

APPENDIX F - BARRIER ANALYSIS

There are many things that should be addressed during the performance of a Barrier Analysis. NOTE: In this usage, a barrier is from Management Oversight and Risk Tree (MORT) terminology and is something that separates an affected component from an undesirable condition/situation. Figure F-1 provides an example of Barrier Analysis. The questions listed below are designed to aid in determining what barrier failed, thus resulting in the occurrence.

What barriers existed between the second, third, etc. condition/situation and the second, third, etc. problems?

If there were barriers, did they perform their functions? Why?

Did the presence of any barriers mitigate or increase the occurrence severity? Why?

Were any barriers not functioning as designed? Why?

Was the barrier design adequate? Why?

Were there any barriers in the condition/situation source(s)? Did they fail? Why?

Were there any barriers on the affected component(s)? Did they fail? Why?

Were the barriers adequately maintained?

Were the barriers inspected prior to expected use?

Why were any unwanted energies present?

Is the affected system/component designed to withstand the condition/situation without the barriers? Why?

What design changes could have prevented the unwanted flow of energy? Why?

What operating changes could have prevented the unwanted flow of energy? Why?

What maintenance changes could have prevented the unwanted flow of energy? Why?

Could the unwanted energy have been deflected or evaded? Why?

What other controls are the barriers subject to? Why?

Was this event foreseen by the designers, operators, maintainers, anyone?

Is it possible to have foreseen the occurrence? Why?

Is it practical to have taken further steps to have reduced the risk of the occurrence?

Can this reasoning be extended to other similar systems/components?

Were adequate human factors considered in the design of the equipment?

What additional human factors could be added? Should be added?

Is the system/component user friendly?

Is the system/component adequately labeled for ease of operation?

Is there sufficient technical information for operating the component properly? How do you know?

Is there sufficient technical information for maintaining the component properly? How do you know?

Did the environment mitigate or increase the severity of the occurrence? Why?

What changes were made to the system/component immediately after the occurrence?

What changes are planned to be made? What might be made?

Have these changes been properly, adequately analyzed for effect?

What related changes to operations and maintenance have to be made now?

Are expected changes cost effective? Why? How do you know?

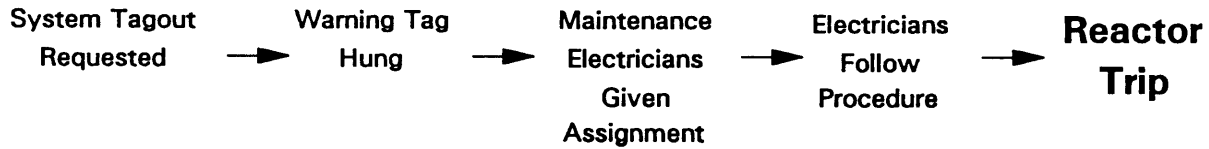
What would you have done differently to have prevented the occurrence, disregarding all economic considerations (as regards operation, maintenance, and design)?

What would you have done differently to have prevented the occurrence, considering all economic concerns (as regards operation, maintenance and design)?

Work Task: Clean Relay Contact

Occurrence: Reactor Trip

Sequence of Events:



Barriers Analysis:



<p>MWR requests de-energizing two panels so relays can be cleaned. Operations will only allow one panel at a time to be tagged out. Electrical foreman told and agrees.</p>	<p>Tag hung on P689 - only P690 is still energized.</p>	<p>Electricians given MWR to work, which references a Maint. Procedure, but not told of change in scope by foreman.</p>	<p>Electricians go to P690 and begin procedure. Procedure has no step to verify dead power supply before starting. They open first relay and plant trips.</p>	<p>Electricians never trained to always check power supply prior to working on electrical equipment.</p>
<p>Barrier Holds</p>	<p>Barrier Holds</p>	<p>Barrier Fails</p>	<p>Barrier Fails</p>	<p>Barrier Fails</p>

Figure F-1. Examples of Barrier Analysis