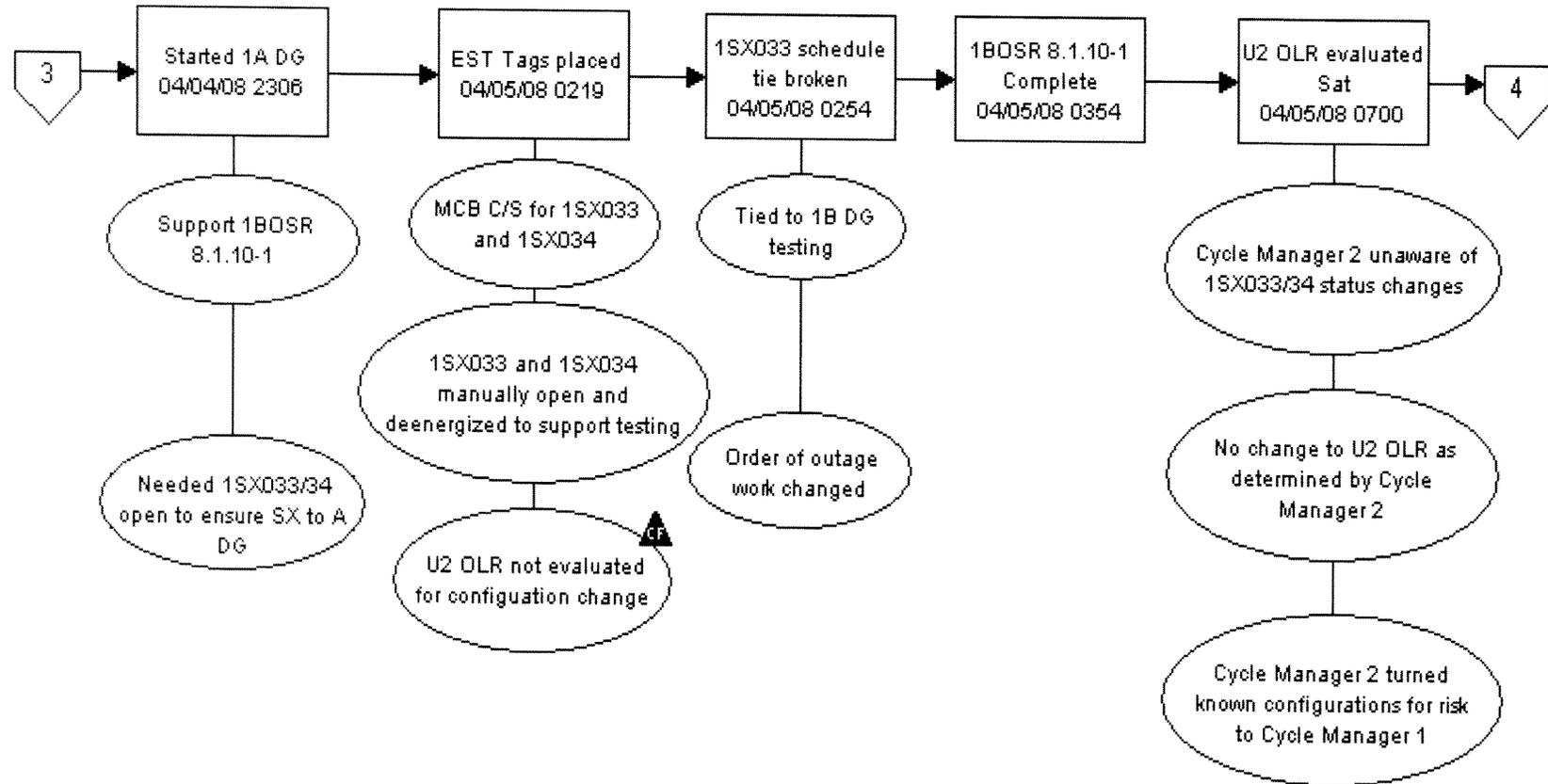
Attachment 2 – Event and Causal Factor Chart
Page 3 of 6

ROR 759945 -- Unplanned Unit 2 On-line Risk (OLR) Orange Condition



Attachment 2 – Event and Causal Factor Chart
Page 4 of 6

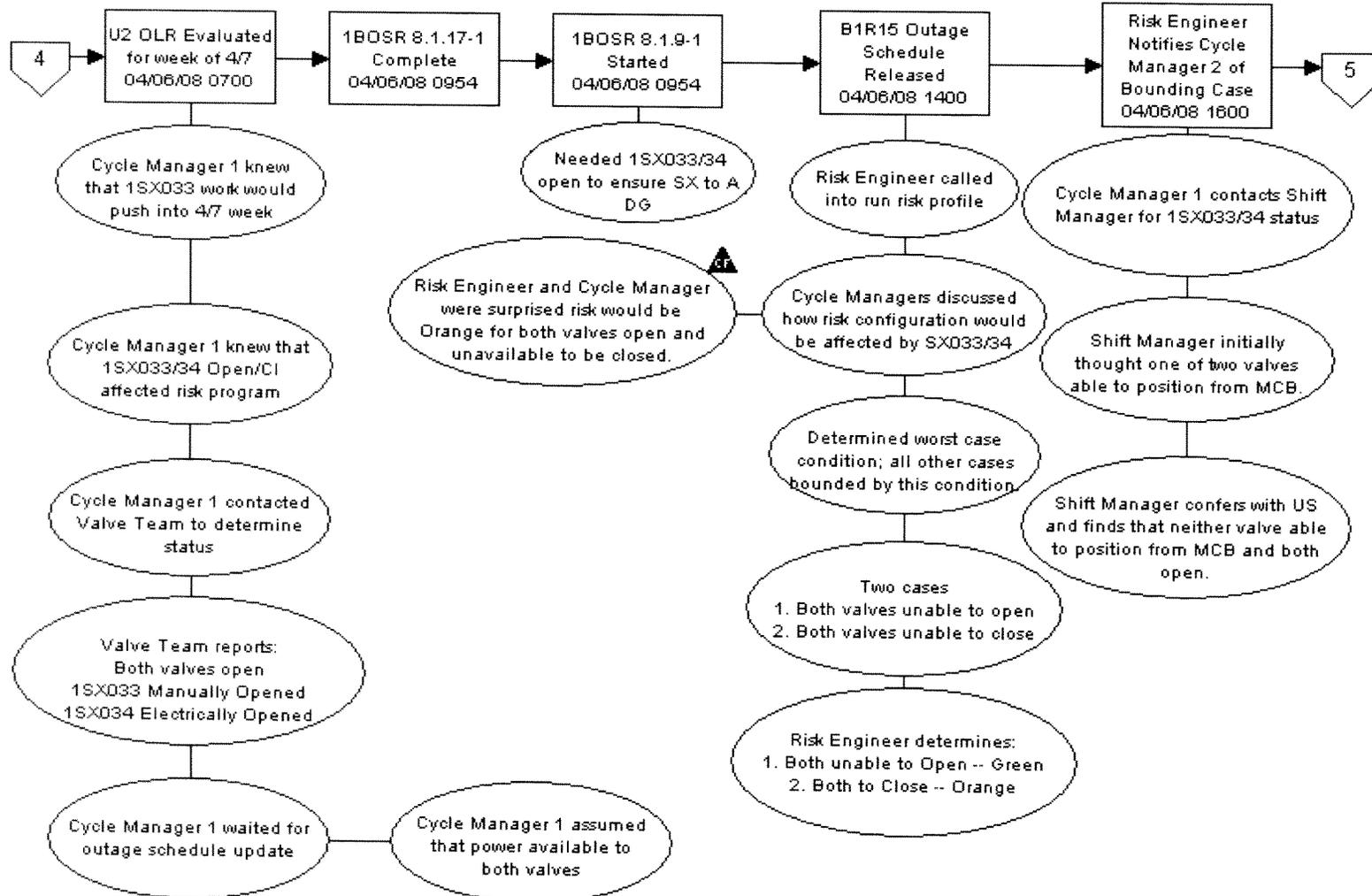
RCR 759945 -- Unplanned Unit 2 On-line Risk (OLR) Orange Condition



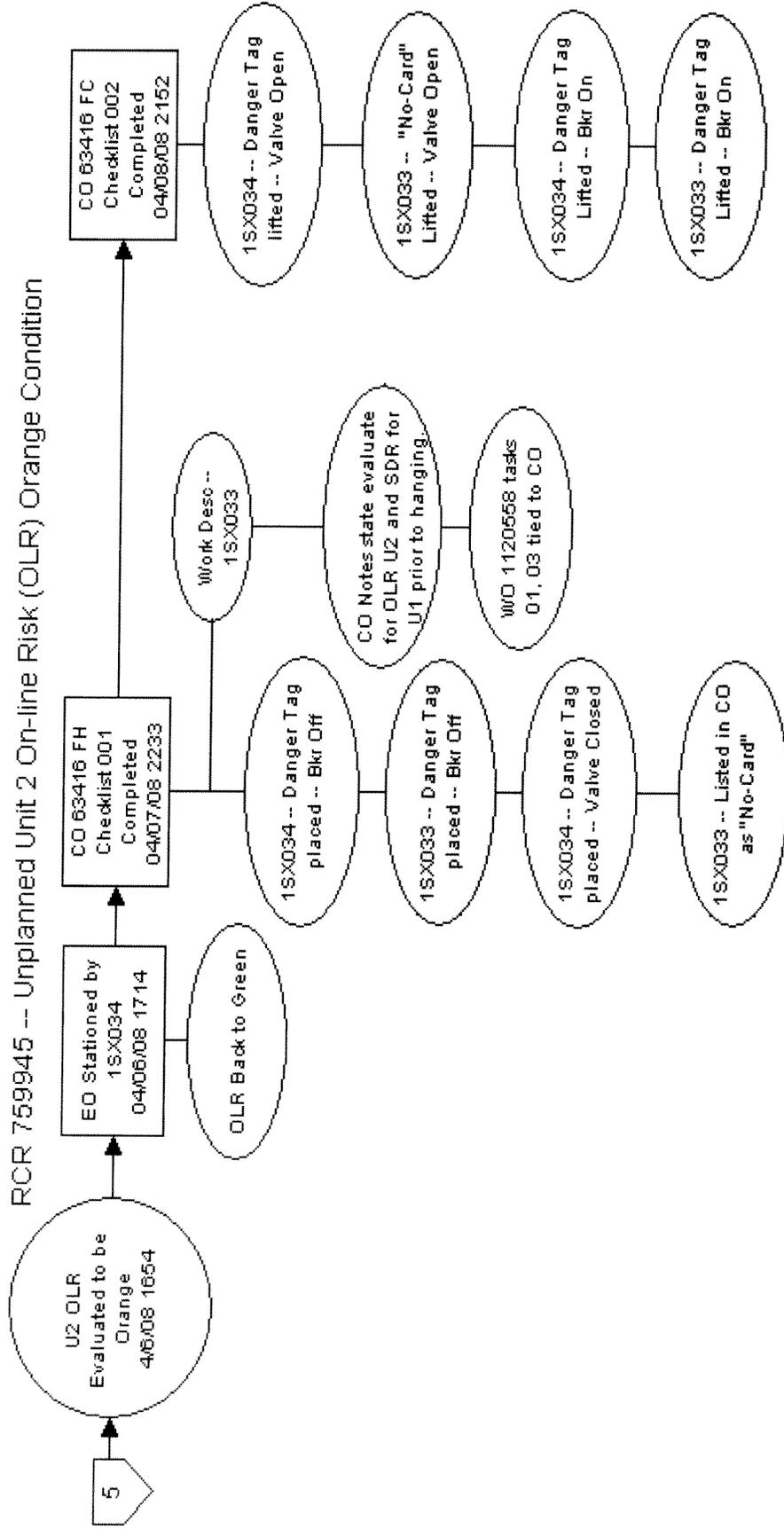
Attachment 2 – Event and Causal Factor Chart

Page 5 of 6

RCR 759945 -- Unplanned Unit 2 On-line Risk (OLR) Orange Condition

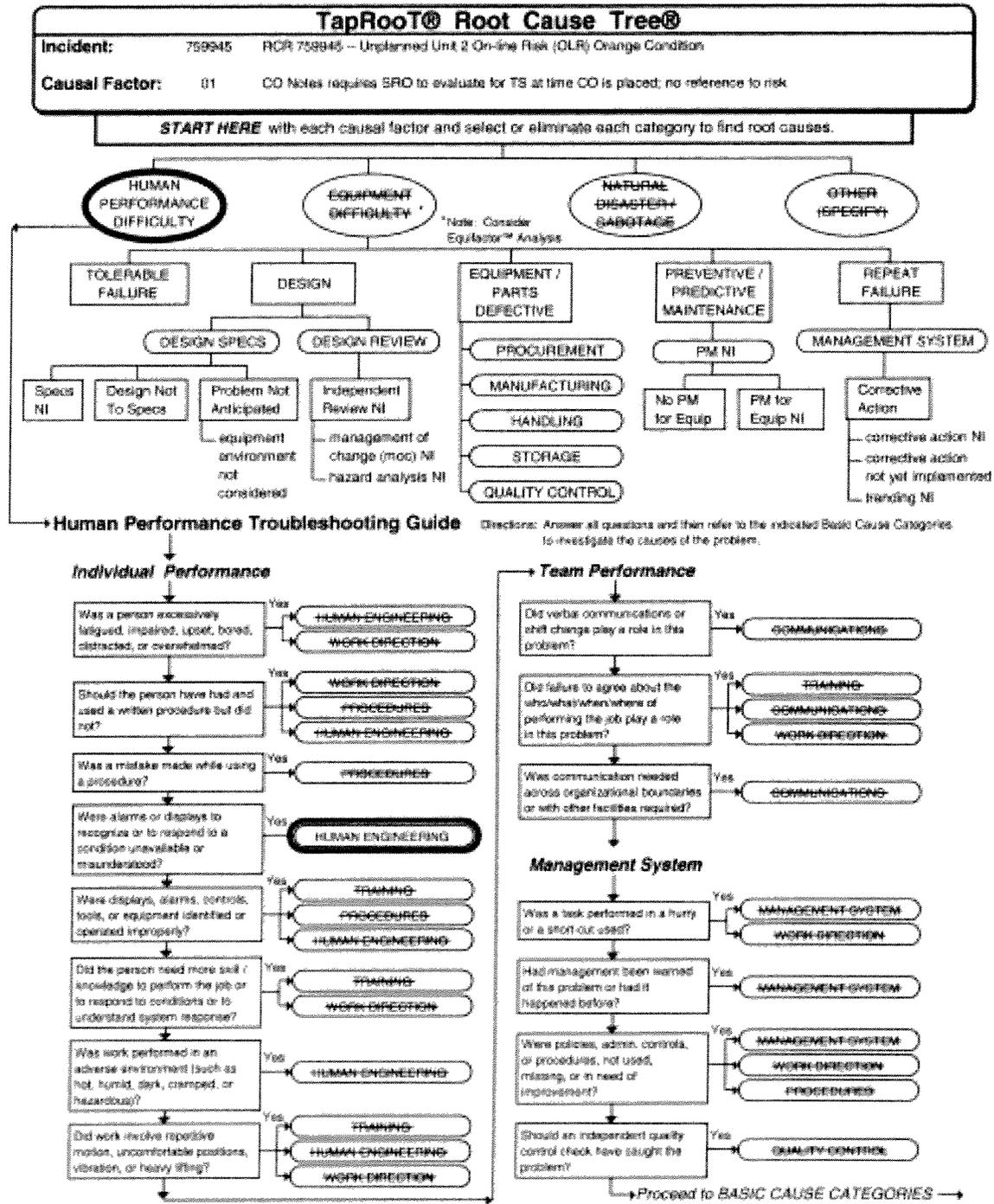


Attachment 2 – Event and Causal Factor Chart
Page 6 of 6



ATTACHMENT 3 – TAPROOT® TREES

Page 1 of 8



NI = Needs Improvement May also substitute LTA (Less Than Adequate) or PIO (Potential Improvement Opportunity)

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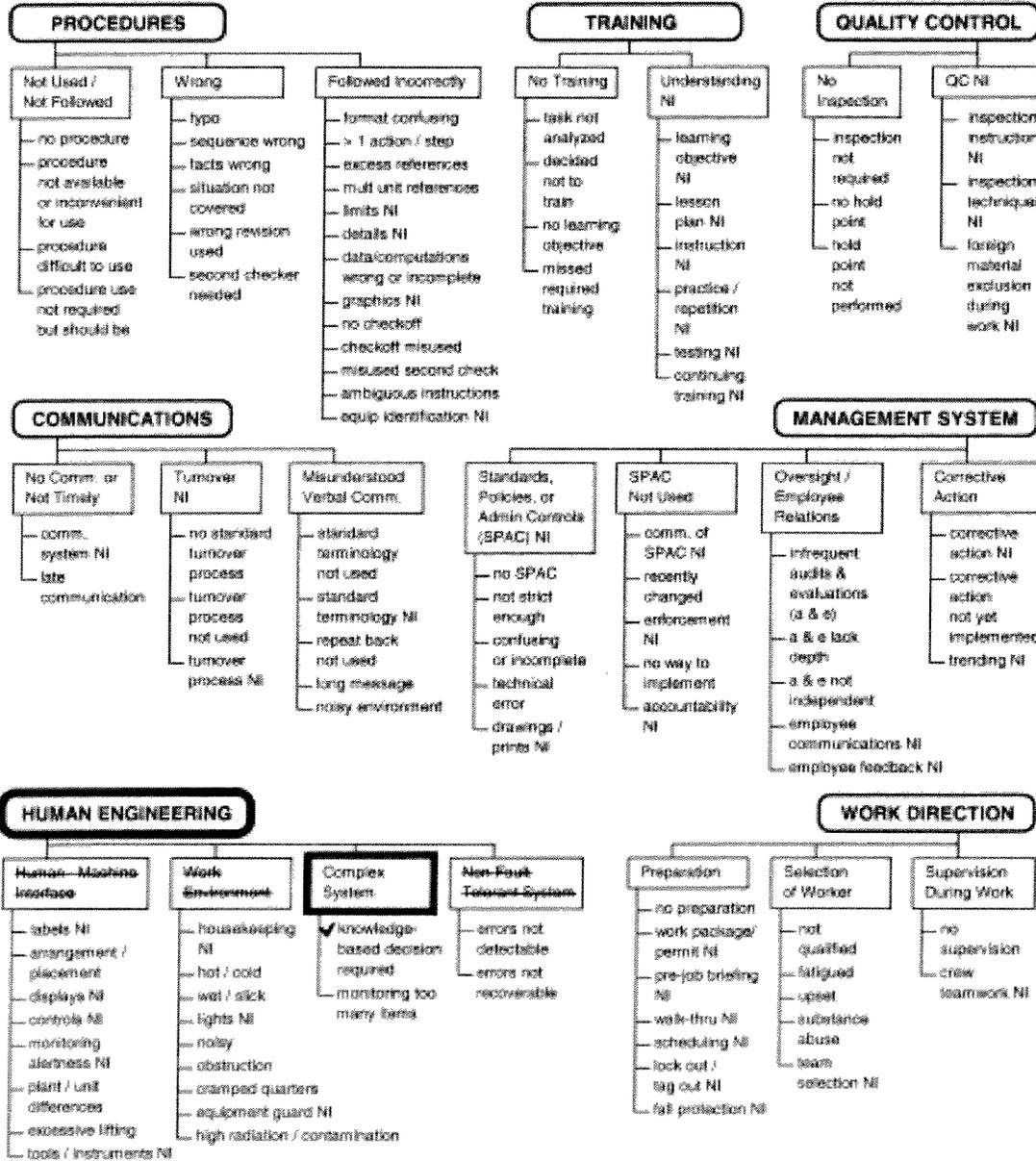
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* indicates a comment

Attachment 3 – TapRoot® Trees

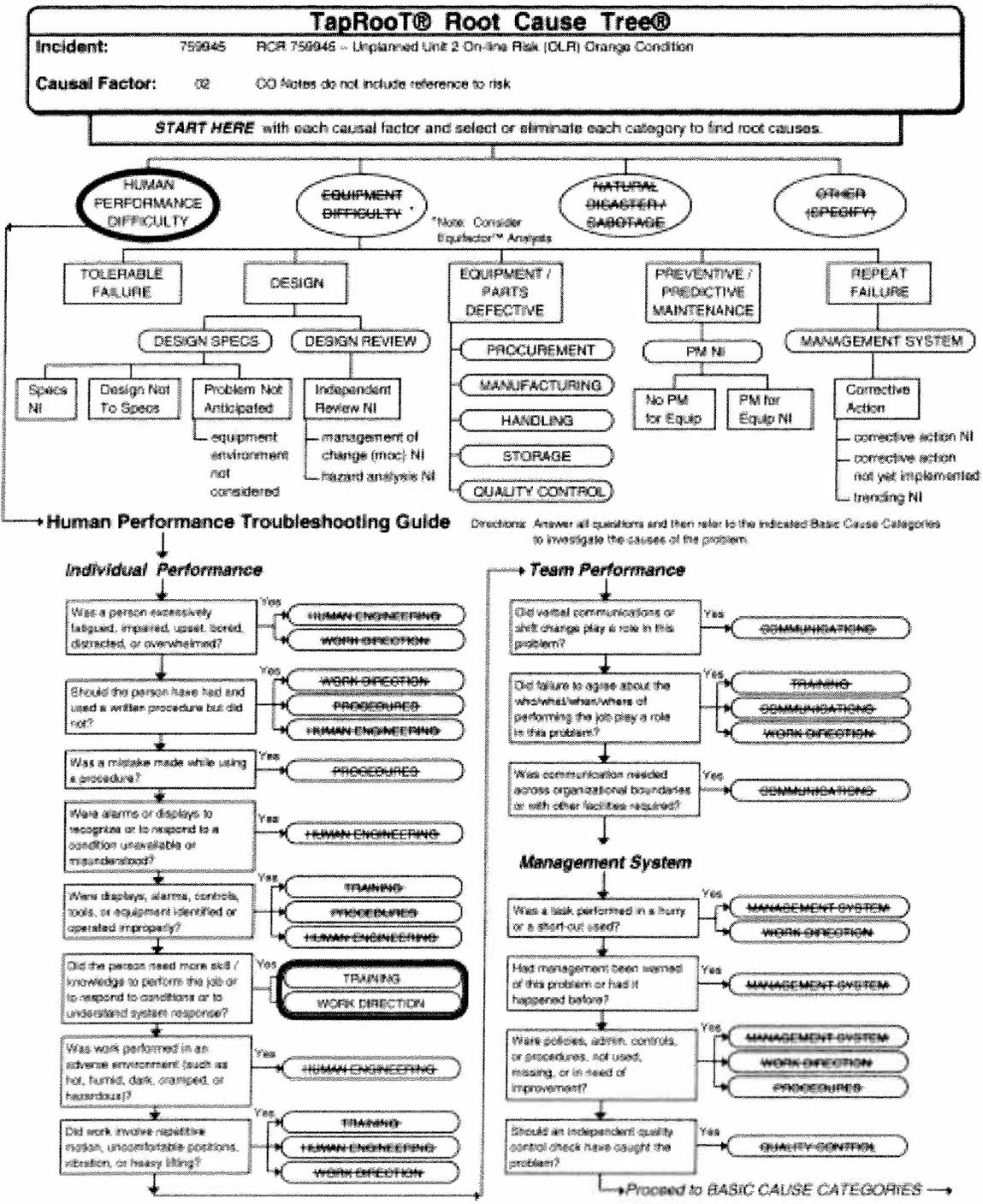
| TapRoot® Root Cause Tree® | | |
|---------------------------|--------|---|
| Incident: | 759945 | ROR 759945 – Unplanned Unit 2 On-line Risk (OLR) Orange Condition |
| Causal Factor: | 01 | CO Notes requires SPD to evaluate for TS at time CO is placed, no reference to risk |

BASIC CAUSE CATEGORIES



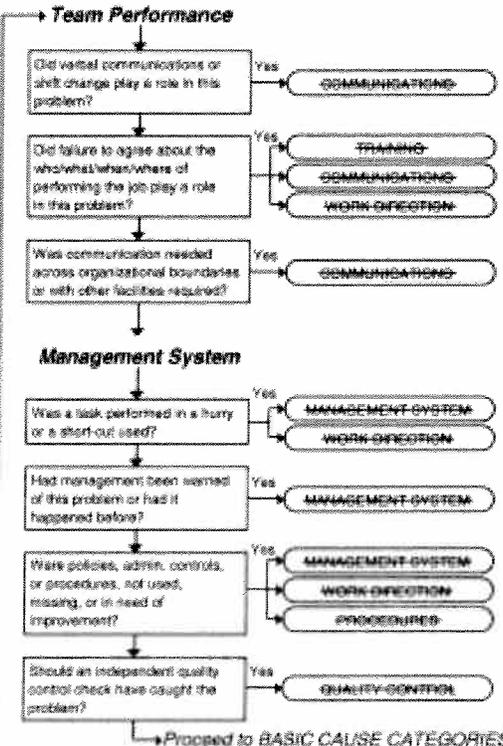
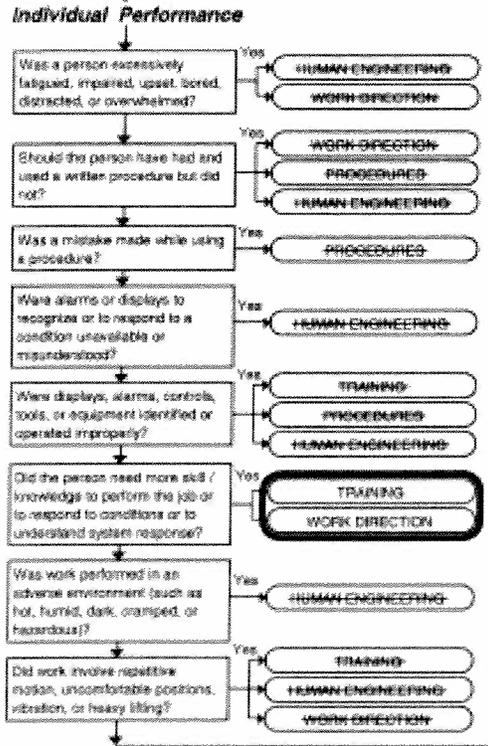
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Attachment 3 – TapRoot® Trees



Human Performance Troubleshooting Guide

Directions: Answer all questions and then refer to the indicated Basic Cause Categories to investigate the causes of the problem.

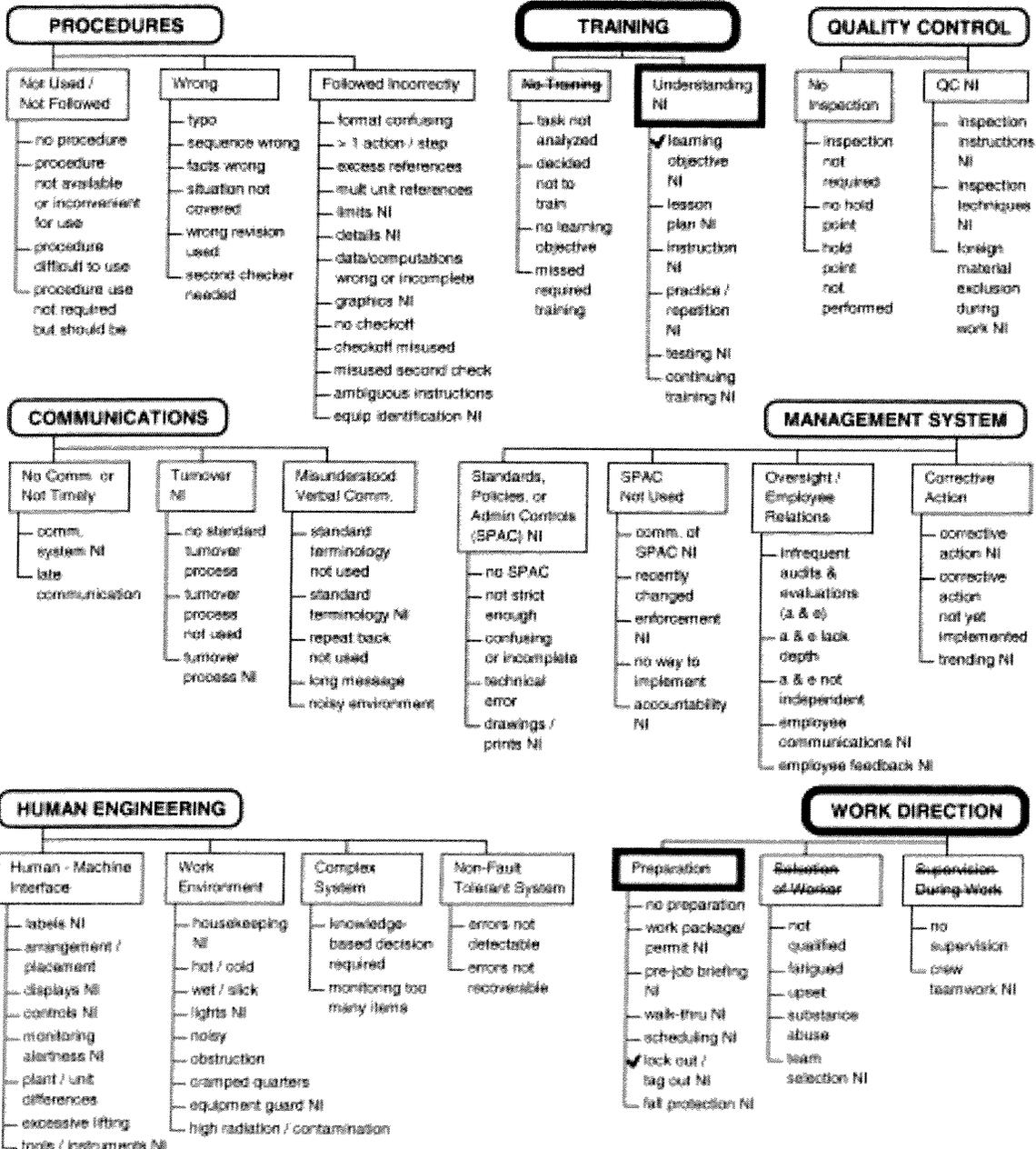


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Attachment 3 – TapRoot® Trees

| TapRoot® Root Cause Tree® | | |
|---------------------------|--------|--|
| Incident: | 759945 | RCR 759945 -- Unplanned Unit 2 On-line Risk (OLR) Change Condition |
| Causal Factor: | 02 | OO Notes do not include reference to risk |

BASIC CAUSE CATEGORIES



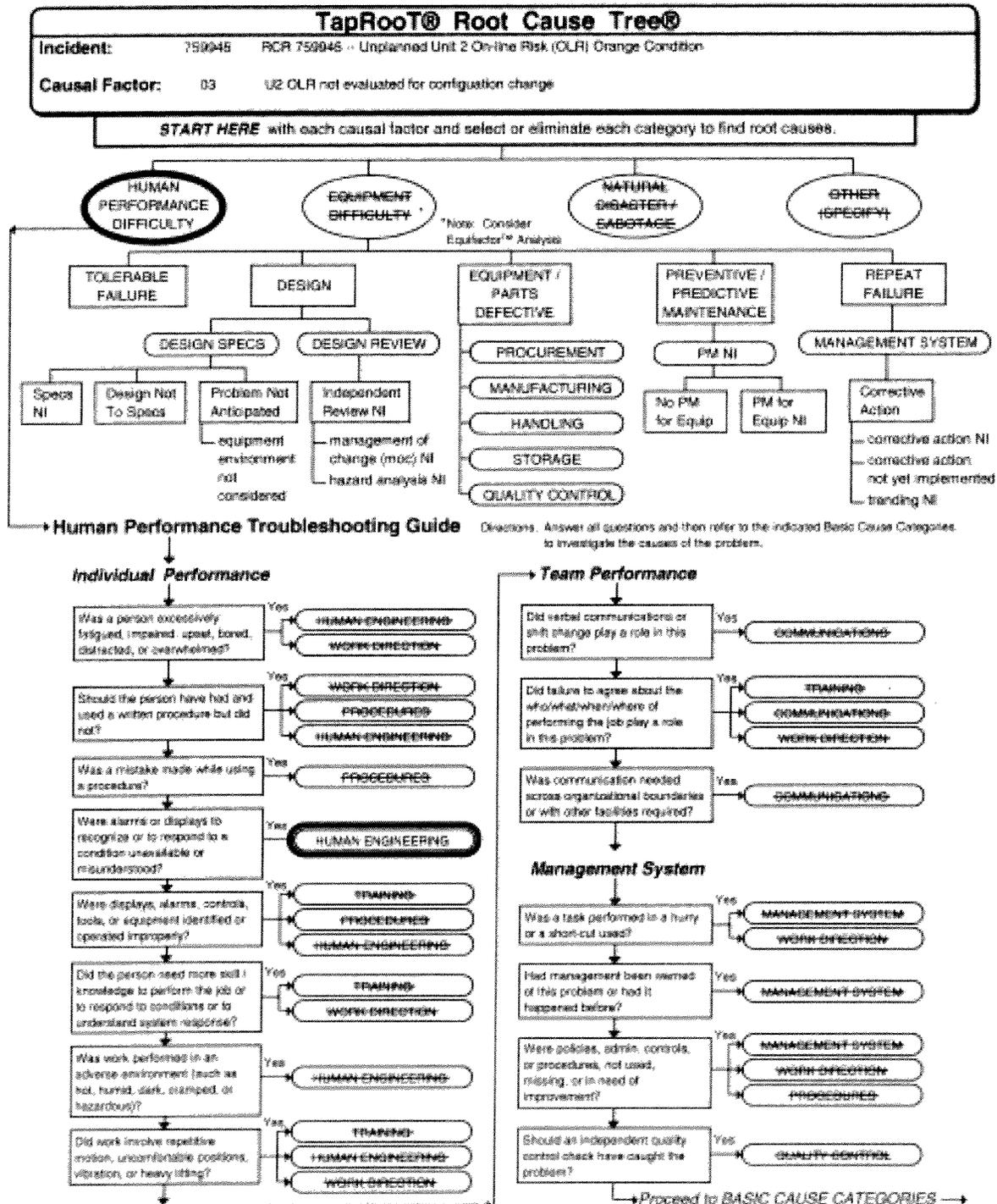
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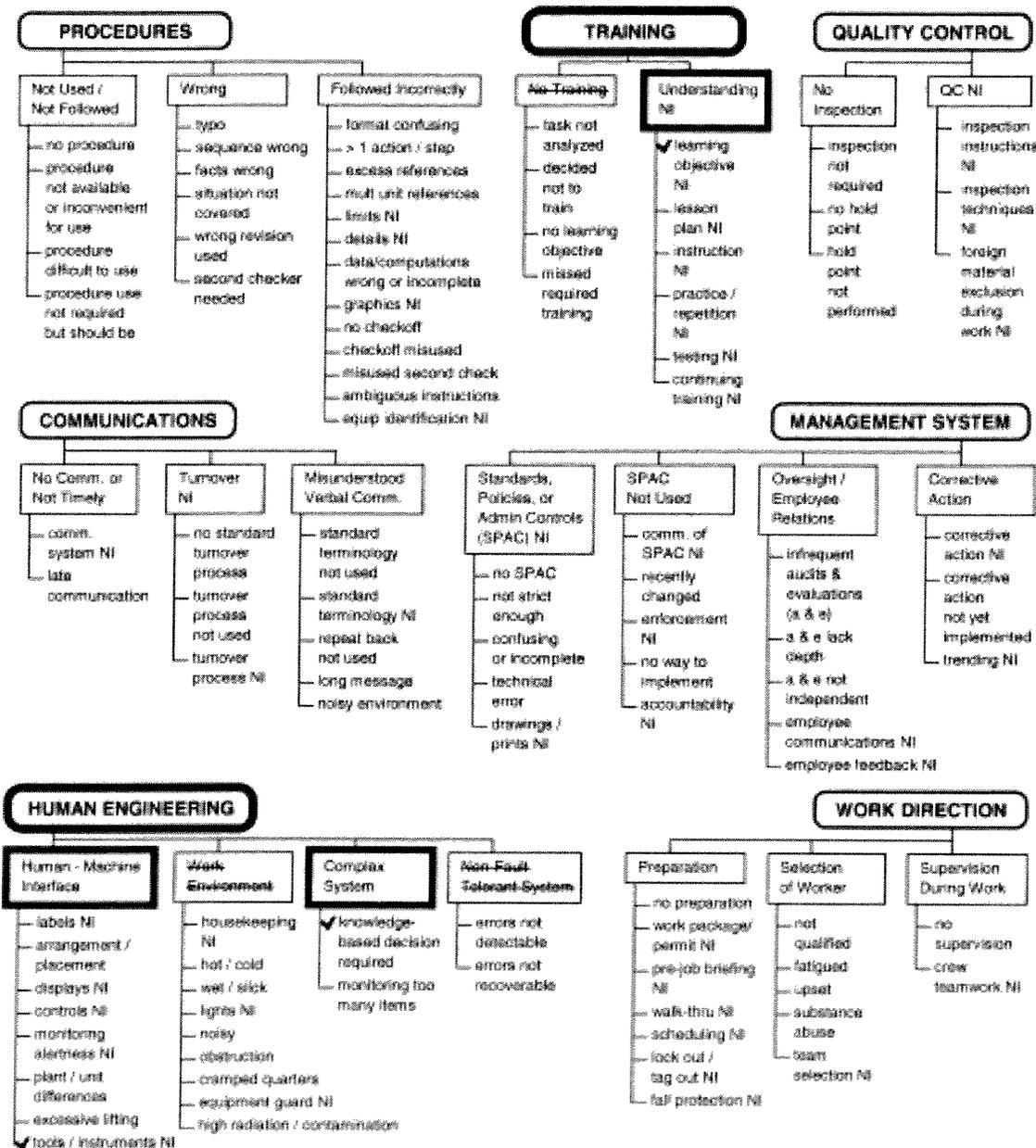
Attachment 3 – TapRoot® Trees



Attachment 3 – TapRoot® Trees

| TapRoot® Root Cause Tree® | | |
|---------------------------|--------|--|
| Incident: | 759945 | RCR 759945 -- Unplanned Unit 2 On-line Risk (OLR) Change Condition |
| Causal Factor: | 03 | U2 OLR not evaluated for configuration change |

BASIC CAUSE CATEGORIES



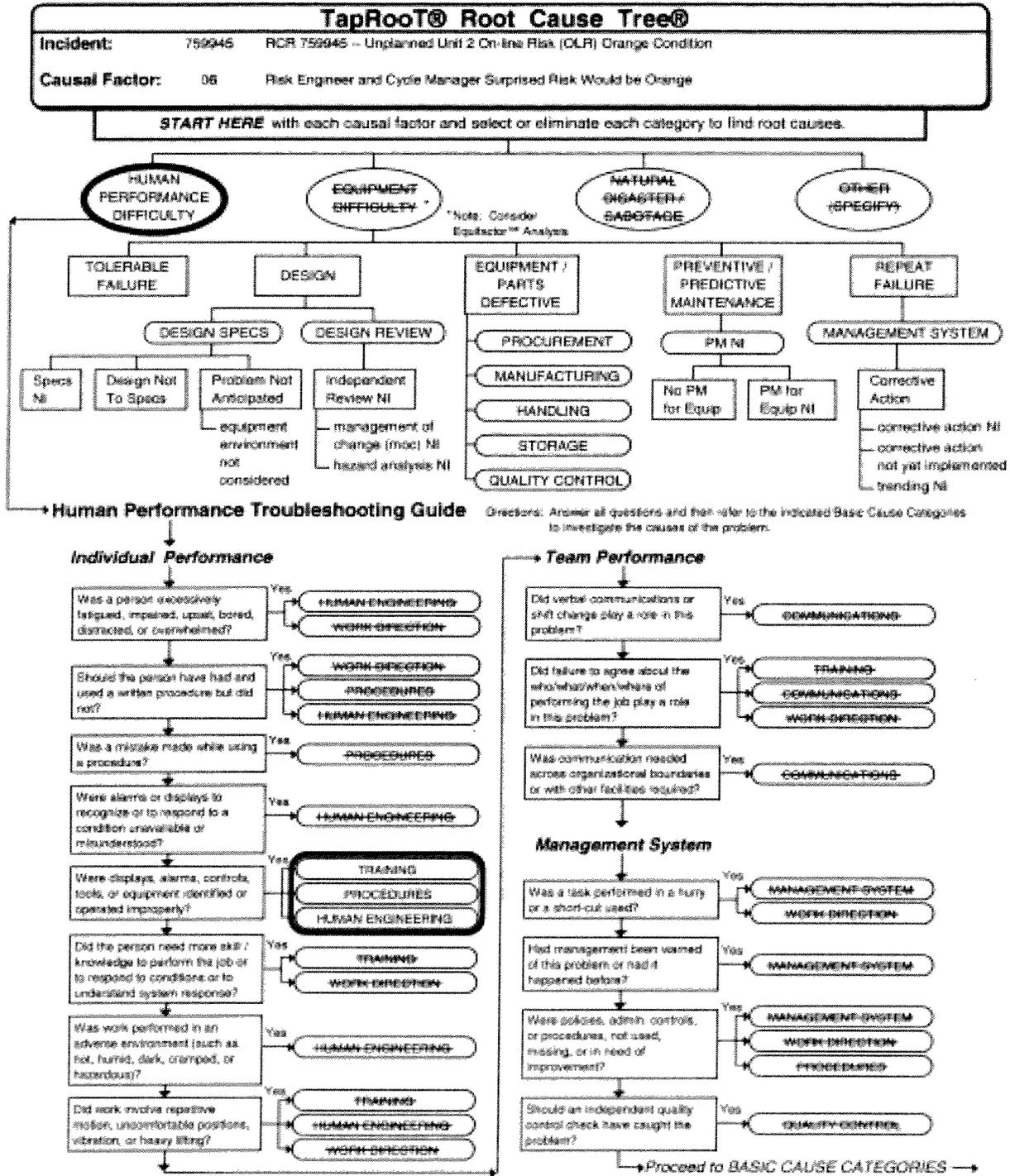
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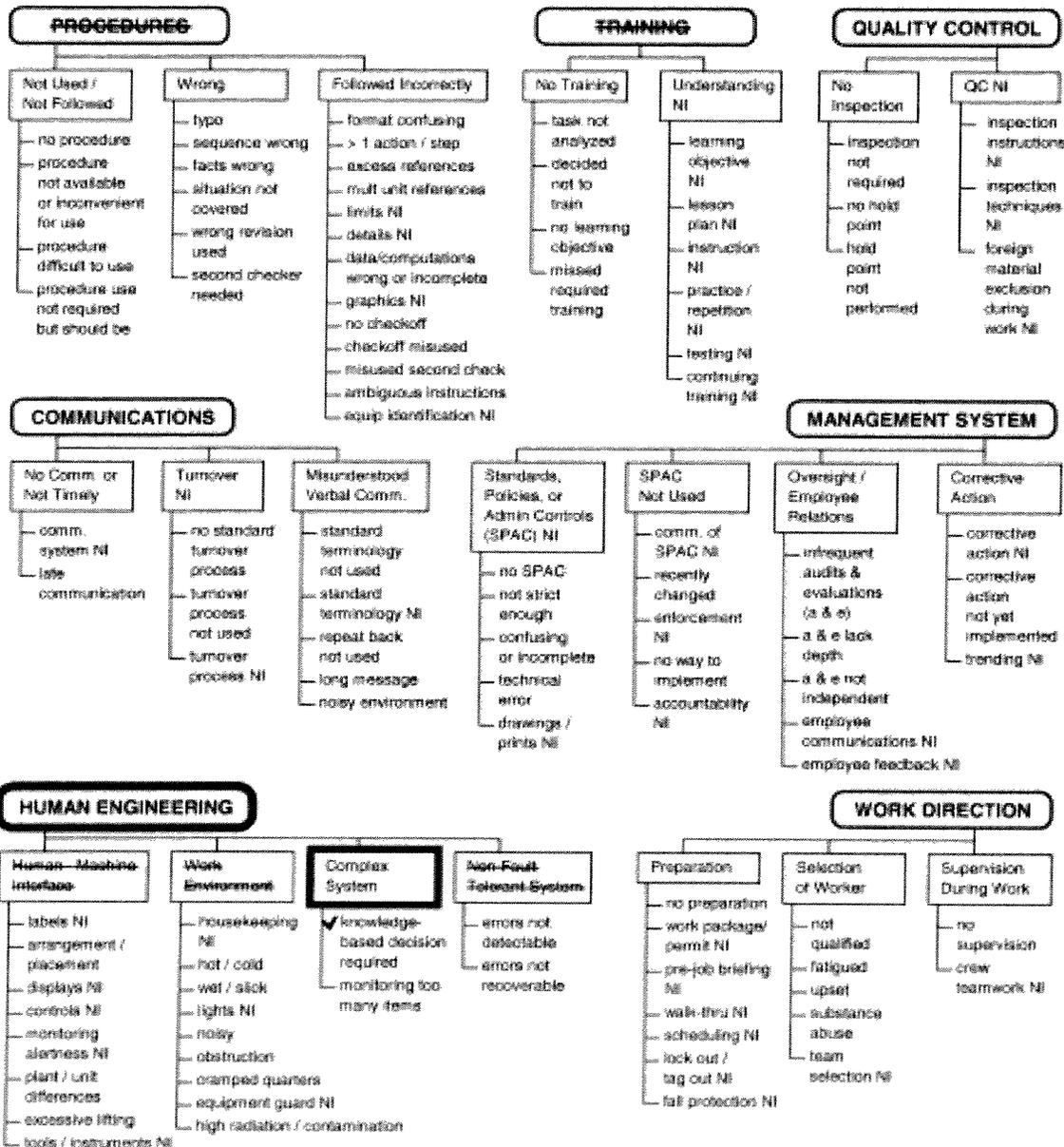
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Attachment 3 – TapRoot® Trees

| TapRoot® Root Cause Tree® | | |
|----------------------------------|--------|---|
| Incident: | 759945 | RCR 759945 – Unplanned Unit 2 On-line Risk (OLR) Orange Condition |
| Causal Factor: | 06 | Risk Engineer and Cycle Manager Surprised Risk Would be Orange |

BASIC CAUSE CATEGORIES



NI = Needs Improvement May also substitute LTA (Less Than Adequate) or PIO (Potential Improvement Opportunity)

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