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FREQUENCY OF DEFLAGRATION IN THE IN-TANK PRECIPITATION PROCESS TANKS DUE TO LOSS OF NITROGEN PURGE SYSTEM (U)

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SAVANNAH RIVER SITE

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1.0 INTRODUCTION AND SUMMARY

1.1 Introduction

High-level liquid wastes (HLLW) from the processing of nuclear material at the Savannah River Site (SRS) are stored in large tanks in the F- and H-Area tank farms. In the tanks the wastes separate into sludge and salt solution. The salt solution is concentrated by evaporation and the salt and sludge are held for further processing. A detailed analysis of the tank farms and HLLW processing is provided in Reference 1. The In-Tank Precipitation (ITP) process is one step in the processing and disposal of HLLW. This process is described and analyzed in detail in Reference 2.

The ITP process decontaminates the salt solution so that it can be transferred to other facilities for further processing. The processing facility includes four large tanks, a filter building, an organic stripper building, filtrate hold tanks, and a cold chemical storage area.

The process hazards review for the ITP identified the need to implement provisions that minimize deflagration/explosion hazards associated with the process. The nitrogen purge system constitutes one of these provisions. One function of this system is to provide a continuous nitrogen sweep of the vapor space in Tanks 48 and 49 to maintain the oxygen concentration at a level that ensures that fires do not occur. Another function of this system is to maintain the concentration of flammable constituents below the composite lower flammability limit (LFL) to ensure that deflagrations do not occur.

The major considerations in this analysis are:

1. The response times available for repair or restoration of an inoperative nitrogen purge system before conditions for deflagrations can develop within a waste tank are dependent upon the system configuration at the time a failure occurs. Estimates of these times are (3):

Tank 48: 3 days, if Tank 48 is in the wash cycle when the nitrogen purge system becomes inoperable.

3 to 6 days, if Tank 48 is transferring its salt solution when the nitrogen purge system becomes inoperable.

6 days, if Tank 48 is in its normal processing cycle when the nitrogen purge system becomes inoperable.

Tank 49: Operations in Tank 49 are limited so that the time to reach the LFL is at least 3 days (4).

2. Maintenance activities on active components of the nitrogen purge system serving Tanks 48 and 49 are assumed to occur as specified in the Operational Safety Requirements (OSRs) (4) and/or as specified explicitly in operating procedures.
3. Conditions favorable to a deflagration within a waste tank can develop in a specified time period after a loss of the nitrogen purge system. If an ignition source is present when the system becomes vulnerable to a deflagration, a deflagration is assumed to occur. An analysis to determine the probability of having an ignition source present during the window of vulnerability was performed (5). The ignition source probability is estimated to be $9.0E-2$ for non-seismic initiators and 0.13 for seismic initiators (5). (The difference between these probabilities is based on the assumption that because an earthquake could cause Sitewide damage, no credit was given for repairs to potentially damaged equipment. For the other events analyzed, the damage is localized and limited so little credit was given for repairs.)
4. Human action considerations were conservatively restricted to a single recovery activity and a single repair activity per cutset.

The objective of this analysis is to determine the frequency of a deflagration in Tank 48 and/or 49 due to nitrogen purge system failures (including external events) and coincident ignition source.

1.2 Summary of Results

A fault tree of the nitrogen purge system coupled with ignition source probability is used to identify dominant system failures that contribute to the frequency of deflagration. These system failures are then used in the recovery analysis.

Several human actions, recovery actions, and repair activities are identified that reduce total frequency. The actions are analyzed and quantified as part of a Human Reliability Analysis (HRA). The probabilities of failure of these actions are applied to the fault tree cutsets and the event trees.

The total frequency for a loss of nitrogen purge due to internal and external events with the presence of an ignition source is $\sim 2.9E-07/\text{yr}$.

The total estimated frequency for a loss of the nitrogen purge system in Tanks 48 and 49 due to internal initiating events for sufficient time to reach the LFL with the presence of an ignition source is $7.2E-8/\text{yr}$. This frequency includes the probability of operators failing to align the emergency purge ventilation equipment (EPVE), the probability of failure of the EPVE to start and run, and the probability of maintenance failing to repair the failed equipment and return the system to normal operation. Approximately 25% of this total is due to failures of the digital

control system (DCS), which fails the nitrogen purge to both tanks, combined with the above mentioned operator actions. Failures of the O₂ analyzers combined with the same operator actions account for approximately 22% of the total failure frequency. Approximately 20% of the total failure frequency is due to failures of the exhaust fan trains combined with the operator actions. Approximately 16% of the total frequency is due to a loss of steam that results in a plugged HEPA filter combined with the operator actions. The remaining contributors are miscellaneous system failures.

The total frequency for a loss of nitrogen purge due to external events with the presence of an ignition source is $2.16\text{E-}7/\text{yr}$. The dominant sequence, which accounts for approximately 90% of the total external event sequence frequency, is a seismic or high-wind event that fails the entire nitrogen purge system coupled with failure to establish air-based ventilation with the EPVE. This frequency is dominated by a 0.02g earthquake as the initiator, subsection 4.2.4 discusses the context of this magnitude event in relation to the full spectrum of external events and its contribution to the overall external event sequence frequency.

1.3 Limiting Conditions for Operation

Credit has been taken in this analysis for several factors concerning system configuration, operating procedures, and administrative controls. These factors are limiting because the results of this analysis are valid only if the facility operation, system configuration, and administrative controls are maintained. The factors that have quantitative impact on the results of this analysis are summarized below:

- o OSR limits on the time to reach LFL on Tanks 48 and 49 must be maintained.
- o Two sets of EPVE are provided as backup to each tank (4 sets total). These units are self-powered. All EPVE sets will be protected to survive a Design Basis Earthquake (DBE) of 0.2g and a high wind of 137 mph (and any missiles generated) and can be physically relocated to Tanks 48 and 49 and made operable within the time limits specified in the OSRs (4).
- o At least one compelling signal is generated immediately for each failure scenario for which a recovery/repair action is required as described in Section 5.0.
- o Adequate procedures exist for each scenario that would lead the operator(s) to the actions considered in Section 5.0. These procedures are written such that each involves step-by-step actions and requires independent check-off provisions, performed after critical steps in the procedure, to assure that the procedure is performed correctly. Operators are adequately trained on all procedures.

2.0 NITROGEN PURGE SYSTEM FUNCTIONAL DESCRIPTION

The nitrogen purge system provides a continuous sweep of nitrogen gas through the vapor space of Tanks 48 and 49. This continuous sweep is required to remove benzene and hydrogen vapors formed by the ITP process occurring within these tanks. Nitrogen is used as the sweeping gas to limit the concentration of flammable constituents that accumulate in the tanks so that deflagrations do not occur. Figures 2-1, 2-2, and 2-3 provide simplified schematics of the common nitrogen supply for Tanks 48 and 49, the nitrogen purge system for Tank 48, and the nitrogen purge system for Tank 49, respectively. Table 2-1 lists the drawings and miscellaneous procedures used to determine the configuration of the system.

The nitrogen supply consists of a main 28,000-gal storage tank and four 13,000-gal backup tanks, each filled with liquid nitrogen. Each tank is self-pressurized by an ancillary vaporizer and pressure regulator. All tanks are interconnected to allow filling via either of two truck fill connectors. The tank outlets are connected to provide a continuous supply to the operating vaporizer train. The main tank, which is normally used, delivers liquid nitrogen at 145 psig to the operating vaporizer. The first backup supply (two 13,000-gal tanks) automatically delivers liquid nitrogen at 140 psig to the operating vaporizer. The second backup supply (two 13,000-gal tanks) delivers liquid nitrogen at 125 psig to the operating vaporizer. The vaporizers are ambient vaporizers and do not rely on any external power source.

Gaseous nitrogen from the vaporizer discharge is routed through a valve and pressure regulator network and then through a permanently installed transfer line to Tanks 48 and 49. A normally closed manual valve isolates the nitrogen system from a header designed to accommodate connection of a flexible transfer line to each tank. Normal operation of the nitrogen storage and vaporization function requires no operator involvement or intervention.

Gaseous nitrogen is supplied to each tank inlet through two normally open valves, one common valve located near the vaporizer valve and regulator network and the other located at each waste tank. The nitrogen from the second valve is routed through two identical paths to a common nozzle entering the tank. Each of the two active paths consists of a normally open manual valve, flow meter, flow control valve, flow switch, pressure regulator, and a second normally open manual valve. The flow meter and flow switch provide information and interlock signals to the DCS. The flow control valve receives control signals from the DCS.

Each tank exhaust system consists of a demister, condenser, heater, parallel HEPA filter trains, parallel flow control valves, an operating exhaust fan, and an installed spare exhaust fan. The demister is installed at the tank vapor outlet and functions to separate the suspended liquids from the exiting gas. An exhaust gas sample from the demister is drawn into the oxygen, LFL, and benzene analyzers.

Exhaust flow from the demister is routed to the condenser that is maintained cooler than the exhaust gas by a constant flow of cooling water from the chromated cooling water system. This temperature difference serves to condense moisture vapors from the exhaust stream. The cooled

gas then passes through the heater that is maintained warmer than the gas by a constant flow of steam. This temperature difference serves to reduce the relative humidity of the stream. The combination of demister, condenser, and heater functions to dry the tank vapor so that moisture does not build up on the HEPA filters and cause excessive pressure drop or HEPA element failure.

The HEPA filters serve to remove particulates from the exhaust gas. The filters are valved into the exhaust piping so that one filter is functioning while the other is isolated as a backup. Filter selection valves are manually operated.

There are two functionally-identical, AC-powered, exhaust fans; one is normally operating. The second fan, in parallel, is on passive standby and must be manually started locally. Exit flow from the active exhaust fan is routed to a stack for final discharge.

Two sets of EPVE are provided as backup to each tank (four sets total) should both the primary and standby exhaust fans fail. These units consist of a motor, coupling, blower, appropriate valving, HEPA filter, and necessary connecting hose for mating with the tanks primary exhaust system. They also each contain their own power supply.

If the nitrogen purge is interrupted and cannot be re-established, air-based ventilation using either the normal exhaust fans or the EPVE is sufficient to prevent the tank atmosphere from reaching the lower flammability limit (6).

Both purge systems are controlled by one common DCS with appropriate software and programming to receive required information from the operating nitrogen purge system and to provide necessary operational control. The DCS is located in the control room of Building 241-82H.

Exhaust flow from the HEPA filter passes through a flow control valve that is controlled by the DCS, based on a signal provided from the tank vacuum sensor. The DCS modulates the flow control valve to maintain a slight negative pressure within the waste tank.

As indicated in Figures 2-2 and 2-3, the DCS receives information from tank inlet flow meters and flow switches, as well as tank outlet oxygen analyzers and vacuum sensors. Control is provided by the DCS to the nitrogen inlet flow valves and the exhaust flow control valves.

Table 2-2 provides an electrical load list for the MCCs that feed the nitrogen purge system components.

Table 2-3 indicates valve positions during normal operations, and positions they take for the analysis following loss of the nitrogen purge system. The worst case position is "closed" for all the valves. The drawings referenced in Table 2-3 in conjunction with interviews with operating personnel indicate that not all valves will go to the worst case position. Table 2-3 notes the impact on the results if all these valves were to go to the worst case position.

REFERENCE DWG. 136-B-H-WR-142C Rev.4, 136-B-H-WR-142B Rev. 8

Figure 2-1. Common Nitrogen Supply System

Figure 2-2. Tank 48 Nitrogen Supply and Exhaust Systems

**Table 2-1. Procedures and Drawings Used To Determine
Nitrogen Purge System Configuration**

<u>PROCEDURES</u>	
241-H-1746SQ R2	Tank 49 Ventilation System
241-H-1887SQ R2	Tank 49 Air Based Ventilation System Operation
241-H-1971 R1	Tank 48 Air Based Ventilation System Operation
241-H-1747SQ R2	Tank 48 Ventilation System
241-H-1872 R0	Tanks 48 and 49 N ₂ Supply Using Emergency Manifold
241-H-1877Q/S R1	Waste Tanks 48 or 49 Nitrogen Purge Ventilation System Failure
138-9-H-WR-168QS R2	Inspection of Nitrogen (N ₂) Storage and Distribution System
241-H-1733Q R4	Unloading N ₂ from Tanker to N ₂ Storage Tank
241-FH-1305T R4	Operation of Installed Hydrogen Monitors
241-H-1757SQ R2	Action To Be Taken on LFL Greater than Round Sheet Limits in Waste Tanks 48 or 49
241-H-1736Q R4	Charging of Nitrogen Headers for ITP
138-9-H-WR-210 R2	Functional Check of Cold Feed Nitrogen Header Pressure Regulators
241-H-1731SQ R6	Loss of N ₂ to STPB, Tanks 48 and 49, Filtrate Hold Tanks and Benzene Stripper Columns
<u>DRAWINGS</u>	
138-8-H-WR-187 R2	Tank 49 H&V Steam
138-8-H-WR-186 R2	Tank 48 H&V Steam
138-8-H-WR-142C R4	N ₂ Storage Area Pipe Routing
138-8-H-WR-142B R6	N ₂ Storage Area Pipe Routing
138-8-H-WR-173 R2	Tank 48 Nitrogen Lines
138-8-H-WR-185 R2	Tank 48 Nitrogen Purge Exhaust System
138-8-H-WR-184 R2	Tank 49 Nitrogen Purge Exhaust System
138-8-H-WR-174 R1	Tank 49 Nitrogen Lines

Table 2-2. Electrical Load List

MCC	Diesel	Loads
MCC S	EN136-50-1.60	Oxygen Analyzers 1 and 2, Tank 48 Oxygen Analyzers 1 and 2, Tank 49 Flow Control Valves 1201FV and 1202FV Flow Control Valves 1251FV and 1252FV Flow Control Valves 1211PV1 and 1211PV2 Flow Control Valves 1251PV1 and 1251PV2
MCC SFA	Y954-51-1	Exhaust Fan Y348-52-7 Exhaust Fan Y348-52-8 Exhaust Fan Y349-52-11 Exhaust Fan Y349-52-12 Digital Control System

Table 2-3. Valve Positions for Normal Operation and Loss of Nitrogen

Component*	Normal Position	Position on Loss of Nitrogen**
2046PV	Open	Open
1251FV	Open	Open
1252FV	Open	Open
1255PV1	Open	Closed
1255PV2	Open	Closed
1257PV	Open	Open
1251PV1	Open	Closed
1251PV2	Open	Closed
1201FV	Open	Open
1202FV	Open	Open
1205PV1	Open	Closed
1205PV2	Open	Closed
1217PV	Open	Open
1211PV1	Open	Closed
1211PV2	Open	Closed

* All other valves are assumed to fail "as is."

** Table 2-3 indicates valve positions during normal operations, and positions they take following loss of the nitrogen purge system. These changes occur because of the action of the DCS or because of hardwired system interlocks. The worst case position is "closed" for each of these valves. Based on the drawings listed below and discussions with operating personnel, not all the valves go to their worst case position. If all these valves were to go to the worst case position, *i.e.*, "closed", then the total frequency of $2.9E-07/\text{yr}$ for a loss of nitrogen purge due to internal and external events coupled with the presence of an ignition source would increase by no more than 20% (conservative estimate).

The valve positions noted above were determined by using the following drawings and updating their information based on discussions with operating personnel:

W822682	Rev. 7 8/6/91	Savannah River Site Building 241H - Interim Waste Management In-Tank Precipitation Tank 48 Nitrogen Purge System Process and Instruments
W822683	Rev. 50 11/21/90	Savannah River Site Building 241H - Interim Waste Management In-Tank Precipitation Nitrogen Distribution System Process and Instruments
W822689	Rev. 73 8/6/91	Savannah River Site Building 241H - Interim Waste Management In-Tank Precipitation Tank 49 Nitrogen Purge System Process and Instruments

Nitrogen Purge Exhaust Control Features

The exhaust flow and nitrogen feed flow are controlled by the DCS. The exhaust flow is controlled by the DCS based on a tank vacuum input signal. The nitrogen flow control valves are also controlled by the DCS based on the oxygen analyzer input signal. The DCS balances the nitrogen feed flow and exhaust flow to maintain oxygen concentrations at 5% by volume. The initial alarms on high oxygen concentration are set at 6.3% with the hi-hi alarm set at 9.5%. Nitrogen flow is expected to be approximately 300 scfm with a low alarm at 150 scfm and the low-low alarm at 100 scfm.

Hardwired interlocks independent of the DCS are also present. The exhaust fans shut down on low-low exhaust flow (<100 scfm), low-low nitrogen flow (<100 scfm), or hi-hi HEPA filter pressure drop. The flow control valves close on loss of an exhaust fan, low tank vacuum, or low-low nitrogen flow.

Two oxygen analyzers operate in parallel to provide exhaust gas analysis information to the DCS. This information is used to control (modulate) the nitrogen inlet flow to the tank. A high oxygen concentration in the exhaust gas results in increased nitrogen inlet flow by opening the inlet flow control valve to provide more nitrogen. A slight increase in tank pressure results in the DCS increasing the exhaust flow by opening the exhaust flow control valve. Thus, the normal operation of the system is controlled and regulated for each tank by the DCS around two information sources: O₂ concentration in the exhaust gas and tank pressure.

The following functional interlocks are provided for each tank:

1. Shutoff of exhaust fans on:
 - a. low tank exhaust flow (one-minute time delay) (hardwired)
 - b. high pressure differential across HEPA filters (hardwired)
 - c. low nitrogen flow (one-minute time delay) (hardwired and software)
 - d. high tank vacuum
2. Nitrogen supply control valves close on:
 - a. loss of an exhaust fan (hardwired and software)
 - b. low tank vacuum (hardwired)
 - c. low nitrogen flow (one-minute time delay) (hardwired and software)

Response to Alarms

Operators verify all alarm conditions prior to taking action. This verification is defined in the Alarm Response Procedure for each alarm as required by 241-FEH-213, "Instructions for Preparation and Review of Alarm Response Procedures."

A keylock switch is used to bypass all the interlocks, except for 1b, in order to place the nitrogen purge system in manual (field) operation.

3.0 METHODOLOGY

The methodology used to analyze the ITP nitrogen purge system consists of four steps:

- o Establish the nitrogen purge system configuration based on system drawings and other information provided by Westinghouse Savannah River Company (WSRC). The system configuration is documented in Section 2.0.
- o Perform a fault tree analysis (FTA) of the nitrogen purge system based on the configuration described in Section 2.0 and including the ignition source probability.
- o Perform an event tree analysis (ETA) for external events, including the ignition source probability.
- o Perform a HRA on the failures or combinations of failures identified in the fault tree and event tree analyses as contributing significantly to overall system failure probability.

3.1 Fault Tree Analysis

Frequencies of rare and hypothetical process accidents are usually evaluated by the FTA method. This method is a formalized procedure that is used to analyze potential accidents and/or evaluate high risk areas in process systems. It is a deductive process in which an undesirable state of a system is defined followed by systematic analysis of the system to determine fault events (initiators) and component failures (enablers) that produce the defined state. One of the advantages of FTA is that it locates those system elements that contribute significantly to the occurrence of the undesired event. These elements are then further analyzed in the recovery analysis.

In developing fault trees, consideration is given to independent component failures, common cause failures, human errors, and maintenance outages. Frequencies or probabilities are assigned to the lowest order event in a fault tree and the top event frequency is calculated using a computer program to perform the Boolean algebraic reductions.

For this analysis, a "frequency space" fault tree is developed. A frequency space fault tree is one in which the undesirable state is evaluated to determine its frequency of occurrence rather than its probability of occurrence. In quantifying the fault tree, frequency values can be greater than 1.0/yr, whereas, probability values can not.

To develop a frequency space fault tree, special modeling rules must be followed to ensure that all combinations of initiators/enablers are captured, and to ensure that frequencies are not combined in an "AND" gate (i.e., two frequencies "ANDed" together produce a (frequency)² number). The

possibility of frequencies being "ANDed" together occurs when redundant trains of equipment are modeled with an "AND" gate (i.e., two trains available (Train A and Train B), and only one is required for success). When there are two trains normally in operation, one train is chosen as the "primary" train (i.e., Train A), and all failures associated with this train are modeled using frequencies. The backup train (i.e., Train B) is modeled using probabilities. The probability is based on the chance that the backup Train B fails while Train A is being repaired following a failure. Therefore, the probabilities of basic event failures in Train B are quantified based on the mean time to repair (MTTR) Train A. This process only captures one half of the frequency of losing the system of redundant trains, since the model only considers the frequency of losing Train A, and the probability of losing Train B while Train A is being repaired. In order to capture the possibility that Train B is the initiator and Train A could fail while Train B is being repaired, the mission times for the "primary" train are doubled (2 per mission time).

Unavailabilities due to testing or maintenance are enablers and are therefore only modeled for the backup trains. Modeling testing/maintenance unavailabilities in both trains results in invalid cutsets, i.e., Trains A and B cannot be unavailable due to testing or maintenance at the same time. This process only captures one half of the probability of one train being unavailable due to testing or maintenance, since the model only considers the frequency of losing Train A and the probability of Train B being unavailable. In order to capture the possibility that Train B is the initiator and Train A could be unavailable due to testing or maintenance, the unavailabilities due to testing or maintenance for the backup trains are doubled.

A modeling convention often used to help the fault tree analyst differentiate between frequency events and probability events is the practice of placing a "*" at the end of every basic event name or gate name in which a frequency is being modeled. This aids in the cutset review process to assure that only one frequency event appears in each cutset.

The fault tree is developed and evaluated with the computer program CAFTA+ (Computer Aided Fault Tree Analysis (7)). CAFTA+ is a computer software tool used to build, modify, and evaluate fault tree models. It includes a fault tree editor, a basic event database, a component database, formatting routines, fault tree analysis routines, and a cutset editor. These processors are integrated into a single microcomputer-based analysis tool.

The principal interface between the fault tree analyst and CAFTA+ is the fault tree editor that is used to build and modify fault trees. Syntax and logic checks are performed on the models.

The fault tree editor also links the basic event reliability data from the database files to the fault tree. The basic event database includes the basic event name, mission time, description of the event, failure probability (either input for a specific event or calculated from the mission time and the component failure rate from the component type code file), and the source of the data. The component database includes failure rates for generic component types and failure modes and also includes the source of the data.

CAFTA+ analyzes fault tree models through a sophisticated fault tree and cutset processor. The fault tree processor generates and quantifies cutsets from fault tree models built by the analyst. A

fault tree may be quantified in terms of the top fault condition and subtier fault conditions. Resulting cutsets are edited and analyzed in the recovery analysis.

A wide range of data sources are used to quantify the fault trees:

- o Component and support system failure rate data from the Tank Farm Safety Analysis Report (SAR) (1),
- o Other SRS data and analyses (8-13), and
- o Other published literature sources (14-16).

The failure probability of a basic event is included in the basic event database that is developed as part of the fault tree.

3.2 Event Tree Analysis

Accident sequences that are initiated by external events are comprised of successive success-failure events that can generate several of outcomes (or end states). The sequences leading to each end state are identified and sequence frequencies are determined through the use of a logic diagram to identify possible outcomes of an undesired event (called the initiating event). This type of diagram is called an event tree.

Unwanted consequences are usually the result of an initiating event combined with failure of facility equipment and/or failure of human actions designed to mitigate consequences or reduce their magnitude. An event tree generates event sequences by taking into account both the success and failure of each mitigating feature or action that is relevant to the initiating event. Each event sequence is a unique combination of mitigator successes and failures and has a defined consequence as its end state.

Event trees are developed and evaluated with the computer program ETA-II (Event Tree Analysis-II) (17). ETA-II is a computer software tool used to build, modify, and evaluate event tree models. ETA-II provides an interactive environment in which to build and refine accident sequence models from beginning to end. Branches and events may be added, copied, or removed with no additional time spent in recalculating modified sequence probabilities. While developing a model the displayed tree reflects the latest changes. In addition, probabilities can be inserted one branch at a time or simultaneously for all branches of a given event. Sequences may be grouped to determine the significance of a particular end state. ETA-II sums the probabilities of these sequences automatically.

3.3 Human Reliability Analysis (HRA)

To incorporate operator actions into the fault tree and event tree analyses, a HRA is performed. Each of the dominant cutsets from the fault tree analysis is analyzed to identify operator corrective actions that can return the system to normal operation. The event tree analysis also

identifies human actions that are required to prevent or mitigate undesirable consequences. The HRA is performed to quantify each human action based on the time available for the operator to perform the action. Results of the HRA are Human Error Probabilities (HEPs) that are assigned to each action. The HRA is performed according to the procedure outlined in Reference 18 unless otherwise noted.

4.0 INTERNAL AND EXTERNAL EVENT ANALYSIS

The frequency of a deflagration in Tankd 48 and/or 49 is determined by a FTA of nitrogen purge system random failures and an ETA of external events that result in system failure. The development and results of these analyses are described in this section.

4.1 Internal Event Analysis

The FTA is performed on the nitrogen purge system for Tanks 48 and 49 based on the configuration and operation described in Section 2.0 and includes the ignition source probability.

4.1.1 Fault Tree Construction

The fault tree is presented in Appendix A. All components are modeled to include loss of necessary support systems (such as electric power and cooling water), hardware faults, unavailability due to maintenance, and common cause failures as appropriate.

The fault tree consists of five major branches "ANDed" with the ignition source probability:

1. Equipment failures common to both Tank 48 and Tank 49 (gate ITP03). This branch of the tree includes the DCS and the common nitrogen supply lines. All events in this branch of the tree result in a loss of the nitrogen purge to both Tank 48 and Tank 49.
2. Nitrogen purge for Tank 48 fails to operate during washing - three days (Mode X) (gate ITP01). This branch includes the probability that Tank 48 is in its wash cycle (probability of 0.2, 20% of the time) (3). The probability is combined with various combinations of system failures leading to a loss of the nitrogen purge system to yield a total branch failure frequency.
3. Nitrogen purge for Tank 48 fails to operate during transfer - three to six days (Mode Y) (gate ITP110). This branch is identical to the branch described above (gate ITP01), except that it includes the probability that Tank 48 is in its salt solution transfer cycle (probability of 0.2, 20% of the time) (3).
4. Nitrogen purge for Tank 48 fails to operate during normal processing - six days (Mode Z) (gate ITP02). This branch is identical to the branch described above (gate ITP110), except that it includes the probability that Tank 48 is in its normal processing cycle (probability of 0.6, 60% of the time) (3).

5. Nitrogen purge for Tank 49 fails to operate for three days (gate ITP04) (3). This branch of the fault tree includes the various combinations of system failures leading to a loss of the nitrogen purge system to yield a total branch failure frequency.

Assumptions

Assumptions and characteristics of system components and operation used in the FTA include:

1. Both oxygen analyzers are normally operating and failure of a single oxygen analyzer does not cause a loss of the nitrogen purge system.
2. Some valves fail in the least desirable position. Table 2-3 indicates the failed position for key valves.
3. All EPVE sets can be interchanged between Tanks 48 and 49.
4. Compelling signals exist for all failure scenarios considered.
5. The DCS fails if air conditioning (HVAC) is lost in the control room. This can occur only if the outside temperature is greater than 80°F.

Common Cause Failures

Common cause failures are considered for separate operating conditions. All common cause contributors for a single component type are collected under the dominant common cause failure.

Normal Operation

Common cause failures are quantified and modeled for the following components:

- o O₂ analyzers: Common cause miscalibration.
- o Fan operation sensors: Common cause miscalibration.
- o Flow sensors: Common cause miscalibration.

Common cause failures were not modeled for the following components. Justifications are provided for exclusion of common cause events.

- o HEPA filters: Only one train is aligned for operation at a time and no credit is taken for the installed spare; therefore, no common cause failure of the HEPA filters is modeled.

- o Exhaust fans: Only one train is aligned for operation at a time and no credit is taken for the installed spare; therefore, no common cause failure of the exhaust fans is modeled.
- o Vaporizers: Only one train is aligned for operation at a time and no credit is taken for the installed spare; therefore, no common cause failure of the vaporizers is modeled.
- o Flow control valves 1211PV1/2 (1251PV1/2): Only one train is aligned for operation at a time and no credit is taken for the installed spare; therefore, no common cause failure of these flow control valves is modeled.
- o Flow control valves 1201FV/1202FV (1251FV/1252FV): The main concern associated with these valves is their failure to maintain flow. This can be caused by DCS failure (modeled), flow sensor failure (modeled), independent valve failures (modeled), or common cause mechanical failures (not modeled). The common cause mechanical failure is a “passive” failure and is not modeled due to low probability.
- o Pressure regulators 1205PV1/1205PV2, 1255PV1/1255PV2, 2045PV/2046PV: The main concern associated with the pressure regulators is their failure to pass flow (transfer closed or plugged). Both of these failure modes are “passive.” Common cause failures of passive failure modes are not modeled due to low probability.

EPVE Operation

When the EPVE sets are in use, no other nitrogen purge system components are necessary; therefore, only the EPVE sets are modeled. Common cause failures are modeled for the following components:

- o EPVE fans: Between the two sets associated with Tank 48.
- o EPVE fans: Between the two sets associated with Tank 49.
- o EPVE fans: Between more than two sets out of the total of four associated with Tanks 48 and 49.

Restart of Nitrogen Purge System

When the nitrogen purge system is restarted, *either* train is available, in which one exhaust fan is required to start, an exhaust line flow control valve must open, and a supply line pressure regulating valve must open. Common cause failures are modeled for the following components:

- o Exhaust fan: Common cause failure to start.
- o Flow control valve: Common cause failure to open.
- o Pressure regulating valve: Common cause failure to open.
- o Oxygen analyzer: Common cause failure to operate

4.1.2 Fault Tree Evaluation

All basic events from the fault tree are quantified using site-specific data (if available) or generic data and are included in the database files in CAFTA+. Data sources are listed in Table 4-1, and the basic events are shown in Table 4-2.

The nomenclature used to label the basic events enables quantification using the component database file option in CAFTA+. The first character of each basic event name identifies the system containing the component. These characters are "8" (Tank 48), "9" (Tank 49), or "N" (common to both tanks and the nitrogen supply system). The second and third characters of the basic event name identify the component type, such as flow control valve (FC) or manual valve (XV). The fourth, fifth, and sixth characters identify the component by name or number. The seventh and eighth characters identify the failure mode such as hardware fault (HW) or fails to start (ST).

The component database file is based on component type (second and third characters) and failure mode (seventh and eighth characters). All components of the same type with the same failure mode are assumed to have the same failure rate or demand failure probability and are included in the component type code file, as shown in Table 4-3. From this file, the failure rate is automatically associated with the basic events in the basic event database file.

The basic events shown in Table 4-2 represent the probability of failure (or unavailability) of a piece of equipment in the system, the probability of an operations or maintenance error, or the frequency of an initiating event (actual initiator bringing about the system state being modeled). These failure probabilities and frequencies are functions of both the failure rate for the basic event and an exposure time. Table 4-4 describes the various exposure times and how they are used in the fault tree analysis.

CAFTA+ utilizes the information contained in the "C", "factor", and "U" columns of Table 4-2 in conjunction with the "Rate" and "U" columns of Table 4-3 to determine the failure probability of each basic event modeled in the fault tree. The "Rate" column is the generic failure rate of a specific type of component, while the "U" column of each table specifies whether the failure rate is per demand (N) or per unit time. If the "U" column is not compatible between the two tables, CAFTA+ generates an error message to warn the analyst of compatibility problems. The "Factor" column determines the mission time for each basic event that has a per unit time failure rate. If

Table 4-1. List of Data Sources

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1. Dexter, A. H. and Perkins, W. C. *Component Failure Rate Data with Potential Applicability to a Nuclear Fuel Processing Plant (U)*. DP-1633. E. I. du Pont de Nemours & Co., Savannah River Laboratory, Aiken, SC, July 1982.
 2. IEEE Standard 500-1984. *IEEE Guide to the Collection and Presentation of Electrical, Electronic, Sensing Component, and Mechanical Equipment Reliability Data for Nuclear-Power Generating Stations*. Institute of Electrical and Electronics Engineers, New York, NY, (1983).
 3. *Some Published and Estimated Failure Rates To Use in Fault Tree Analysis (U)*. E. I. du Pont de Nemours & Co., Wilmington, DE, January 9, 1981.
 4. *Generic Component Database for Severe Service Chemical Process Plants*. SAIC 90/1026, Science Applications International Corporation, Richland, WA, January 1990.
 5. *Offshore Reliability Data Handbook*. First Edition, (1984).
 6. Legler, B. M., et al. *Safety Analysis - 200 Area Savannah River Plant Separations Area Operations Liquid Radioactive Waste Handling Facilities (U)*. Internal Report DPSTSA-200-10. E. I. du Pont de Nemours & Co., Savannah River Laboratory, Aiken, SC, August 1988.
 7. Durant, W. D. and Perkins, W. C. *Safety Analysis - 200-S Area Savannah River Site Defense Waste Processing Facility Operations (U)*. Internal Report DPSTSA-200-10, SUP 20, Rev. 6/93 (Draft), Westinghouse Savannah River Company, Savannah River Site, Aiken, SC, June 1993.
 8. Memo, J. E. Held to R. E. Vail and D. A. Sharp. *Human Reliability Analysis of DWPF Calibration Activities (U)*. SRT-HFE-930011. Westinghouse Savannah River Company, Aiken, SC, May 7, 1993.
 9. Memo, D. S. Cramer to T. E. Britt. *Failure Probability To Start a System of Fans Driven By Gasoline Engines for the In Tank Precipitation Program*. SRT-RST-930225. Westinghouse Savannah River Company, Aiken, SC, May 27, 1993.
 10. Cramer, D. S. *SRP Generic Database (SAIC/NY 85-8-14)*. Internal Report DPST-86-401, E. I. du Pont de Nemours & Co., Savannah River Laboratory, Aiken, SC, April 1986.
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Table 4-2. Basic Event File

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NAME	C	FACTOR	U	DESC	PROB
1 8AZO21HW*	1	2	Y	TANK 48 O2 ANALYZER 1 HARDWARE FAULTS	5.26E+00
2 8AZO22HWA	3	7	D	TANK 48 O2 ANALYZER 2 HARDWARE FAULTS	4.92E-02
3 8AZO22TM	1	2	N	TANK 48 O2 ANALYZER 2 UNAVAILABLE DUE TO MAINTENANCE	3.60E-03
4 8AZO2SCM*	1	1	Y	COMMON MODE SENSOR MISCALIBRATION FAILURE FOR O2 ANALYZERS	2.38E-01
5 8CNCNHW*	1	1	Y	LOCAL FAULTS OF TANK 48 CONDENSER	2.63E-02
6 8DMDEMHW*	1	1	Y	LOCAL FAULTS OF TANK 48 DEMISTER	3.15E-02
7 8FC111HW	2	3	M	FLOW CONTROL VALVE 1211PV1 MECHANICAL FAULT (MODE C)	9.18E-03
8 8FC111TM	1	2	N	FLOW CONTROL VALVE 1211PV1 MAINTENANCE	7.20E-03
9 8FC112HW*	1	1	Y	FLOW CONTROL VALVE 1211PV2 MECHANICAL FAULT	7.45E-02
10 8FC121HW*	1	2	Y	MECHANICAL FAULT OF TANK 48 FLOW CONTROL VALVE 1201FV	1.49E-01
11 8FC122HW	3	7	D	MECHANICAL FAULT OF TANK 48 FLOW CONTROL VALVE 1202FV	1.43E-03
12 8FC122TM	1	2	N	TANK 48 FLOW CONTROL VALVE 1202FV UNAVAILABLE DUE TO MAINTENANCE	7.20E-03
13 8FLHP2HW*	1	1	Y	LOCAL FAULT OF HEPA FILTER 2	8.76E-03
14 8FN527HW	3	7	D	TANK 48 EXHAUST FAN Y348-52-7 FAILS TO RUN FOR 6 DAYS	1.34E-03
15 8FN527ST	1	1	N	TANK 48 EXHAUST FAN Y348-52-7 FAILS TO START DUE TO MECHANICAL FAULTS	4.80E-04
16 8FN527TM	1	2	N	TANK 48 EXHAUST FAN Y348-52-7 UNAVAILABLE DUE TO MAINTENANCE	3.60E-03
17 8FN528HW*	1	1	Y	TANK 48 EXHAUST FAN Y348-52-8 FAILS TO RUN DUE TO MECHANICAL FAULTS	7.01E-02
18 8FSEXHHW*	1	1	Y	TANK 48 NITROGEN FLOW SENSOR FOR EXHAUST LINE FAILS	1.05E+00
19 8FSHEPHW*	1	1	Y	FLOW SENSOR ACROSS HEPA FILTER FAILS DUE TO MECHANICAL FAULT	1.05E+00
20 8FSNFAHW*	1	2	Y	TANK 48 NITROGEN FLOW SENSOR FOR LINE A FAILS DUE TO LOCAL FAULTS	2.10E+00
21 8FSNFBHW	3	7	D	TANK 48 NITROGEN FLOW SENSOR FOR LINE B FAILS DUE TO LOCAL FAULTS (MODE C)	2.00E-02
22 8FSNFSCM*	1	1	Y	BOTH NITROGEN FLOW SENSORS FAIL DUE TO COMMON MODE MISCALIBRATION	4.40E-01
23 8HOUSE01		.2		CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)	2.00E-01
24 8HOUSE02		1		NO ACTION TAKEN FOR 48 HOURS	1.00E+00
25 8HOUSE03		.20		CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE	2.00E-01
26 8HOUSE04		.60		CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C TEMP)	6.00E-01
27 8HTHTRHW*	1	1	Y	LOCAL MECHANICAL FAULTS OF TANK 48 HEATER	1.75E-04
28 8ILFANH*	1	1	Y	INTERLOCK FAILURE (FAN EXHAUST FLOW METER) CLOSES FLOW CONTROL VALVE	4.03E-01
29 8OPC-HS		1		OPERATOR FAILS TO ENTER FIELD CONTROL MODE (HIGH STRESS LEVELS)	1.00E+00
30 8OPC-MS		1		OPERATOR FAILS TO ENTER FIELD CONTROL MODE (MODERATE STRESS LEVELS)	1.00E+00
31 8OPTRNBE		1		OPERATOR FAILS TO ALIGN AND START TRAIN B FOR OPERATION - EXHAUST SIDE	1.00E+00
32 8PRPV1HW*	1	2	Y	MECHANICAL FAULTS OF TANK 48 PRESSURE REGULATING VALVE 1205PV1	3.85E-02
33 8PRPV2HW	3	7	D	MECHANICAL FAULTS OF TANK 48 PRESSURE REGULATING VALVE 1205PV2	3.70E-04
34 8PRPV2TM	1	2	N	TANK 48 PRESSURE REGULATING VALVE 1205PV2 UNAVAILABLE DUE TO MAINTENANCE	7.20E-03
35 8PRREGHW*	1	1	Y	TANK 48 FAILURE OF PRESSURE REGULATING VALVE 1217PV	1.93E-02
36 8SFFANCM*	1	1	Y	COMMON MODE MISCALIBRATION FAILURE OF SENSORS DETECTING FAN OPERATION	4.40E-01
37 8SFFANHW*	1	1	Y	SENSOR DETECTING FAN OPERATION FOR NORMALLY RUNNING FAN FAILS	1.84E-01
38 8VSVACHW*	1	1	Y	TANK 48 VACUUM SENSOR FAILS AND CLOSES FAN FLOW CONTROL VALVES	3.07E-02
39 8XV6N2PG*	1	1	Y	TANK 48 VALVE T48-N2 FROM THE NITROGEN SUPPLY FAILS TO REMAIN OPEN (PLUG)	1.23E-04
40 8XV8N5PG	3	7	D	MANUAL VALVE T48-N5 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
41 8XV8N8PG	3	7	D	MANUAL VALVE T48-N8 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
42 8XVHV2PG*	1	1	Y	MANUAL VALVE T48-HV2 FAILS TO REMAIN OPEN (PLUG)	1.23E-04
43 8XVHV3PG*	1	2	Y	MANUAL VALVE T48-HV3 FAILS TO REMAIN OPEN (PLUG)	2.45E-04
44 8XVHV4PGA	3	7	D	MANUAL VALVE T48-HV4 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
45 8XVHV9PG*	1	1	Y	TANK 48 O2 ANALYZER DISCHARGE VALVE T48-HV9 FAILS TO REMAIN OPEN (PLUG)	1.23E-04
46 8XVN22PG*	1	2	Y	TANK 48 PATH A INLET MANUAL VALVE T48-N22 FAILS TO REMAIN OPEN (PLUG)	2.45E-04
47 8XVN24PG*	1	2	Y	TANK 48 PATH A DISCHARGE VALVE T48-N24 FAILS TO REMAIN OPEN (PLUG)	2.45E-04

Table 4-2. Basic Event File (Continued)

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NAME	C	FACTOR	U	DESC	PROB
48 8XVN31PG*	1	1 Y TANK 48 TANK INLET VALVE T48-N31 FAILS TO REMAIN OPEN (PLUG)			1.23E-04
49 8XVV10PG*	1	2 Y MANUAL VALVE T48-HV10 FAILS TO REMAIN OPEN (PLUG)			2.45E-04
50 8XVV11PGA	3	7 D MANUAL VALVE T48-HV11 FAILS TO REMAIN OPEN (PLUG)			2.35E-06
51 8XVV15PG*	1	1 Y MANUAL VALVE T48-HV15 FAILS TO REMAIN OPEN (PLUG)			1.23E-04
52 8XVV17PG*	1	1 Y MANUAL VALVE T48-HV17 FAILS TO REMAIN OPEN (PLUG)			1.23E-04
53 8XVV19HW	1	1 N MANUAL VALVE T48-HV19 FAILS TO OPEN ON DEMAND			1.60E-04
54 8XVV20PG*	1	1 Y MANUAL VALVE T48-HV20 FAILS TO REMAIN OPEN (PLUG)			1.23E-04
55 8XVV21PG	3	7 D MANUAL VALVE T48-HV21 FAILS TO REMAIN OPEN (PLUG) (MODE C)			2.35E-06
56 8XVV22PG*	1	1 Y MANUAL VALVE T48-HV22 FAILS TO REMAIN OPEN (PLUG)			1.23E-04
57 8XVV33PG*	1	1 Y MANUAL VALVE T48-HV33 FAILS TO REMAIN OPEN (PLUG)			1.23E-04
58 9AZO21HW*	1	2 Y TANK 49 O2 ANALYZER 1 HARDWARE FAULTS			5.26E+00
59 9AZO22HW	3	7 D TANK 49 O2 ANALYZER 2 HARDWARE FAULTS			4.92E-02
60 9AZO22TM	1	2 N TANK 49 O2 ANALYZER 2 UNAVAILABLE DUE TO MAINTENANCE			3.60E-03
61 9AZO2SCM*	1	1 Y COMMON MODE SENSOR MISCALIBRATION FAILURE FOR O2 ANALYZERS			2.38E-01
62 9CNCONHW*	1	1 Y LOCAL FAULTS OF TANK 49 CONDENSER			2.63E-02
63 9DMDEMHW*	1	1 Y LOCAL FAULTS OF TANK 49 DEMISTER			3.15E-02
64 9FC121HW*	1	2 Y MECHANICAL FAULT OF TANK 49 FLOW CONTROL VALVE 1251FV			1.49E-01
65 9FC122HW	3	7 D MECHANICAL FAULT OF TANK 49 FLOW CONTROL VALVE 1252FV			1.43E-03
66 9FC122TM	1	2 N TANK 49 FLOW CONTROL VALVE 1252FV UNAVAILABLE DUE TO MAINTENANCE			7.20E-03
67 9FC511HW	2	3 M FLOW CONTROL VALVE 1251PV1 MECHANICAL FAULT			9.18E-03
68 9FC511TM	1	2 N FLOW CONTROL VALVE 1251PV1 MAINTENANCE			7.20E-03
69 9FC512HW*	1	1 Y FLOW CONTROL VALVE 1251PV2 MECHANICAL FAULT			7.45E-02
70 9FLHP2HW*	1	1 Y LOCAL FAULT OF TANK 49 HEPA FILTER 2			8.76E-03
71 9FN511HW	3	7 D TANK 49 EXHAUST FAN Y349-52-11 FAILS TO RUN DUE TO MECHANICAL FAULTS			1.34E-03
72 9FN511ST	1	1 N TANK 49 EXHAUST FAN Y349-52-11 FAILS TO START DUE TO MECHANICAL FAULTS			4.80E-04
73 9FN511TM	1	2 N TANK 49 EXHAUST FAN Y349-52-11 UNAVAILABLE DUE TO MAINTENANCE			3.60E-03
74 9FN512HW*	1	1 Y TANK 49 EXHAUST FAN Y349-52-12 FAILS TO RUN DUE TO MECHANICAL FAULTS			7.01E-02
75 9FSEXHHW*	1	1 Y TANK 49 NITROGEN FLOW SENSOR FOR EXHAUST LINE FAILS			1.05E+00
76 9FSHEPHW*	1	1 Y FLOW SENSOR ACROSS HEPA FILTER FAILS DUE TO MECHANICAL FAULT			1.05E+00
77 9FSNFAHW*	1	2 Y TANK 49 NITROGEN FLOW SENSOR FOR LINE A FAILS DUE TO LOCAL FAULTS			2.10E+00
78 9FSNFBHW	3	7 D TANK 49 NITROGEN FLOW SENSOR FOR LINE B FAILS DUE TO LOCAL FAULTS			2.00E-02
79 9FSNFSCM*	1	1 Y BOTH NITROGEN FLOW SENSORS FAIL DUE TO COMMON MODE MISCALIBRATION			4.40E-01
80 9HOUSE02		1 NO ACTION TAKEN FOR 48 HRS			1.00E+00
81 9HTHTRHW*	1	1 Y LOCAL MECHANICAL FAULTS OF TANK 49 HEATER			1.75E-04
82 9ILFANHW*	1	1 Y INTERLOCK FAILURE (FAN EXHAUST FLOW METER) CLOSURES FLOW CONTROL VALVE			4.03E-01
83 9OPC-HS	1	1 OPERATOR FAILS TO ENTER MODE C - FIELD CONTROL (HIGH STRESS LEVELS)			1.00E+00
84 9OPC-MS	1	1 OPERATOR FAILS TO ENTER MODE C - FIELD CONTROL (MODERATE STRESS LEVELS)			1.00E+00
85 9OPTRNBE	1	1 OPERATOR FAILS TO ALIGN AND START TRAIN B FOR OPERATION - EXHAUST SIDE			1.00E+00
86 9PRPV1HW*	1	2 Y MECHANICAL FAULTS OF TANK 49 PRESSURE REGULATING VALVE 1255PV1			3.85E-02
87 9PRPV2HW	3	7 D MECHANICAL FAULTS OF TANK 49 PRESSURE REGULATING VALVE 1255PV2			3.70E-04
88 9PRPV2TM	1	2 N TANK 49 PRESSURE REGULATING VALVE 1255PV2 UNAVAILABLE DUE TO MAINTENANCE			7.20E-03
89 9PRREGHW*	1	1 Y TANK 49 FAILURE OF PRESSURE REGULATING VALVE 1257PV			1.93E-02
90 9SFFANCM*	1	1 Y COMMON MODE MISCALIBRATION FAILURE OF SENSORS DETECTING FAN OPERATION			4.40E-01
91 9SFFANHW*	1	1 Y SENSOR DETECTING FAN OPERATION FOR NORMALLY RUNNING FAN FAILS			1.84E-01
92 9VSVACHW*	1	1 Y TANK 49 VACUUM SENSOR FAILS AND CLOSURES FAN FLOW CONTROL VALVES			3.07E-02
93 9XVHV2PG*	1	1 Y MANUAL VALVE T49-HV2 FAILS TO REMAIN OPEN (PLUG)			1.23E-04
94 9XVHV3PG*	1	2 Y MANUAL VALVE T49-HV3 FAILS TO REMAIN OPEN (PLUG)			2.45E-04

Table 4-2. Basic Event File (Continued)

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NAME	C	FACTOR	U	DESC	PROB
95 9XVHV4PG	3			7 D MANUAL VALVE T49-HV4 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
96 9XVHV9PG*	1			1 Y TANK 49 O2 ANALYZER DISCHARGE VALVE T49-HV9 FAILS TO REMAIN OPEN (PLUG)	1.23E-04
97 9XVN10PG*	1			1 Y MANUAL VALVE T49-N10 FAILS TO REMAIN OPEN (PLUG)	1.23E-04
98 9XVN13PG	3			7 D MANUAL VALVE T49-N13 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
99 9XVN15PG	3			7 D TANK 49 PATH B DISCHARGE VALVE T49-N15 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
100 9XVN16PG*	1			2 Y TANK 49 PATH A DISCHARGE VALVE T49-N16 FAILS TO REMAIN OPEN (PLUG)	2.45E-04
101 9XVN19PG*	1			2 Y TANK 49 PATH A INLET VALVE T49-N19 FAILS TO REMAIN OPEN (PLUG)	2.45E-04
102 9XVN24PG*	1			1 Y TANK 49 TANK INLET VALVE T49-N24 FAILS TO REMAIN OPEN (PLUG)	1.23E-04
103 9XVV10PG*	1			2 Y MANUAL VALVE T49-HV10 FAILS TO REMAIN OPEN (PLUG)	2.45E-04
104 9XVV11PG	3			7 D MANUAL VALVE T49-HV11 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
105 9XVV15PG*	1			1 Y MANUAL VALVE T49-HV15 FAILS TO REMAIN OPEN (PLUG)	1.23E-04
106 9XVV17PG*	1			1 Y MANUAL VALVE T49-HV17 FAILS TO REMAIN OPEN (PLUG)	1.23E-04
107 9XVV19HW	1			1 N MANUAL VALVE T49-HV19 FAILS TO OPEN ON DEMAND	1.60E-04
108 9XVV20PG*	1			1 Y MANUAL VALVE T49-HV20 FAILS TO REMAIN OPEN (PLUG)	1.23E-04
109 9XVV21PG	3			7 D MANUAL VALVE T49-HV21 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
110 9XVV22PG*	1			1 Y MANUAL VALVE T49-HV22 FAILS TO REMAIN OPEN (PLUG)	1.23E-04
111 9XVV33PG*	1			1 Y MANUAL VALVE T49-HV33 FAILS TO REMAIN OPEN (PLUG)	1.23E-04
112 EPVNTINT	2.35E-5			OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HARDWARE FAULTS	2.35E-05
113 HEPA	1.03E-3			PROBABILITY OF NOT REPLACING/REPAIRING HEPA FILTER IS NEGLIGIBLE	1.03E-03
114 IGNITION	.09			CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT	9.00E-02
115 NCPDCSHW*	1			1 Y LOCAL MECHANICAL FAULTS OF DCS COMPUTER	7.88E-01
116 NCWCHRRW*	1			1 Y MECHANICAL FAULTS IN CHROMATED COOLING WATER SYSTEM	2.19E-01
117 NELGRDHW*	1			1 Y LOSS OF !!-AREA POWER	3.00E-01
118 NCFCCACM	1			1 N COMMON CAUSE FAILURE OF FLOW CONTROL VALVES TO OPEN	1.00E-04
119 NCFCCANN	1			1 N FLOW CONTROL VALVE TRAIN A FAILS TO OPEN	1.00E-03
120 NCFCCBNN	1			1 N FLOW CONTROL VALVE TRAIN B FAILS TO OPEN	1.00E-03
121 NFENACM	1			1 N COMMON CAUSE FAILURE OF EXHAUST FANS TO START	4.80E-05
122 NFENAST	1			1 N EXHAUST FAN TRAIN A FAILS TO START	4.80E-04
123 NFENNBST	1			1 N EXHAUST FAN TRAIN B FAILS TO START	4.80E-04
124 NHOUSE01	0.125			CONDITIONAL PROBABILITY OF OUTSIDE TEMPERATURE BEING > 80 F	1.25E-01
125 NHVCOMHW*	1			1 Y LOSS OF HVAC TO ROOM CONTAINING DCS COMPUTER	1.40E-01
126 NOPC-HS	1			1 OPERATOR FAILS TO ENTER FIELD CONTROL MODE (HIGH STRESS LEVELS)	1.00E+00
127 NOPTRNBS	1			1 OPERATOR FAILS TO ALIGN TRAIN B FOR OPERATION - SUPPLY SIDE	1.00E+00
128 NPPDIVBK*	1			1 Y ISOLABLE GUILLotine PIPE BREAK	8.76E-06
129 NPPNONBK*	1			1 Y NON-ISOLABLE GUILLotine PIPE BREAK	8.76E-06
130 NPR245HW	2			3 M PRESSURE REGULATING VALVE 2045PV FAILS	2.38E-03
131 NPR245TM	1			2 N PRESSURE REGULATING VALVE 2045PV MAINTENANCE	7.20E-03
132 NPR246HW*	1			1 Y PRESSURE REGULATING VALVE 2046PV FAILS	1.93E-02
133 NPRPRACM	1			1 N COMMON CAUSE FAILURE OF PRESSURE REGULATING VALVES TO OPEN	8.10E-04
134 NPRPRANN	1			1 N PRESSURE REGULATING VALVE TRAIN A FAILS TO OPEN	8.10E-03
135 NPRPRBNN	1			1 N PRESSURE REGULATING VALVE TRAIN B FAILS TO OPEN	8.10E-03
136 NSSSTMHW*	1			1 Y LOSS OF STEAM SUPPLY TO HEATER	2.63E+00
137 NTKTKAHW*	1			1 Y NITROGEN STORAGE TANK 1 LEAKS	2.01E-05
138 NVPVPAHW*	1			1 Y FAILURE OF VAPORIZER A DUE TO HARDWARE FAULTS	3.59E-03
139 NVPVPBHW	3			7 D FAILURE OF VAPORIZER B DUE TO HARDWARE FAULTS	6.89E-05
140 NXV032PG*	1			1 Y MANUAL VALVE N32 FAILS TO REMAIN OPEN (PLUG)	1.23E-04
141 NXVN12PG*	1			1 Y VALVE N12 FROM THE NITROGEN SUPPLY FAILS TO REMAIN OPEN (PLUG)	1.23E-04

Table 4-2. Basic Event File (Continued)

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NAME	C	FACTOR	U	DESC	PROB
142 NXVN15HW	1		1	N MANUAL VALVE N15 FAILS TO OPEN	1.60E-04
143 NXVN16HW	1		1	N MANUAL VALVE N16 FAILS TO OPEN ON DEMAND	1.60E-04
144 NXVN18PG	3		7	D PATH B OUTLET VALVE N18 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
145 NXVN20PG*	1		1	Y PATH A OUTLET VALVE N20 FAILS TO REMAIN OPEN (PLUG)	1.23E-04
146 NXVN22PG	3		7	D PATH B INLET VALVE N22 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
147 NXVN24PG*	1		1	Y PATH A INLET VALVE N24 FAILS TO REMAIN OPEN (PLUG)	1.23E-04
148 NXVN25PG	3		7	D MANUAL VALVE N25 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
149 NXVN26PG*	1		1	Y MANUAL VALVE N26 FAILS TO REMAIN OPEN (PLUG)	1.23E-04
150 NXVN33PG	3		7	D MANUAL VALVE N33 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
151 NXVN46PG*	1		1	Y MANUAL VALVE N46 FAILS TO REMAIN OPEN (PLUG)	1.23E-04
152 NXVN47HW	1		1	N MANUAL VALVE N47 FAILS TO OPEN ON DEMAND	1.60E-04
153 NXVN92PG*	1		1	Y MANUAL VALVE N92 FAILS TO REMAIN OPEN (PLUG)	1.23E-04
154 RECPWR		1.8E-3		PROBABILITY OF NOT RECOVERING OFFSITE POWER	1.80E-03
155 REPAIRM		.011		PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE	1.10E-02
156 REPAIRN		1.03E-3		PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE	1.03E-03

Table 4-3. Type Code File

.\DATA\ITP.TC		CAPTA Database Report		7-16-93	10:19	Page	1
TYPE	RATE	U	DESC	SOURCE	COMMON		
1 AZ CM	2.38E-1	Y	O2 ANALYZER COMMON MODE MISCALIBRATION	Table 4-1, #8			
2 AZ HW	3.0E-4	H	O2 ANALYZER ??? MECHANICAL FAULT	Table 4-1, #1, Pg 10			
3 AZ TM	1.8E-3	N	O2 ANALYZER ??? MAINTENANCE	Calculation			
4 CN HW	3.0E-6	H	CONDENSER ??? MECHANICAL FAULT	Table 4-1, #3			
5 CP HW	9.0E-5	H	DIGITAL CONTROL SYSTEM ??? MECHANICAL FAULT	Table 4-1, #5			
6 CW HW	2.5E-5	H	COOLING WATER MECHANICAL FAULT	Table 4-1, #6			
7 DM HW	3.6E-6	H	DEMISTER ??? FAILS DUE TO PLUGGING	Table 4-1, #10			
8 EL HW	3.43E-5	H	LOSS OF H-AREA POWER	Table 4-1, #7			
9 FC CM	1.0E-4	N	COMMON CAUSE FAILURE OF FLOW CONTROL VALVES TO OPEN	Section 4.1.2			
10 FC HW	8.5E-6	H	FLOW CONTROL VALVE ??? MECHANICAL FAULT	Table 4-1, #1, Pg 35			
11 FC HN	1.0E-3	N	FLOW CONTROL VALVE ??? FAILS TO OPEN	Table 4-1, #2, Pg 38			
12 FC TM	3.6E-3	N	FLOW CONTROL VALVE ??? MAINTENANCE	Calculation			
13 FL HW	1.0E-6	H	HEPA FILTER ??? MECHANICAL FAULT	Table 4-1, #1, Pg 16			
14 FL TM	1.8E-3	N	HEPA FILTER ??? MAINTENANCE	CALCULATION			
15 FN CM	4.8E-5	N	COMMON CAUSE FAILURE OF FANS TO START	Section 4.1.2			
16 FN HW	8.0E-6	H	EXHAUST FAN ??? FAILS TO RUN	Table 4-1, #1, Pg 16			
17 FN RR	8.0E-6	H	EMERGENCY PURGE VENTILATION SYSTEM ??? FAILS TO RUN	Table 4-1, #9			
18 FN SC	2.26E-5	N	COMMON MODE FAILURE OF EMERGENCY PURGE VENTILATION SYSTEM	Table 4-1, #9			
19 FN SS	1.0E-2	N	EMERGENCY PURGE VENTILATION SYSTEM ??? FAILS TO START	Table 4-1, #9			
20 FN ST	4.8E-4	N	EXHAUST FAN ??? FAILS TO START	Table 4-1, #10			
21 FN TM	1.8E-3	N	EXHAUST FAN ??? MAINTENANCE	Calculation			
22 FS CM	4.4E-1	Y	FLOW SENSOR MISCALIBRATION	Table 4-1, #8			
23 FS HW	1.2E-4	H	FLOW SENSOR ??? MECHANICAL FAULT	Table 4-1, #1, Pg 16			
24 HT HW	2.0E-8	H	HEATER ??? MECHANICAL FAULT	Table 4-1, #3			
25 HV HW	1.6E-5	H	HVAC MECHANICAL FAULT	Table 4-1, #4, Cp 85			
26 IL HW	4.6E-5	H	INTERLOCK MECHANICAL FAULT	Table 4-1, #3			
27 PP BK	1.0E-9	H	GUILLOTINE PIPE BREAK	Table 4-1, #1, Pg 21			
28 PR CM	8.1E-4	N	COMMON CAUSE FAILURE OF PRESSURE REGULATING VALVES TO OPEN	Section 4.1.2			
29 PR HW	2.2E-6	H	PRESSURE REGULATING VALVE ??? MECHANICAL FAULT	Table 4-1, #1, Pg 22			
30 PR HN	8.1E-3	N	PRESSURE REGULATING VALVE ??? FAILS TO OPEN	Table 4-1, #10			
31 PR TM	3.6E-3	N	PRESSURE REGULATING VALVE ??? MAINTENANCE	Calculation			
32 SP CM	4.4E-1	Y	FAN SENSOR MISCALIBRATION	Table 4-1, #8			
33 SP HW	2.1E-5	H	FAN SENSOR ??? MECHANICAL FAULT	Table 4-1, #1, Pg 25			
34 SS HW	3.0E-4	H	STEAM SUPPLY MECHANICAL FAULT	Table 4-1, #6			
35 TK HW	2.3E-9	H	NITROGEN STORAGE TANK ??? LEAKS	Table 4-1, #3			
36 VP HW	4.1E-7	H	VAPORIZER ??? FAILS DUE TO PLUGGING	Table 4-1, #2			
37 VS HW	3.5E-6	H	VACUUM SENSOR MECHANICAL FAULT	Table 4-1, #1, Pg 25			
38 XV HW	1.6E-4	N	MANUAL VALVE ??? FAILS TO OPEN ON DEMAND	Table 4-1, #4, Cp 57			
39 XV PG	1.4E-8	H	MANUAL VALVE ??? FAILS TO REMAIN OPEN (PLUG)	Table 4-1, #4, Cp 57			

the failure rate is a per-demand failure rate, the "Factor" column determines the number of demands. Finally, the "C" column tells CAFTA+ which failure probability formula is applicable to each basic event. The formulas CAFTA+ use in this analysis are:

- (0) User-defined failure probability.
- (1) λt : Used for the initiators in the fault tree (components on the primary train).
- (2) $\lambda t/2$: Used for the components on the backup trains that are maintained on a regular basis.
- (3) $1-e^{-\lambda t}$: Used for the enablers in the fault tree (the components not on the backup trains).

where:

- λ = operating failure rate
- t = mission time (no repair)

The following paragraphs discuss quantification of specific types of basic events or components.

Common Cause Miscalibration Failures

An HRA has been performed to quantify the probability of miscalibrating groups of equipment. The analysis method used was Technique for Human Error Rate Prediction (THERP) from NUREG/CR-1278 (19). The results of this analysis are documented in Reference 11. The mean values for failure on demand ($5.95E-2$ for analyzers and $1.05E-1$ for level sensors or flow sensors) were converted for this analysis to a frequency by multiplying by four (quarterly calibrations) to obtain a yearly frequency ($2.38E-1$ and $4.20E-1$) at which miscalibrations occur.

Common Cause Failure of the EPVE

The EPVE consists of four portable fans each powered by a separate gasoline engine. These four sets can be used in various combinations to mitigate loss of the nitrogen purge. Only one fan is required per tank for successful operation. A probability is calculated for the common cause failure probabilities to start and run for two sets and for three or more sets. Credit is taken for the fact that in most cases a failure can be repaired and the sets restored to service within a few hours. No data are available specifically for the EPVE sets; however, several sources of generic data can be used to bound the calculation:

- o Reference 14 recommends $1.0E-2$ /demand as the mean failure probability for a "Diesel Engine". This is a conservative value since the failure probability for a diesel to start is expected to bound the failure probability of a gasoline engine.

- o The failure rate for a gasoline driven fan to run is taken to be $8.0\text{E-}6/\text{hr}$ which is also consistent with Reference 14 and bounds engine failure rates based on manufacturer's test data (20). The failure probability for a single fan to operate for 7 days is, therefore, $1.34\text{E-}3 = (8.0\text{E-}6/\text{hr}) \times (7 \text{ days}) \times (24 \text{ hrs/day})$.
- o The combined failure probability for a single gasoline driven fan to start and run 7 days is $1.13\text{E-}2/\text{demand} = (1.0\text{E-}2) + (1.34\text{E-}3)$ based on the above values. At this point in the calculation, no credit has been taken for repair.
- o Without identifying the specific root causes, it is possible to estimate the common cause failure probabilities that may occur between gasoline powered fan sets. Based on previous work with common cause failure probabilities with a broad spectrum of equipment at SRS (21), it has been found that upper bounds can be established for these probabilities. For example, given that the failure probability for one set is $1.13\text{E-}2$, the failure probability that two fail is bounded by $1.13\text{E-}3$. This can be expressed, alternatively, as a conditional probability, i.e., given that the first set has failed, the conditional probability that the second set also fails is 0.1. Continuing, it is also conservative to assume that given that the first and second sets have failed, the third fails with a probability of 0.5. For four sets, given that the first, second, and third sets fail, it is conservative to assume that the fourth set fails with certainty, i.e., probability equal to 1.0.
- o Before these probabilities are applied, it is necessary to consider repair of common cause failures. Based on manufacturer's data (20), it takes less than 3 hours to repair a gasoline fueled combustion engine (several horsepower), including complete disassembly if needed. This time is consistent with Reference 14, which indicates an average time of 1.18 hrs to repair a "Gasoline Engine Driven Generator". Therefore, for common cause failures, it is reasonable to give credit for repair. A failure probability of 0.02 is used for failure to diagnose, repair, and/or correct the common cause. This value is conservative since the action takes place many hours after the initiating event has occurred when the stress has decreased significantly. Another conservative assumption is made that if the operators are not able to repair one set, they cannot repair any sets affected by the common cause. No credit is taken for repair of the failure of a single set in order to avoid cutsets containing two different repair actions.
- o The common cause failure probabilities are calculated as:

$$2.26\text{E-}5/\text{demand} = \{1.13\text{E-}2 \text{ first set}/(\text{start and run 7 days})\} \times \{0.1 \text{ second set fails}\} \times \{0.02 \text{ failure to repair the common cause}\}$$

Table 4-4. Exposure Times

Exposure Time	Applicability
1 year	Primary operating train components not in a redundant system when both trains are normally operating.
7 days	Equipment on Backup Trains. If primary train fails, OSRs require repair/restoration within 7 days; therefore, backup train must be available for 7 days.
2 N	To correctly account for testing/maintenance unavailability in a frequency space fault tree, the probability of having the backup train in maintenance is doubled, and no test maintenance fault is modeled for the primary train (see Section 3.1).
2 years	To correctly account for backup trains in fault trees with frequency events, primary train components in a redundant system where both trains are normally operating are modeled with their frequency doubled (see Section 3.1).
3 months	Components with quarterly maintenance (flow control valves, pressure regulation valves).

This value is used for a common cause failure that may occur between two sets (1 and 2) for Tank 48 (or sets 3 and 4 for Tank 49).

$$1.13\text{E-}5/\text{demand} = \{1.13\text{E-}2 \text{ first set}/(\text{start and run 7 days})\} \times \\ \{0.1 \text{ second set fails}\} \times \\ \{0.5 \text{ third set fails}\} \times \\ \{0.02 \text{ failure to repair the common cause}\}$$

This value is used for a common cause failure that may occur between two sets used with Tank 48 (or 49) and a third set from the other tank.

Common Cause Failure to Restart Equipment

Common cause failure probabilities for the normal exhaust fans failing to restart, the flow control valves failing to open, and the pressure regulating valves failing to open are calculated using the same methodology as discussed above. The common cause failure probabilities are calculated as follows:

- o Fan fails to restart:

$$4.8\text{E-}5/\text{demand} = \{4.8\text{E-}4/\text{demand first fan fails to start}\} \times \\ \{0.1 \text{ second fan fails to start}\}$$

This value is used for a common cause failure that may occur between two fans.

- o Flow control valve fails to reopen:

$$1.0\text{E-}4/\text{demand} = \{1.0\text{E-}3/\text{demand first flow control valve fails}\} \times \\ \{0.1 \text{ second flow control valve fails}\}$$

This value is used for a common cause failure that may occur between two flow control valves.

- o Pressure regulating valves fail to reopen:

$$8.1\text{E-}4/\text{demand} = \{8.1\text{E-}3/\text{demand first pressure regulating valve fails}\} \times \\ \{0.1 \text{ second pressure regulating valve fails}\}$$

This value is used for a common cause failure that may occur between two pressure regulating valves.

- o It is assumed that these nominal values encompass all unlisted contributors.

Preventive Maintenance Unavailabilities

In the following, nominal times for preventive maintenance are estimated based on the repair times given in Table 5-3.

- o Oxygen analyzer maintenance:
 - time to maintain analyzer = ~4 hrs
 - maintenance performed four times per year
 $(4 \text{ times/yr}) \times (1 \text{ yr}/8760 \text{ hr}) \times (4 \text{ hr/time}) = 1.8\text{E-}3/\text{demand}$
- o Exhaust fan maintenance:
 - time to maintain and test fan = ~16 hr
 - maintenance performed one time per year
 $(1 \text{ time/yr}) \times (1 \text{ yr}/8760 \text{ hr}) \times (16 \text{ hr/time}) = 1.8\text{E-}3/\text{demand}$
- o HEPA filter maintenance:
 - time to replace HEPA filter = ~16 hr
 - maintenance performed one time per year
 $(1 \text{ time/yr}) \times (1 \text{ yr}/8760 \text{ hr}) \times (16 \text{ hr/time}) = 1.8\text{E-}3/\text{demand}$
- o Flow control valves, pressure regulator valves:
 - time to repair/replace valve = ~8 hr (similar to manual valve)
 - maintenance performed four times per year
 $(4 \text{ times/yr}) \times (1 \text{ yr}/8760 \text{ hr}) \times (8 \text{ hr/time}) = 3.6\text{E-}3/\text{demand}$

Unavailabilities due to corrective maintenance are accounted for by using the seven-day mission time for backup trains. This implies that the primary train fails and is unavailable (due to maintenance) for the following seven days.

Component Failure Data

A wide range of data sources are used to arrive at component failure data. The specific failure data and sources are discussed below.

For demisters, a value of $3.06\text{E-}6/\text{hr}$ was taken from Reference 13 for filters. This choice was made since the internal construction of the demisters is similar to typical filter designs and principles of operation. Additionally, SRS experience with demisters that are integral to the filter compartments used for the reactor buildings indicates that the value of $3.06\text{E-}6/\text{hr}$ is conservative since no catastrophic failures have occurred in over a million demister hours of service over the last 18 years in South Carolina's humid climate.

For vaporizers, steam generator tubes in Reference 9 have a failure rate of $3.0\text{E-}7/\text{hr}$ and evaporators in Reference 14 for an electrical humidifier has a failure rate of $4.1\text{E-}7/\text{hr}$. Since both of these components are more complicated in design and function than the vaporizers that are powered by the ambient influx of heat energy, their failure rates are expected to bound the vaporizer failure rate. The value of $4.1\text{E-}7/\text{hr}$ is used.

For the Digital Control System (DCS) a failure rate of $9.0\text{E-}5/\text{hr}$ is used. A comparison of this failure rate with those discussed in "Operational Failure Experience of Fault-Tolerant Digital Control Systems" (23) showed this rate to account for hardware and software failures. Since initial testing of the DCS has not been completed, this generic value is used.

For oxygen analyzer mechanical fault, generic failure rates ranged from $1.1\text{E-}4/\text{hr}$ to $8.0\text{E-}4/\text{hr}$. The mean of the rates was taken to determine a failure rate of $3.0\text{E-}4/\text{hr}$ for this analysis.

For flow control valve mechanical fault, the failure rates listed in the data sources range from a low value of $1.68\text{E-}6/\text{hr}$ to a high value of $2.1\text{E-}5/\text{hr}$. The "average" failure rates ranged from $2.2\text{E-}6/\text{hr}$ to $8.5\text{E-}6/\text{hr}$. For this analysis, the highest "average" failure rate was used.

For exhaust fan (permanent) fails to run, the failure rates listed in the data sources range from $1.1\text{E-}7/\text{hr}$ to $9.0\text{E-}5/\text{hr}$. For this analysis, a mean value of $8.0\text{E-}6/\text{hr}$ was used.

4.1.3 Fault Tree Results

The quantified basic events are used to derive quantified cutsets using CAFTA+. The initial quantification of the nitrogen purge system fault tree provides cutsets that reflect the major failure paths for the system excluding recovery and repair considerations. The types of failures that

contribute significantly are:

- o Loss of steam supply to the heater.
- o Failure of flow sensor across HEPA filters.

- o Failure of nitrogen exhaust line flow sensor.
- o Interlock failures.

The quantification of the nitrogen purge system fault tree including recovery and repair considerations identified the following failures as those that contribute significantly:

- o DCS failure coupled with
 - Failure to repair and restore the DCS to operation (includes restoring the nitrogen purge system) coupled with
 - Failure of the EPVE (includes operator failure to align and start the EPVE sets plus single and common cause hardware faults among the sets) coupled with
 - Probability that a source is present that causes ignition.
- o Oxygen analyzer failure (includes hardware faults plus common cause miscalibrations) coupled with
 - Failure to repair and restore the analyzers to operation (includes restoring the nitrogen purge system) coupled with
 - Failure of the EPVE (includes operator failure to align and start the EPVE sets plus single and common cause hardware faults among the sets) coupled with
 - Probability that a source is present that causes ignition.
- o Loss of steam to the heater resulting in the HEPA filter plugging coupled with
 - Failure to replace the filter and restore the filter line to operation (includes restoring the nitrogen purge system) coupled with
 - Failure of the EPVE (includes operator failure to align and start the EPVE sets plus single and common cause hardware faults among the sets) coupled with
 - Probability that a source is present that causes ignition.

- o Hardware failure of the exhaust train flow sensor coupled with
 - Failure to repair the flow sensor to operation (includes restoring the nitrogen purge system to operation) coupled with
 - Failure of the EPVE (includes operator failure to align and start the EPVE set plus single and common cause hardware faults among the sets) coupled with
 - Probability that a source is present that causes ignition.

Dominant cutsets (with and without recovery actions applied) for the fault tree are shown in Appendix B.

4.2 External Events Analysis

The external event analysis for the nitrogen purge system considers seven initiating events in which no credit is given for component repair or restoration of power, except where noted.

- o Severe winter storm that delays nitrogen delivery for more than four days. Frequency is $1\text{E-}2/\text{yr}$ for a storm that results in significant accumulation of snow and/or ice on the roads (24). It is assumed that this storm is severe enough to preclude nitrogen deliveries for four days.
- o Seismic event resulting in structural failure of the liquid nitrogen storage and vaporization systems and the normal exhaust systems. This event is defined as having a peak horizontal ground acceleration of 0.02g and an occurrence frequency of $5\text{E-}2/\text{yr}$ for general-use structures for the SRS (25).
- o High wind event that fails both the nitrogen supply and exhaust systems. Frequency is $2\text{E-}2/\text{yr}$ for a 78-mph straight wind for SRS general-use structures (26).
- o Tornado missile that damages the nitrogen supply system. This event is assumed to affect only the supply system, because there is more equipment surface area (tanks and overhead piping) available for impact. The frequency of this event is $2\text{E-}5/\text{yr}$ (26).
- o Vehicle accident that damages the nitrogen supply system. Vehicle crashes are assumed to impact only the nitrogen supply system, because there are no roads or vehicle access to the area around the exhaust fans. The frequency of this event is based on the following estimates from SRS experience: failure

rate of $1.9\text{E-}8$ accidents per vehicle mile (27) for 0.2 miles of road being traveled by 100 vehicles per day, or

$$(1.9\text{E-}8 \text{ accidents/mile}) \times (0.2 \text{ mile}) \times (100 \text{ vehicles/day}) \times (365 \text{ days/yr}) = 1.4\text{E-}4/\text{yr}$$

- o Helicopter crash that damages the nitrogen supply system. The frequency of this event is $3.5\text{E-}5/\text{yr-km}^2$ (10). The area of the nitrogen supply system is approximately 100 ft x 100 ft. Therefore, the frequency of helicopter crash is:

$$(3.5\text{E-}5/\text{yr-km}^2) \times (1\text{E}4 \text{ ft}^2) \times (1 \text{ km}^2/9.29\text{E}6 \text{ ft}^2) = 3.8\text{E-}8/\text{yr}$$

Therefore, this event is not credible and is not considered further. The frequency and consequences of a helicopter crash at Tanks 48 and 49 are evaluated as part of the overall ITP accident analysis (1, 2) and are not part of this analysis, which is limited to the nitrogen purge system.

- o Aircraft crash that damages the nitrogen supply system. The frequency of this event is $1\text{E-}8/\text{flight-mi}^2$ (10). The area of the nitrogen supply system is approximately 100 ft x 100 ft and the total number of flights is estimated to be 12/day (10). Therefore, the frequency of aircraft crash is:

$$(1\text{E-}8/\text{flight-mi}^2) \times (1\text{E}4 \text{ ft}^2) \times (1 \text{ mi}^2/2.79\text{E}7 \text{ ft}^2) \times (12 \text{ flights/day}) \times (365 \text{ days/yr}) = 1.6\text{E-}8/\text{yr}$$

Therefore this event is not credible and is not considered further. The frequency and consequences of an aircraft crash at Tanks 48 and 49 are evaluated as part of the overall ITP accident analysis (1, 2) and are not part of this analysis, which is limited to the nitrogen purge system.

Three event trees have been developed that show event sequences for all of the credible initiating events:

STORM:	Includes sequences for initiating events that fail supply of nitrogen to the site (severe winter storm). Total initiating event frequency is $1.0\text{E-}2/\text{yr}$.
SEISMIC:	Includes sequences for initiating events that fail both the nitrogen supply and exhaust systems (seismic, high wind). Total initiating event frequency is $7.0\text{E-}2/\text{yr}$.
OTHERS:	Includes sequences for initiating events that fail the nitrogen supply system only (tornado missile, vehicle crash). Total initiating event frequency is $1.6\text{E-}4/\text{yr}$.

Events that reflect operating conditions associated with external events are developed. Three scenarios are considered:

- o Failure of normal exhaust fans to continue to run for seven days.
- o Failure of continuing nitrogen supply to Tanks 48 and 49 for seven days. This scenario includes the main nitrogen supply tank and all piping and valving to Tanks 48 and 49.
- o Failure of three of four EPVE sets to start and run for seven days. If EPVE sets are required during external events, it is assumed that they are required for both Tanks 48 and 49 at the same time, and that there are two sets available for each tank. Since only one set is required for each tank, three of the four available sets must fail before this condition is not satisfied.

The seven-day mission time is based on the assumption that the OSR requirement for repair/restoration of primary system components within seven days also applies to external events. This assumption is considered valid based on the normal repair times discussed in Section 5.0 and practice in the nuclear industry.

Hardware failures and normal proceduralized operator actions (described in Subsection 5.2.1) are included in these fault trees. The fault trees and cutsets developed specifically for the external events analysis are included in Appendix C.

4.2.1 Severe Winter Storm

A severe winter storm challenges the site's ability to maintain nitrogen supply due to impassible roads. Although a minimum nitrogen supply of 26,000 gal (4) would be on hand as prescribed by the OSR, as a conservative analysis, no credit is taken for this supply. Times required to reach the LFL after nitrogen flow stops are based on an analysis provided in Reference 3.

The key operating parameters applied in this analysis are described below.

1. The onsite nitrogen supply is 26,000 gal at the time the event occurs. This is the OSR minimum.
2. Tank 48 is in the washing cycle and the LFL is reached in three days.
3. Procedures and administrative controls are in place to establish air-based ventilation in the tanks if nitrogen supply cannot be restored within one shift after the storm abates.

The event tree showing the severe winter storm scenario is shown in Figure 4-1. The recovery action of establishing air-based ventilation for the sequences in which nitrogen flow cannot be restored or the exhaust system fails is included. This action requires moving the EPVE into position and aligning, connecting, and starting one set of EPVE for each tank. Estimates of the probabilities of the events shown in Figure 4-1 are discussed below:

Event I: Initiating event frequency is $1.0\text{E-}2/\text{yr}$.

Event A: Probability that the nitrogen supply is inadequate. Since no credit is given for the supply to last through the severe storm, the failure probability is set to 1.0.

Event B: Probability of failing to align, connect, and start the EPVE is estimated to be $5.3\text{E-}6$ (see Subsection 5.2.1).

Event C: Probability that the EPVE fails to start and run for seven days is estimated to be $1.8\text{E-}5$, based on fault tree quantification (see Appendix C) (Repair included).

Event D: Probability that ignition source is present is 0.09 (5).

4.2.2 Seismic and High Wind Events

The seismic and high wind events are assumed to fail the entire nitrogen supply and exhaust systems. The times required to reach the LFL after nitrogen flow stops are assumed to be three days for both tanks (Tank 48 is assumed to be in the wash cycle). Two sets of EPVE with power supplies are available for each tank (four sets total) and survive the event. The recovery action of establishing air-based ventilation requires moving the EPVE into position and aligning, connecting, and starting a unit for each tank.

The event tree showing the seismic and high wind event scenarios with a single recovery action is shown in Figures 4-2 and 4-3. Estimates of the probabilities of the events shown in the figures are as follows:

Event I: The initiating event frequency for the seismic event tree is $2.0\text{E-}2/\text{yr}$ and $5.0\text{E-}2$ for the high wind.

Event A: Probability of failing to align, connect, and start the EPVE is estimated to be $5.3\text{E-}6$ (see Subsection 5.2.1).

Event B: Probability that the EPVE fails to start and run for seven days is estimated to be $1.8\text{E-}5$, based on fault tree quantification (see Appendix C) (Repair included).

Event C: Probability that ignition source is present is 0.13 for the seismic event and 0.09 for the high wind (5).

4.2.3 Other External Events

The event tree for the other external events is similar to that for the seismic and high wind events except that only the nitrogen supply system is affected. The times required to reach the LFL after nitrogen flow stops are assumed to be three days for both tanks (Tank 48 is assumed to be in the wash cycle). Two sets of EPVE with power supplies are available for each tank (four sets total) and that air-based ventilation is required using the EPVE (normal exhaust system does not restart). This action requires moving the EPVE into position and aligning, connecting, and starting a unit for each tank.

The event tree showing the other external event scenario with a single recovery action is shown in Figure 4-4. Estimates of the probabilities of the events shown in Figure 4-4 are as follows:

Event I: The combined initiating event frequency for other external events is $1.6\text{E-}4/\text{yr}$.

Event A: Probability of failing to align, connect, and start the EPVE is estimated to be $5.3\text{E-}6$ (see Subsection 5.2.1).

Event B: Probability that the EPVE fails to start and run for seven days is estimated to be $1.8\text{E-}5$, based on fault tree quantification (see Appendix C) (Repair included).

Event C: Probability that ignition source is present is 0.09 (5).

SEVERE WINTER STORM (NO N2 DELIVERY FOR FOUR DAYS) A: WS-09.TRE 1-10-94

Figure 4-1. Event Tree for Severe Winter Storm

SEISMIC (0.02G) EVENT FAILS N2 SUPPLY AND EXHAUST SYSTEMS	ALIGN, CONNECT, AND START EPVE	EPVE STARTS AND RUNS FOR SEVEN DAYS	IGNITION SOURCE IS PREVENTED	SEQ.FREQ.	CLASS
I	A	B	C		
5.00E-02 INIT EVENT		YES		5.00E-02	AIR
		1.82E-05	YES	7.92E-07	OK
		NO	.13 NO	1.18E-07	NO
		5.27E-06	YES	2.29E-07	OK
		NO	.13 NO	3.43E-08	NO

SEISMIC FAILS N2 SUPPLY, EXHAUST A: SEIS-13.TRE 1-10-94

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Figure 4-2 Event Tree for Seismic Event

HIGH WIND EVENT FAILS N2 SUPPLY AND EXHAUST SYSTEMS	ALIGN, CONNECT, AND START EPVE	EPVE STARTS AND RUNS FOR SEVENN DAYS	IGNITION SOURCE IS PREVENTED	SEQ.FREQ.	CLASS
I	A	B	C		
2.00E-02 INIT EVENT		YES		2.00E-02	AIR
		1.82E-05	YES	3.31E-07	OK
		NO	9.00E-02	3.28E-08	NO
			NO	9.59E-08	OK
		5.27E-06	YES	9.49E-09	NO
		NO	9.00E-02		
			NO		

HIGH WIND FAILS N2 SUPPLY, EXHAUST A: WIND-09.TRE 1-10-94

Figure 4-3 Event Tree for Tornado Wind Event

OTHER EXTERNAL EVENT FAILS NITROGEN SUPPLY SYSTEM	ALIGN. CONNECT. AND START EPVE	EPVE STARTS AND RUNS FOR SEVEN DAYS	IGNITION SOURCE IS PREVENTED	SEQ.FREQ.	CLASS
I	A	B	C		
1.60E-04 INIT EVENT	YES 5.27E-06 NO	YES		1.60E-04	AIR
		1.82E-05	YES	2.65E-09	OK
		NO	9.00E-02	2.62E-10	NO
			NO	7.67E-10	OK
			YES	7.59E-11	NO
			9.00E-02		
			NO		

EXTERNAL EVENT FAILS N2 SUPPLY A: EXTRNL1.TRE 1-10-94

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Figure 4-4 Event Tree for Other External Events

4.2.4 Event Tree Results

Total sequence frequencies for unacceptable end states for all credible external initiating events are:

<u>Event Tree</u>	<u>Total Frequency for Unacceptable End States</u>
STORM	2.1E-8/yr
SEISMIC	1.52E-7/yr
HIGH WIND	4.23E-8/yr
OTHERS	3.38E-10/yr
<hr/> Total	<hr/> 2.16E-7/yr

The dominate sequence for the external events is a seismic initiated accident. Seismic events account for more than 70% of the external event frequency.

Although all magnitude earthquakes are represented in this report with a single sequence frequency of 2.0E-2/yr., it should be noted that an earthquake large enough to cause such extensive damage represents a small contribution to this overall initiating event frequency. This analysis is based on an initiating frequency of .02/yr. which corresponds to a much smaller earthquake of about a 0.02g magnitude. The basis for this initiator is the limited scope seismic analyses that exist for the ITP facility and its surrounding support facilities. This earthquake is assumed to fail equipment, but not challenge the structural integrity of the buildings or roadways. Earthquakes of this magnitude have already occurred at the SRS with no reported damage. However, with limited technical bases, no credit is taken for continued operation or restoration of facilities that could reasonably be expected following a high frequency, low intensity seismic event. Therefore credit is taken only for the EPVE.

The most likely seismic event that could significantly challenge buildings and roadways would be on the order of 0.1g or greater (29). At this range, challenges to equipment and supporting facilities is credible, and real challenges to operator performance are genuine. Events of such magnitude, however, are small contributors to the overall sequence frequency due to their lower initiating event frequencies. These relative contributions are summarized in Table 4-5 which includes the contributions of various seismic and wind events.

The challenges for which immediate operator action would not be credited are limited to less than 3% of the total event sequence frequencies (such as seismic events of 0.1 g or greater). Of this, the event that might cause some level of sitewide damage, 0.1g earthquake or greater, contributes approximately 1.5% to the total. It is for a seismic event of 0.2g that the HRA and ignition source probability analyses are predicated and for which the results are applicable. Applied to events of magnitude of less than 0.2g, the results of the analyses are applicable and conservative.

Table 4-5. Contributions to Seismic/High Wind Event Sequence Frequency

Initiating Event	Exceedance Frequency, /yr	Sequence Frequency, /yr	% Contribution to Total
0.02g Seismic	5E-2	1.52E-8	76%
78 mph Straight Wind	2E-2	4.23E-8	21%
0.1g Seismic	1E-3	3.1E-9	1.5%
109 mph Straight Wind	1E-3	2.11E-9	1.1%
DBE (0.2g Seismic)	2E-4	6.1E-10	0.3%
DBT (137 mph Tornado)	2E-5	4.23E-11	0.02%

5.0 HUMAN RELIABILITY ANALYSIS

The FTA/ETA of the nitrogen purge system for Tanks 48 and 49 identified various human actions that could be taken to mitigate the accident being considered. These actions fall into two groups: normal proceduralized operating actions/recovery actions and repair activities.

This section discusses the methodology used in quantifying these actions, and the results of the quantification. The numbers generated from this analysis are used in the fault/event tree quantification discussed previously in this report.

5.1 Methodology

The goal of the HRA is to provide estimates of HEPs. These estimates are then used to quantify the fault trees and event trees that depict the accident scenarios.

A detailed HRA study was not performed for all actions. Where a simplified approach was taken, methodology provides results that are sufficiently accurate for use in the fault/event trees. It should be noted that by using a simplified approach, conservative results are obtained. If a detailed HRA analysis were to be performed, the anticipated results would yield lower failure probabilities. The methods used for quantifying the recovery and repair actions are described below in their respective sections. Because there are separate operating and maintenance crews, independence between repair and recovery actions is assumed.

The HRA is predicated on the fact that compelling signals are generated to notify the operators of a ventilation upset. The alarms were not modeled individually, however; the ITP facility contains multiple alarms that will indicate a ventilation upset. No common mode failure mechanisms were identified which would fail all the alarms with the possible exception of loss of electrical power. The interruption of power to the control panels is in itself a compelling signal, since, the operator would detect this failure simply through visual inspection of the "powerless" panel immediately or, at the latest, when taking the required control room readings or shiftily field verification (4). In either case, the detection would lead to further investigation and detection of the loss of ventilation.

There are multiple alarms available to aid the operator in assessing the status of the normal ITP tank ventilation. Independent signals are available from the DCS (Distributed Control System) and from the 7400B panel "hard-wired" alarms which effectively duplicate the DCS signals (32 and 33). The signals include the LFL alarm, the two O₂ alarms, the benzene alarm, nitrogen flow alarm, exhaust air flow alarm, HEPA ΔP alarm and tank vacuum alarm. Failure of any single device will not prevent the operator from getting other compelling signals from one or more alarms. Based on typical failure rates for alarms, $\sim 5 \times 10^{-5}/\text{hr.}$, (9 and 34), the probability that multiple failures would occur and prevent the operations from receiving a compelling signal is estimated to be on the order of $10^{-7}/\text{yr.}$ This is based on a failure of each instrument on the 7400B panel, failure of the DCS, and failure to conduct the required visual inspection of the

ventilation equipment. Thus, the contribution of multiple alarm failures to the deflagration frequency is very small. If an extremely conservative assumption is made that all the instruments which would indicate an interruption of tank ventilation have failed in such a manner that the alarms and signal readouts fail to indicate such, an OSR requirement for a shiftily field verification of the status of the tank ventilation system would detect the loss of ventilation. For the tank to reach a deflagrable mixture of benzene and hydrogen, the ventilation system must fail and not be detected by multiple shifts over a three day period. The likelihood of multiple shifts failing to identify the loss of ventilation combined with the loss of all alarms and control room indications is considered to be incredible.

It should be noted that this system is fully automated and does not require operator intervention during normal operations. However, it is possible for an operator to misinterpret the information received from the DCS. To minimize the potential for erroneous responses, immediate action based on data received which is outside procedural requirements - but does not constitute an alarm condition - is not permitted in existing procedures. Under alarm conditions, the initial response includes acknowledgement and confirmation (31) of the alarm condition.

Operator errors during normal operation in which tank ventilation could be interrupted, thought to be unlikely, are recoverable. In order to stop the ventilation system, an operator must sequence through several computer screens (on the DCS) before reaching the menu screen that contains a stop command option. Nevertheless, whether the fans were interrupted by computer signal or manual action, there are many alarms and indicators which would signal the operator of the loss of ventilation [such as the LFL monitors, nitrogen flow indications, tank ΔP gauge, oxygen monitors, etc] and allow for rapid recovery. Since there are three days available to respond, immediate recovery upon discovery is not critical. There is ample time to respond and correct the situation. Therefore, obvious errors of commission are considered small contributors to the event frequency and are not included in the analysis.

The ITP process is a new facility and, as such, procedure development and training are on-going. Because final procedures to cover all the human actions quantified are not available, several general assumptions had to be made. These assumptions have been reviewed and accepted by the facility. The results of this analysis rely heavily on these assumptions which are listed below

- o Compelling signals are generated immediately for each scenario considered.
- o Adequate procedures exist for each scenario that would lead the operator to the actions considered.
- o Procedures will be written such that each involves step-by-step actions, when appropriate.
- o Operators are adequately trained on all procedures.

- o Procedures require independent check-off provisions, where appropriate, to assure that the procedure was performed correctly. These are performed after critical steps in the procedure.

5.1.1 Normal Proceduralized Operation, Actions/Recovery Methodology

The first step in evaluating the recovery actions was to review the existing procedures and drawings available that deal with the operation of the nitrogen purge system. This review provided the background information for the analysis and established current operations practices. A list of the procedures and drawings examined is shown in Table 5-1.

There are three normal proceduralized operating modes for the nitrogen purge system: 1) DCS control; 2) DCS/field control, and 3) field control. Since a failure of the DCS is assumed to be catastrophic, no credit is taken for the DCS/field control.

The "Post-Accident Nominal" model from Section 8 of Reference 18, "Accident Sequence Evaluation Program Human Reliability Analysis Procedure", known as the ASEP method, is the method used to quantify human actions (18), unless noted otherwise. This method is a widely accepted HRA tool that can be applied with considerably less background information and judgement than is required for a more detailed HRA methods such as the Technique for Human Error Rate Prediction (THERP) (19). It has been shown that the ASEP method yields estimates that are typically more conservative than those generated by more detailed methods.

Interviews with operations personnel are used to establish the times required to adequately perform the recovery actions. The ASEP procedure requires that time estimates gathered directly from operating personnel instead of through simulated measurements be doubled. The doubling is done to compensate for inherent under-estimation of task completion times by personnel. The results of these interviews and the corresponding times which have been adjusted (doubled) are shown in Table 5-2. The adjusted times are used in the analysis. See Section 5.2.2 for a discussion of the times associated with installation and starting of the Emergency Purge Ventilation Equipment.

5.1.2 Repair Methodology

The first step is to establish the expected repair times for vital equipment. Interviews with ITP personnel were held with representatives from Waste Management Operations, Maintenance, and Computer Services. As with the recovery estimates, all time estimates derived from the interviews are doubled to compensate for inherent underestimation of task completion times by personnel. The results of these interviews and the repair time estimates are shown in Table 5-3.

The times reflected in the doubled column are examined to determine how likely repair would be in the time allotted by the accident scenario being considered. Repairs are categorized as either simple or moderate (see Section 5.2.3).

5.2 Quantification and Results

The following section describes the quantification of the operator actions and repair activities analysed.

5.2.1 Normal Proceduralized Operating Actions/Recovery Actions

This section includes quantification for each human action considered explicitly in the fault tree analysis. These results are valid when considering one operator action only, excluding repair activities. When more than one human action is applicable to a specific cutset, for example, an operator action considered explicitly in the fault tree and an additional recovery action, a screening value of 1.0 is applied to the action with the higher failure probability to account for any dependencies between those actions.

As documented earlier in this report, all accident scenarios allow for at least a three-day (72-hr) recovery time. It is assumed that a compelling signal is generated. A comparison of the times required to perform the recovery actions, shown in Table 5-2, and the total time available (three days) shows that at least 24 hrs are available for diagnosis following a compelling signal. Based on calculations using NUREG/CR-4772 (18), the failure to diagnose properly over a 24-hr period can be assumed to be negligible compared to the failure contribution from post-diagnosis errors. Post diagnosis values are taken from NUREG/CR-4772 and are shown in Table 5-4.

A value of 0.1 is used in quantifying the recovery actions to give credit for performance of recovery actions by additional shifts beyond the first shift. The value of 0.1 is based on Section 3 of Reference 18, which indicates that this value should be used for human redundancy.

Operator Fails To Align and Start Train B - Exhaust Side

Upon loss of the normally operating exhaust fan, the operator is required to manually realign to the backup exhaust fan train, and manually start the backup exhaust fan.

- o Time available to identify and accomplish action: 72 hr
- o Time allowed for diagnosis: 24 hr
 - Probability of failing to properly diagnose in 24 hr: negligible
- o Time remaining for action: 48 hr
 - Task is a critical action as part of a step-by-step procedure done under moderately high stress
 - Four shifts are available to perform this action

- HEP for initial action: 0.02
- Verification of action: 0.2
- Credit for additional shifts: 0.1
- o Total Failure Probability: $(0.02)(0.2)(0.1) = 4E-4$

Operator Fails To Enter Field Control Mode (Moderate Stress Levels)

If a failure occurs while operating the nitrogen purge system in automatic mode, the operator can take manual control of the system. Procedures instruct the operator on how to override the automatic controls and interlocks, and manually control nitrogen flow and the exhaust fan.

- o Time available to identify and accomplish action: 72 hr
- o Time allowed for diagnosis: 24 hr
 - Probability of failing to properly diagnose in 24 hr: negligible
- o Time remaining for action: 48 hr
 - Task is a critical action as part of a step-by-step procedure done under moderately high stress
 - Four shifts are available to perform this action
 - HEP for initial action: 0.02
 - Verification of action: 0.2
 - Credit for additional shifts: 0.1
- o Total Failure Probability: $(0.02)(0.2)(0.1) = 4E-4$

Operator Fails To Enter Field Control Mode (High Stress Levels)

This recovery action is identical to the manual mode-moderate stress action described above; however, this task is performed under extremely high stress. A loss of the DCS as well as common cause sensor failures are assumed to create extremely high stress situations.

- o Time available to identify and accomplish action: 72 hr

Table 5-1. Procedures and Drawings Used in Human Reliability Analysis

<u>PROCEDURES</u>	
241-H-1731	Loss of N ₂ to STPB, Tank 48 and 49, Filtrate Hold Tanks and Benzene Stripper Columns
241-H-1746SQ	Tank 49 Ventilation System
241-H-1747SQ	Tank 48 Ventilation System
241-H-1757SQ	Action To Be Taken on LFL Greater than Round Sheet Limits in Waste Tanks 48 or 49
241-H-1779Q	Set-up and Operation of Portable Purge Exhaust Unit for Tanks 48 and 49
241-H-1877SQ	Waste Tanks 48 or 49 Nitrogen Purge Ventilation System Failure
241-H-1897S	Conserving Nitrogen Inventory
 <u>SKETCHES</u>	
138-8-H-WR-173	Tank 48 Nitrogen Lines
138-8-H-WR-174	Tank 49 Nitrogen Lines
138-8-H-WR-177	Tanks 48 and 49 Emergency N ₂ Supply
138-8-H-WR-204	Tanks 48 and 49 Emergency Exhaust Skid

Table 5-2. Time Estimates for Recovery Actions

Equipment	Action	Time Estimate	Adjusted Time
Standby Exhaust Fan	Perform procedure to start standby exhaust fan	~30 min.	60 min.
Nitrogen Valves	Establish manual control of valves	~30 min.	60 min.
Miscellaneous	Transfer operation of system from automatic to manual mode	~20-30 min.	40-60 min.
	Transfer operation of system from manual mode to air-based ventilation	~20-30 min.	40-60 min.

For a discussion of the Time Estimate and Adjusted Time for the Emergency Purge Ventilation Equipment (EPVP), see Section 5.2.1.

Table 5-3. Time Estimates for Repair Actions

Equipment	Action	Time Estimate	Adjusted Time
DCS	Repair DCS	~2 hr	4 hr
O ₂ Analyzer	Diagnose/troubleshoot problem with analyzer	~1-1.5 hr	2-3 hr
	Replace one analyzer	~30-45 min.	1-1.5 hr
	Check out/test new analyzer	~1-1.5 hr	2-3 hr
Exhaust Fan	Diagnose loss of fan	~4-6 hr	8-12 hr
	Troubleshoot problem with fan	~2-3 hr	4-6 hr
	Repair/replace exhaust fan component	~4-6 hr	8-12 hr
	Check out/test fan	~1-1.5 hr	2-3 hr
Vacuum Sensor	Diagnose failure of vacuum sensor	~2 hr	4 hr
	Install spare sensor	~1 hr	2 hr
	Check out/test sensor	~1 hr	2 hr
HEPA Filter	Replace one filter	~4-8 hr	8-16 hr
Manual Valve	Repair/replace one valve	~4 hr	8 hr

Table 5-4. Post-Diagnosis Human Error Probabilities

HEP	Action
0.02	Perform a critical action as part of a step-by-step task done under moderately high stress
0.05	Perform a critical action as part of a dynamic task done under moderately high stress or a step-by-step task done under extremely high stress
0.25	Perform a critical action as part of a dynamic task done under extremely high stress
0.2	Verify the correctness of a critical action as part of a step-by-step task under moderately high stress
0.5	Verify the correctness of a critical action as part of a dynamic task done under moderately high stress or a step-by-step task done under extremely high stress
0.5	Verify the correctness of a critical action as part of a dynamic task done under extremely high stress

- o Time allowed for diagnosis: 24 hr
 - Probability of failing to properly diagnose in 24 hr: negligible
- o Time remaining for action: 48 hr
 - Task is a critical action as part of a step-by-step procedure done under extremely high stress
 - Four shifts are available to perform this action
 - HEP for initial action: 0.05
 - Verification of action: 0.5
 - Credit for additional shifts: 0.1
- o Total Failure Probability: $(0.05)(0.5)(0.1) = 2.5E-3$

Operator Fails to Align and Start EPVE

The major recovery action for failure of the ITP process nitrogen purge system is establishing air-based ventilation using EPVE. Reference 22 documents the methodology used for calculating the HEP for setup and use of EPVE on ITP process Tanks 48 and 49 after a failure of the nitrogen purge system following a seismic event. The analyses were performed according to THERP as described in NUREG/CR-1278 (19).

The analysis assumes a seismic event initiator which presents the greatest challenge for operator response. Onsite and offsite power is assumed to be unavailable, and all operator control actions are to be performed locally on the tank top. A task analysis was performed based on Off Normal Procedure (ONP), "Loss of Ventilation," and the Standard Operating Procedure (SOP), "Tank 48 System." Due to the current startup mode of ITP process operations, several assumptions had to be made in order to perform the analysis. Assumptions regarding procedures, staffing, equipment locations, equipment tagging, equipment availability, and training were made and documented in Reference 22. This analysis bounds all the accident scenarios analyzed.

The HEP to align, connect and startup the EPVE following an external event or random system failure is reported in Reference 22 as a median value of $4.2E-6$. For use in the fault tree quantification, this number was converted to a point value of $5.3E-6$ which approximates a mean value assuming a lognormal distribution with an error factor of 3. An error factor of 3 was assigned since the largest contributors to the event tree (22) have an error factor of 3. It is important to note that this result is predicated on maintaining all of the assumptions listed in the "Assumptions" section of Reference 22 and does not include hardware faults associated with the EPVE.

The failure probability for align, connect, startup and run the EPVE, following a random system failure or external event is $2.3\text{E-}5$. This failure probability is a summation of the failure probability of the hardware faults associated with the EPVE to start and run ($1.8\text{E-}5$; see Appendix C) combined with the HEP discussed above ($5.3\text{E-}6$).

5.2.2 Repair Activities

Repairs are divided into two groups of difficulty where each group has associated with it a different failure probability. Generally, components that require power operation are considered to be the most difficult to repair and have the largest failure probability to repair. Conversely, components which do not require power are considered simple to repair and have a smaller failure probability to repair. Exceptions are the vacuum sensor, hardwired interlocks, and common cause miscalibrations which require power but for which repair is considered simple because of their inherently simple design. The ability to obtain replacement parts in three days is considered very likely. Extra parts can be taken from the backup train of the unaffected tank in most cases. For the case of external events, no credit is given for repair.

Simple Repairs

The failure probability is the summation of the HEP for failing to perform the repair and the failure probability of the hardware faults associated with restarting the system following the repair.

The failure to perform simple repairs in *less than 3 days* is determined to be negligible, therefore, the failure probability is set to $1\text{E-}6$. Components with simple repairs are:

- o Sensor repair and/or replacement
- o Interlock repair
- o Manual valve replacement/repair

Added to the failure to repair is the failure probability of the hardware faults associated with restarting the system. The failure probability to restart the system is evaluated using FTA as shown in Figure 5-1. Quantification of the fault tree results in a failure probability of $1.0\text{E-}3$ as shown in Table 5-5. Therefore the total failure probability for simple repairs followed by restoration of the system is $1.0\text{E-}3$ ($1.0\text{E-}6 + 1.0\text{E-}3$).

Moderate Repairs

Similarly, the failure probability for failed components which are more complex to repair is the sum of HEP for failing to perform the repair of moderate complexity and the failure probability of the hardware faults associated with restarting the system following repair.

Repairs that are more difficult than those listed above are given a moderate chance of repair (failure probability estimated to be 0.01). Based on the times shown in Table 5-3, 0.01 is a conservative estimate. Moderate repairs are:

- o Flow control valve replacement/repair
- o Regulating valve replacement/repair
- o Exhaust fan repair
- o Piping repair
- o Analyzer calibrations/repair/replacement
- o DCS

The failure probability of the hardware faults associated with restarting the system is evaluated using FTA as shown in Figure 5-1. Quantification of the fault tree results in a failure probability of $1.0\text{E-}3$ as shown in Table 5-5. Therefore the total failure probability for moderate repairs followed by restoration of the system is $1.1\text{E-}2$ ($1.0\text{E-}2 + 1.0\text{E-}3$).

HEPA Filter Repair/Replacement

The failure probability to repair/replace a HEPA filter is a summation of the HEP for failing to repair or replace the HEPA filter and the failure probability of the hardware faults associated with restarting the system following the filter replacement.

Failures that cause the HEPA filters to plug, i.e., loss of steam, loss of condenser, etc., are detectable via pressure drop indication and constant air monitors and do not cause an immediate loss of the filter. An additional three days are available to either repair the failed component or replace the HEPA filter. Therefore, failure to repair from this type of failure is considered to be negligible and the repair probability is set to $1\text{E-}6$.

The failure probability of the hardware faults associated with restarting the system is evaluated using FTA as shown in Figure 5-1. Quantification of the fault tree results in a failure probability of $1.0\text{E-}3$ as shown in Table 5-5. Therefore the total failure probability for repairing/replacing a HEP filter followed by restoration of the system is $1.0\text{E-}3$ ($1.0\text{E-}6 + 1.0\text{E-}3$).

Figure 5-1. Fault Tree for Restart of Nitrogen Purge System

Table 5.5. Cutsets for Restart of Nitrogen Purge System

.\CUT\ITPSTRT.CUT		CUTSET REPORT		7-15-93	9:13	Page	1
Filter: 'ALL'		Truncation Limit: 1.00E-08					
MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.		
-----	-----	----	-----	-----	-----		
1) RST001							*1.03E-03
1) NPRPRACH	COMMON CAUSE FAILURE OF PRESSURE REGULATING VALVES TO OPEN	8.1E-4	1	8.10E-04	8.10E-04		
2) NPCPCACH	COMMON CAUSE FAILURE OF FLOW CONTROL VALVES TO OPEN	1.0E-4	1	1.00E-04	1.00E-04		
3) NPRPRANN	PRESSURE REGULATING VALVE TRAIN A FAILS TO OPEN	8.1E-3	1	8.10E-03	6.56E-05		
NPRPRBNN	PRESSURE REGULATING VALVE TRAIN B FAILS TO OPEN	8.1E-3	1	8.10E-03			
4) NPNFNACH	COMMON CAUSE FAILURE OF EXHAUST FANS TO START	4.8E-5	1	4.80E-05	4.80E-05		
5) NPCPCANN	FLOW CONTROL VALVE TRAIN A FAILS TO OPEN	1.0E-3	1	1.00E-03	1.00E-06		
NPCPCBNN	FLOW CONTROL VALVE TRAIN B FAILS TO OPEN	1.0E-3	1	1.00E-03			
6) NPCPCBNN	FLOW CONTROL VALVE TRAIN B FAILS TO OPEN	1.0E-3	1	1.00E-03	4.80E-07		
NPNFNAST	EXHAUST FAN TRAIN A FAILS TO START	4.8E-4	1	4.80E-04			
7) NPCPCANN	FLOW CONTROL VALVE TRAIN A FAILS TO OPEN	1.0E-3	1	1.00E-03	4.80E-07		
NPNFNBST	EXHAUST FAN TRAIN B FAILS TO START	4.8E-4	1	4.80E-04			
8) NPNFNAST	EXHAUST FAN TRAIN A FAILS TO START	4.8E-4	1	4.80E-04	2.30E-07		
NPNFNBST	EXHAUST FAN TRAIN B FAILS TO START	4.8E-4	1	4.80E-04			

Recovery of Offsite Power

Based on Reference 30 and the time available to restore power (~3 days), the probability of failing to recover from a loss of offsite power is $1.8\text{E-}3$. No credit is taken for recovery of offsite power after an external event.

5.3 Application to Fault Tree Cutsets

The probabilities of the repair/recovery actions are summarized in Table 5-6. Basic guidelines are followed when determining which actions are applicable for each cutset. The following rules are followed:

Apply REPAIRN to:

1. Cutsets associated with Tank 48 in the normal processing mode (cutset contains event 8HOUSE04)
2. Cutsets containing manual valve failures
3. Cutsets containing sensor failures
4. Cutsets containing interlock failures

Apply HEPA to:

1. Cutsets containing HEPA filter failures
2. Cutsets containing heater failures
3. Cutsets containing condenser failures
4. Cutsets containing demister failures
5. Cutsets containing steam failures
6. Cutsets containing chromated water failures
7. Cutsets containing vaporizer failures

Apply RECPWR to:

1. Cutsets containing electric power failures

Apply REPAIRM to:

1. Cutsets containing any hardware failures not already mentioned
2. Cutsets containing instrument air failures
3. Cutsets containing DCS hardware failures

Apply EPVNTINT to:

1. Cutsets containing any hardware failures

It should be noted, as discussed in Subsections 5.2.1 and 5.2.2, that a screening value of 1.0 is applied to the higher of any two operating or recovery actions that is applicable to a single cutset. Thus, a single cutset contains at most one operating or recovery action, and one repair activity.

Table 5-6. Summary of Repair/Recovery Action Probabilities

Action	Basic Event Name	Failure Probability
Align and Start Train B - Exhaust Side	8OPTRNBE 9OPTRNBE	4E-4 (screening value = 1.0)
Enter Field Control Mode (Moderate Stress)	8OPC-MS 9OPC-MS	4E-4 (screening value = 1.0)
Enter Field Control Mode (High Stress)	8OPC-HS 9OPC-HS NOPC-HS	2.5E-3 (screening value = 1.0)
Align and Start EPVE combined with start and run EPVE	EPVENT EPVNTINT	5.3E-6 2.3E-5
Recovery of Normal Power Supply	RECPWR	1.8E-3
HEPA Filter Repair/Replacement	HEPA	1.0E-3
Simple Repairs	REPAIRN	1.0E-3
Moderate Repairs	REPAIRM	1.1E-2

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APPENDIX A

FAULT TREE FOR NITROGEN PURGE SYSTEM FOR TANKS 48 AND 49

This fault tree models the different component and support system failure paths that lead to a loss of the nitrogen purge system to either one or both tanks and includes the coincident ignition source probability. The following conventions are applied in developing this fault tree:

1. As discussed in Section 3.1 a frequency-based fault tree is developed rather than a probability-based fault tree.
2. Point estimates for failure rates, initiators (per year) and failure probabilities are expressed where possible as means. Therefore, data values which were clearly expressed as medians in the data sources were converted to means to input to the fault tree quantification. For example, the human error probability (HEP) to align, connect and startup the EPVE following an external event or random system failure is reported (22) as a median value of $4.2\text{E-}6$. For use in the fault tree quantification, this number was converted to a point value of $5.3\text{E-}6$ which approximates the mean value assuming a Lognormal distribution with an error factor of 3. An error factor of 3 was assigned since the dominant terms in the event tree (22) have an error factor of 3.
3. Unavailabilities due to testing and maintenance are not modeled for components that do not have backups, e.g., condenser or vaporizer. Unavailabilities are modeled for equipment in standby trains, such as the permanent exhaust fans; however, the final analysis is conservative in that it does not take any credit for the operator switching to these trains. The unavailabilities are doubled as discussed in Section 3.1.
4. The final analysis is conservative in that it does not take any credit for the manual bypass line or its cross-connect for nitrogen feed into the tank.
5. HEPA filters eventually plug after a loss of the demister, condenser, or heater.
6. Plugging is the only valid HEPA filter failure mode considered. A rupture of the filter may result in a release, but does not fail the function modeled by this fault tree.
7. For each tank, only one HEPA filter train is online during operation. The fault tree assumes HEPA filter Train B is online and HEPA Train A is on standby. The final analysis is conservative in that no credit is taken for the HEPA filter on standby.

8. One exhaust fan for each tank is normally operating. The other fan (one for each tank) is in standby.
9. Both hardware and software failures are considered for the DCS. Since only limited site-specific data are available, a generic estimate is taken from industrial experience for software and hardware failure rates (23).
10. Since the OSRs require a minimum of 26,000 gallons of liquid nitrogen onsite at all times, the fault tree conservatively models the complete volume of available liquid nitrogen in Tank 1 and no credit is taken for automatic switch over to Tanks 2, 3, 4 or 5.
11. The fault trees do not model components whose function is to provide information only, *e. g.*, benzene analyzer and LFL analyzer.

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TANK 48 EXHAUST FAN
Y348-52-7 FAILS TO
START DUE TO
MECHANICAL FAULTS

8FN527ST

PROB: 4.80E-04 (1)
RATE: 4.8E-4
EXPO: 1

/N
N

TANK 48 EXHAUST FAN
Y348-52-7 FAILS TO
RUN FOR 6 DAYS

8FN527HW

PROB: 1.34E-03 (3)
RATE: 8.0E-6
EXPO: 7

/H
D

FAULTS OF VALVES ON
STANDBY EXHAUST FAN
TRAIN

ITP127B

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TANK 48 EXHAUST FAN
Y348-52-7
UNAVAILABLE DUE TO
MAINTENANCE

8FN527TM

PROB: 3.60E-03 (1)
RATE: 1.8E-3
EXPO: 2

/N
N

OPERATOR FAILS TO
ALIGN AND START
TRAIN B FOR OPERATION
N - EXHAUST SIDE

8OPTRNBE

PROB: 1.00E+00 (0)

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8AZO21HW*	27		8PRPV2HW	32		9FC122TM	5		9XVN13PG	3	
8AZO22HWA	28		8PRPV2TM	32		9FC511HW	14		9XVN15PG	5	
8AZO22TM	28		8PRREGHW*	26		9FC511TM	14		9XVN16PG*	3	
8AZO2SCM*	26		8SFFANCM*	33		9FC512HW*	15		9XVN19PG*	4	
8CNCNHW*	35		8SFFANHW*	33		9FLHP2HW*	10		9XVN24PG*	2	
8DMDEMHW*	35		8VSVACHW*	34		9FN511HW	13		9XVV10PG*	7	
8FC111HW	38		8XV8N2PG*	29		9FN511ST	13		9XVV11PG	8	
8FC111TM	38		8XV8N5PG	30		9FN511TM	13		9XVV15PG*	10	
8FC112HW*	36		8XV8N8PG	32		9FN512HW*	15		9XVV17PG*	10	
8FC121HW*	31		8XVHV2PG*	26		9FSEXHHW*	16		9XVV19HW	14	
8FC122HW	32		8XVHV3PG*	27		9FSHEPHW*	16		9XVV20PG*	15	
8FC122TM	32		8XVHV4PGA	28		9FSNFAHW*	16		9XVV21PG	14	
8FLHP2HW*	34		8XVHV9PG*	26		9FSNFBHW	16		9XVV22PG*	15	
8FN527HW	37		8XVN22PG*	31		9FSNFSCM*	16		9XVV33PG*	1	
8FN527ST	37		8XVN24PG*	30		9HOUSE02	10		IGNITION	1	
8FN527TM	37		8XVN31PG*	29		9HTHTRHW*	11		ITP0*	1	
8FN528HW*	36		8XVV10PG*	27		9ILFANHW*	2		ITP00*	1	
8FSEXHHW*	39		8XVV11PGA	28		9OPC-HS	6		ITP00*	25	
8FSHEPHW*	39		8XVV15PG*	34		9OPC-HS	16		ITP000*	1	
8FSNFAHW*	39		8XVV17PG*	34		9OPC-MS	6		ITP0013*	1	
8FSNFBHW	39		8XVV19HW	38		9OPTRNBE	13		ITP0013*	10	
8FSNFSCM*	39		8XVV20PG*	36		9PRPV1HW*	3		ITP0013A*	16	
8HOUSE01	40		8XVV21PG	38		9PRPV2HW	5		ITP0013B*	16	
8HOUSE02	34		8XVV22PG*	36		9PRPV2TM	5		ITP0023*	10	
8HOUSE03	25		8XVV33PG*	26		9PRREGHW*	9		ITP0023*	13	
8HOUSE04	25		9AZO21HW*	7		9SFFANCM*	6		ITP0025*	13	
8HTHTRHW*	35		9AZO22HW	8		9SFFANHW*	6		ITP0025*	15	
8ILFANHW*	29		9AZO22TM	8		9VSVACHW*	10		ITP0026*	1	
8OPC-HS	33		9AZO2SCM*	7		9XVHV2PG*	7		ITP0026*	2	
8OPC-HS	39		9CNCNHW*	11		9XVHV3PG*	7		ITP003*	1	
8OPC-MS	33		9DMDEMHW*	11		9XVHV4PG	8		ITP003*	7	
8OPTRNBE	37		9FC121HW*	4		9XVHV9PG*	9		ITP0035*	10	
8PRPV1HW*	30		9FC122HW	5		9XVN10PG*	2		ITP0035*	16	

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ITP010*	7		ITP030*	3		ITP12*	26		ITP37*	33	
ITP0100*	19		ITP030*	4		ITP127B	37		ITP38*	33	
ITP0101	19		ITP034*	17		ITP127B	38		ITP3A*	26	
ITP0101	20		ITP034*	19		ITP129*	36		ITP42	30	
ITP0102	20		ITP036*	2		ITP13AA*	39		ITP43	30	
ITP0102	21		ITP036*	6		ITP13BA*	39		ITP43	32	
ITP0104	19		ITP037*	6		ITP14*	34		ITP44	32	
ITP0104A	20		ITP038*	6		ITP16*	34		ITP67*	19	
ITP0104A	22		ITP04*	1		ITP16A*	34		ITP9A*	26	
ITP011	7		ITP042	3		ITP16A*	35		NCPDCSHW*	17	
ITP011	8		ITP043	3		ITP17*	35		NCWCHRH*	12	
ITP012*	7		ITP043	5		ITP18*	35		NELGRDHW*	2	
ITP012*	9		ITP044	5		ITP19*	35		NELGRDHW*	10	
ITP014*	10		ITP047*	17		ITP20*	11		NELGRDHW*	12	
ITP015*	10		ITP061*	19		ITP20*	12		NELGRDHW*	17	
ITP016*	10		ITP061*	23		ITP20*	35		NELGRDHW*	29	
ITP016A*	10		ITP064*	23		ITP21A*	34		NELGRDHW*	34	
ITP016A*	11		ITP064*	24		ITP23*	34		NHOUSE01	18	
ITP017*	11		ITP065B*	24		ITP23*	36		NHVCOMHW*	18	
ITP018*	11		ITP09*	7		ITP24	36		NOPC-HS	17	
ITP019*	11		ITP095*	17		ITP24	37		NOPTRNBS	19	
ITP02*	25		ITP10*	26		ITP26*	26		NPPDIVBK*	19	
ITP022*	17		ITP10*	27		ITP26*	29		NPPNONBK*	19	
ITP022*	18		ITP110*	25		ITP27*	29		NPR245HW	20	
ITP024	13		ITP110*	40		ITP27*	30		NPR245TM	20	
ITP025	13		ITP111*	25		ITP28*	30		NPR246HW*	23	
ITP025	14		ITP111*	25		ITP29*	30		NSSSTMHW*	11	
ITP027*	2		ITP111*	26		ITP30*	30		NSSSTMHW*	35	
ITP027*	3		ITP111*	40		ITP30*	31		NTKTKAHW*	19	
ITP028*	3		ITP114*	26		ITP35*	34		NVPVPAHW*	24	
ITP029*	3		ITP114*	34		ITP35*	39		NVPVPBHW	21	
ITP03*	1		ITP11A	26		ITP36*	29		NXV032PG*	24	

TITLE	
DEFLAGRATION OCCURS IN ITP TANK 48 OR 49	
DRAWING NUMBER	DATE
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<u>Gate/Event Name</u>	<u>Page</u>	<u>Zone</u>	<u>Gate/Event Name</u>	<u>Page</u>	<u>Zone</u>	<u>Gate/Event Name</u>	<u>Page</u>	<u>Zone</u>	<u>Gate/Event Name</u>	<u>Page</u>	<u>Zone</u>
NXVN12PG*	19										
NXVN15HW	22										
NXVN16HW	22										
NXVN18PG	20										
NXVN20PG*	23										
NXVN22PG	20										
NXVN24PG*	23										
NXVN25PG	21										
NXVN26PG*	24										
NXVN33PG	21										
NXVN46PG*	24										
NXVN47HW	21										
NXVN92PG*	19										

TITLE	
DEFLAGRATION OCCURS IN ITP TANK 48 OR 49	
DRAWING NUMBER	DATE
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APPENDICES B.1 AND B.2

CUTSETS FOR APPENDIX A FAULT TREE

APPENDIX B.1

- o Cutsets for Quantified Fault Tree (see Appendix A) without Recovery Actions or Repair Activities.

These cutsets represent the most probable failure combinations that would lead to a deflagration due to loss of the nitrogen purge system to either or both tanks coincident with the pressures of an ignition source if no operator recovery actions or repair activities are taken.

APPENDIX B.2

- o Cutsets for Quantified Fault Tree (see Appendix A) with Recovery Actions and Repair Activities Included.

These cutsets are the same as those above but with recovery actions and repair activities included. After applying the recovery actions and/or repair activities, the cutsets are re-ordered based on probability in order to help identify the most critical system components.

APPENDIX B.1

CUTSETS FOR QUANTIFIED FAULT TREE

WITHOUT RECOVERY ACTIONS OR REPAIR ACTIVITIES

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Filter: 'ALL'

Truncation Limit: 1.00E-08

CUTSET REPORT

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
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1) ITP000*					*7.71E-01
1) 9HOUSE02	NO ACTION TAKEN FOR 48 HRS		1	1.00E+00	2.37E-01
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
NSSSTMHW*	LOSS OF STEAM SUPPLY TO HEATER	3.0E-4	1	2.63E+00	
2) 8HOUSE02	NO ACTION TAKEN FOR 48 HOURS		1	1.00E+00	1.42E-01
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
NSSSTMHW*	LOSS OF STEAM SUPPLY TO HEATER	3.0E-4	1	2.63E+00	
3) 9FSEXXHW*	TANK 49 NITROGEN FLOW SENSOR FOR EXHAUST LINE FAILS	1.2E-4	1	1.05E+00	9.46E-02
9OPC-HS	OPERATOR FAILS TO ENTER MODE C - FIELD CONTROL (HIGH STRESS LEVELS		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
4) 9FSHEPHW*	FLOW SENSOR ACROSS HEPA FILTER FAILS DUE TO MECHANICAL FAULT	1.2E-4	1	1.05E+00	9.46E-02
9OPC-HS	OPERATOR FAILS TO ENTER MODE C - FIELD CONTROL (HIGH STRESS LEVELS		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
5) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	7.10E-02
NCPDCSHW*	LOCAL MECHANICAL FAULTS OF DCS COMPUTER	9.0E-5	1	7.88E-01	
NOPC-HS	OPERATOR FAILS TO ENTER FIELD CONTROL MODE (HIGH STRESS LEVELS)		1	1.00E+00	
6) 8FSEXXHW*	TANK 48 NITROGEN FLOW SENSOR FOR EXHAUST LINE FAILS	1.2E-4	1	1.05E+00	5.68E-02
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
9OPC-HS	OPERATOR FAILS TO ENTER FIELD CONTROL MODE (HIGH STRESS LEVELS)		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
7) 8FSHEPHW*	FLOW SENSOR ACROSS HEPA FILTER FAILS DUE TO MECHANICAL FAULT	1.2E-4	1	1.05E+00	5.68E-02
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
9OPC-HS	OPERATOR FAILS TO ENTER FIELD CONTROL MODE (HIGH STRESS LEVELS)		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
8) 8HOUSE02	NO ACTION TAKEN FOR 48 HOURS		1	1.00E+00	4.73E-02
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
NSSSTMHW*	LOSS OF STEAM SUPPLY TO HEATER	3.0E-4	1	2.63E+00	
9) 8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	4.73E-02
8HOUSE02	NO ACTION TAKEN FOR 48 HOURS		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
NSSSTMHW*	LOSS OF STEAM SUPPLY TO HEATER	3.0E-4	1	2.63E+00	
10) 9OPC-HS	OPERATOR FAILS TO ENTER MODE C - FIELD CONTROL (HIGH STRESS LEVELS		1	1.00E+00	3.96E-02
9SFFANCM*	COMMON MODE MISCALIBRATION FAILURE OF SENSORS DETECTING FAN OPERAT	4.4E-1	1	4.40E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
11) 9FSNFSCM*	BOTH NITROGEN FLOW SENSORS FAIL DUE TO COMMON MODE MISCALIBRATION	4.4E-1	1	4.40E-01	3.96E-02
9OPC-HS	OPERATOR FAILS TO ENTER MODE C - FIELD CONTROL (HIGH STRESS LEVELS		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
12) 9ILFANH*	INTERLOCK FAILURE (FAN EXHAUST FLOW METER) CLOSES FLOW CONTROL VAL	4.6E-5	1	4.03E-01	3.63E-02
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
13) 8FSNFSCM*	BOTH NITROGEN FLOW SENSORS FAIL DUE TO COMMON MODE MISCALIBRATION	4.4E-1	1	4.40E-01	2.38E-02
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
9OPC-HS	OPERATOR FAILS TO ENTER FIELD CONTROL MODE (HIGH STRESS LEVELS)		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
14) 8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	2.38E-02

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
8OPC-HS	OPERATOR FAILS TO ENTER FIELD CONTROL MODE (HIGH STRESS LEVELS)		1	1.00E+00	
8SFFANCM*	COMMON MODE MISCALIBRATION FAILURE OF SENSORS DETECTING FAN OPERAT	4.4E-1	1	4.40E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
15) 9AZO21HW*	TANK 49 O2 ANALYZER 1 HARDWARE FAULTS	3.0E-4	2	5.26E+00	2.33E-02
9AZO22HW	TANK 49 O2 ANALYZER 2 HARDWARE FAULTS	3.0E-4	7	4.92E-02	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
16) 8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	2.18E-02
8ILFANH*	INTERLOCK FAILURE (FAN EXHAUST FLOW METER) CLOSES FLOW CONTROL VAL	4.6E-5	1	4.03E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
17) 9AZO2SCM*	COMMON MODE SENSOR MISCALIBRATION FAILURE FOR O2 ANALYZERS	2.38E-1	1	2.38E-01	2.14E-02
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
18) 9HOUSE02	NO ACTION TAKEN FOR 48 HRS		1	1.00E+00	1.97E-02
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
NCWCHRRH*	MECHANICAL FAULTS IN CHROMATED COOLING WATER SYSTEM	2.5E-5	1	2.19E-01	
19) 8FSEXHHW*	TANK 48 NITROGEN FLOW SENSOR FOR EXHAUST LINE FAILS	1.2E-4	1	1.35E+00	1.89E-02
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
8OPC-HS	OPERATOR FAILS TO ENTER FIELD CONTROL MODE (HIGH STRESS LEVELS)		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
20) 8FSHEPHW*	FLOW SENSOR ACROSS HEPA FILTER FAILS DUE TO MECHANICAL FAULT	1.2E-4	1	1.05E+00	1.89E-02
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
8OPC-HS	OPERATOR FAILS TO ENTER FIELD CONTROL MODE (HIGH STRESS LEVELS)		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
21) 8FSHEPHW*	FLOW SENSOR ACROSS HEPA FILTER FAILS DUE TO MECHANICAL FAULT	1.2E-4	1	1.05E+00	1.89E-02
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
8OPC-HS	OPERATOR FAILS TO ENTER FIELD CONTROL MODE (HIGH STRESS LEVELS)		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
22) 8FSEXHHW*	TANK 48 NITROGEN FLOW SENSOR FOR EXHAUST LINE FAILS	1.2E-4	1	1.05E+00	1.89E-02
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
8OPC-HS	OPERATOR FAILS TO ENTER FIELD CONTROL MODE (HIGH STRESS LEVELS)		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
23) 9OPC-MS	OPERATOR FAILS TO ENTER MODE C - FIELD CONTROL (MODERATE STRESS LE		1	1.00E+00	1.66E-02
9SFFANHW*	SENSOR DETECTING FAN OPERATION FOR NORMALLY RUNNING FAN FAILS	2.1E-5	1	1.84E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
24) 8AZO21HW*	TANK 48 O2 ANALYZER 1 HARDWARE FAULTS	3.0E-4	2	5.26E+00	1.40E-02
8AZO22HWA	TANK 48 O2 ANALYZER 2 HARDWARE FAULTS	3.0E-4	7	4.92E-02	
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
25) 8AZO2SCM*	COMMON MODE SENSOR MISCALIBRATION FAILURE FOR O2 ANALYZERS	2.38E-1	1	2.38E-01	1.29E-02
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
26) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	2.70E-02
NELGRDHW*	LOSS OF H-AREA POWER	3.43E-5	1	3.00E-01	
27) 8HOUSE02	NO ACTION TAKEN FOR 48 HOURS		1	1.00E+00	1.18E-02
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
NCWCHRRH*	MECHANICAL FAULTS IN CHROMATED COOLING WATER SYSTEM	2.5E-5	1	2.19E-01	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
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28) 8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	9.93E-03
8OPC-MS	OPERATOR FAILS TO ENTER FIELD CONTROL MODE (MODERATE STRESS LEVELS		1	1.00E+00	
8SFFANHW*	SENSOR DETECTING FAN OPERATION FOR NORMALLY RUNNING FAN FAILS	2.1E-5	1	1.84E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
29) 8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	7.92E-03
8OPC-HS	OPERATOR FAILS TO ENTER FIELD CONTROL MODE (HIGH STRESS LEVELS)		1	1.00E+00	
8SFFANCM*	COMMON MODE MISCALIBRATION FAILURE OF SENSORS DETECTING FAN OPERAT	4.4E-1	1	4.40E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
30) 8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	7.92E-03
8OPC-HS	OPERATOR FAILS TO ENTER FIELD CONTROL MODE (HIGH STRESS LEVELS)		1	1.00E+00	
8SFFANCM*	COMMON MODE MISCALIBRATION FAILURE OF SENSORS DETECTING FAN OPERAT	4.4E-1	1	4.40E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
31) 8FSNFSCM*	BOTH NITROGEN FLOW SENSORS FAIL DUE TO COMMON MODE MISCALIBRATION	4.4E-1	1	4.40E-01	7.92E-03
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
8OPC-HS	OPERATOR FAILS TO ENTER FIELD CONTROL MODE (HIGH STRESS LEVELS)		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
32) 8FSNFSCM*	BOTH NITROGEN FLOW SENSORS FAIL DUE TO COMMON MODE MISCALIBRATION	4.4E-1	1	4.40E-01	7.92E-03
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
8OPC-HS	OPERATOR FAILS TO ENTER FIELD CONTROL MODE (HIGH STRESS LEVELS)		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
33) 8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	7.25E-03
8ILFANHW*	INTERLOCK FAILURE (FAN EXHAUST FLOW METER) CLOSES FLOW CONTROL VAL	4.6E-5	1	4.03E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
34) 8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	7.25E-03
8ILFANHW*	INTERLOCK FAILURE (FAN EXHAUST FLOW METER) CLOSES FLOW CONTROL VAL	4.6E-5	1	4.03E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
35) 9FC512HW*	FLOW CONTROL VALVE 1251PV2 MECHANICAL FAULT	8.5E-6	1	7.45E-02	6.70E-03
9OPTRNBE	OPERATOR FAILS TO ALIGN AND START TRAIN B FOR OPERATION - EXHAUST		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
36) 9FN512HW*	TANK 49 EXHAUST FAN Y349-52-12 FAILS TO RUN DUE TO MECHANICAL FAUL	8.0E-6	1	7.01E-02	6.31E-03
9OPTRNBE	OPERATOR FAILS TO ALIGN AND START TRAIN B FOR OPERATION - EXHAUST		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
37) 8AZO21HW*	TANK 48 O2 ANALYZER 1 HARDWARE FAULTS	3.0E-4	2	5.26E+00	4.65E-03
8AZO22HWA	TANK 48 O2 ANALYZER 2 HARDWARE FAULTS	3.0E-4	7	4.92E-02	
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
38) 8AZO21HW*	TANK 48 O2 ANALYZER 1 HARDWARE FAULTS	3.0E-4	2	5.26E+00	4.65E-03
8AZO22HWA	TANK 48 O2 ANALYZER 2 HARDWARE FAULTS	3.0E-4	7	4.92E-02	
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
39) 8AZO2SCM*	COMMON MODE SENSOR MISCALIBRATION FAILURE FOR O2 ANALYZERS	2.38E-1	1	2.38E-01	4.28E-03
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
40) 8AZO2SCM*	COMMON MODE SENSOR MISCALIBRATION FAILURE FOR O2 ANALYZERS	2.38E-1	1	2.38E-01	4.28E-03
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
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41) 8FC112HW*	FLOW CONTROL VALVE 1211PV2 MECHANICAL FAULT	8.5E-6	1	7.45E-02	4.02E-03
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
8OPTRNBE	OPERATOR FAILS TO ALIGN AND START TRAIN B FOR OPERATION - EXHAUST		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
42) 8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	3.94E-03
8HOUSE02	NO ACTION TAKEN FOR 48 HOURS		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
NCWCHRRHW*	MECHANICAL FAULTS IN CHROMATED COOLING WATER SYSTEM	2.5E-5	1	2.19E-01	
43) 8HOUSE02	NO ACTION TAKEN FOR 48 HOURS		1	1.00E+00	3.94E-03
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
NCWCHRRHW*	MECHANICAL FAULTS IN CHROMATED COOLING WATER SYSTEM	2.5E-5	1	2.19E-01	
44) 8FN528HW*	TANK 48 EXHAUST FAN Y348-52-8 FAILS TO RUN DUE TO MECHANICAL FAULT	8.0E-6	1	7.01E-02	3.78E-03
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
8OPTRNBE	OPERATOR FAILS TO ALIGN AND START TRAIN B FOR OPERATION - EXHAUST		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
45) 8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	3.31E-03
8OPC-MS	OPERATOR FAILS TO ENTER FIELD CONTROL MODE (MODERATE STRESS LEVELS		1	1.00E+00	
8SFFANHW*	SENSOR DETECTING FAN OPERATION FOR NORMALLY RUNNING FAN FAILS	2.1E-5	1	1.84E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
46) 8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	3.31E-03
8OPC-MS	OPERATOR FAILS TO ENTER FIELD CONTROL MODE (MODERATE STRESS LEVELS		1	1.00E+00	
8SFFANHW*	SENSOR DETECTING FAN OPERATION FOR NORMALLY RUNNING FAN FAILS	2.1E-5	1	1.84E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
47) 9DMDMHW*	LOCAL FAULTS OF TANK 49 DEMISTER	3.6E-6	1	3.15E-02	2.84E-03
9HOUSE02	NO ACTION TAKEN FOR 48 HRS		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
48) 9VSVACHW*	TANK 49 VACUUM SENSOR FAILS AND CLOSES FAN FLOW CONTROL VALVES	3.5E-6	1	3.07E-02	2.76E-03
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
49) 9CNCNHW*	LOCAL FAULTS OF TANK 49 CONDENSER	3.0E-6	1	2.63E-02	2.37E-03
9HOUSE02	NO ACTION TAKEN FOR 48 HRS		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
50) 9FSNFAHW*	TANK 49 NITROGEN FLOW SENSOR FOR LINE A FAILS DUE TO LOCAL FAULTS	1.2E-4	2	2.10E+00	3.78E-03
9FSNFBHW	TANK 49 NITROGEN FLOW SENSOR FOR LINE B FAILS DUE TO LOCAL FAULTS	1.2E-4	7	2.00E-02	
9OPC-HS	OPERATOR FAILS TO ENTER MODE C - FIELD CONTROL (HIGH STRESS LEVELS		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
51) 9PRREGHW*	TANK 49 FAILURE OF PRESSURE REGULATING VALVE 1257PV	2.2E-6	1	1.93E-02	1.73E-03
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
52) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	1.73E-03
NOPTRNBS	OPERATOR FAILS TO ALIGN TRAIN B FOR OPERATION - SUPPLY SIDE		1	1.00E+00	
NPR246HW*	PRESSURE REGULATING VALVE 2046PV FAILS	2.2E-6	1	1.93E-02	
53) 8DMDMHW*	LOCAL FAULTS OF TANK 48 DEMISTER	3.6E-6	1	3.15E-02	1.70E-03
8HOUSE02	NO ACTION TAKEN FOR 48 HOURS		1	1.00E+00	
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
54) 9AZO21HW*	TANK 49 O2 ANALYZER 1 HARDWARE FAULTS	3.0E-4	2	5.26E+00	1.70E-03

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
9AZO22TM	TANK 49 O2 ANALYZER 2 UNAVAILABLE DUE TO MAINTENANCE	1.8E-3	2	3.60E-03	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
55) 8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	1.66E-03
8VSVACHW*	TANK 48 VACUUM SENSOR FAILS AND CLOSES FAN FLOW CONTROL VALVES	3.5E-6	1	3.07E-02	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
56) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	1.58E-03
NHOUSE01	CONDITIONAL PROBABILITY OF OUTSIDE TEMPERATURE BEING > 80 F		0.125	1.25E-01	
NHVCOMHW*	LOSS OF HVAC TO ROOM CONTAINING DCS COMPUTER	1.6E-5	1	1.40E-01	
NOPC-HS	OPERATOR FAILS TO ENTER FIELD CONTROL MODE (HIGH STRESS LEVELS)		1	1.00E+00	
57) 8CNCNHW*	LOCAL FAULTS OF TANK 48 CONDENSER	3.0E-6	1	2.63E-02	1.42E-03
8HOUSE02	NO ACTION TAKEN FOR 48 HOURS		1	1.00E+00	
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
58) 8FC112HW*	FLOW CONTROL VALVE 1211PV2 MECHANICAL FAULT	8.5E-6	1	7.45E-02	1.34E-03
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
8OPTRNBE	OPERATOR FAILS TO ALIGN AND START TRAIN B FOR OPERATION - EXHAUST		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
59) 8FC112HW*	FLOW CONTROL VALVE 1211PV2 MECHANICAL FAULT	8.5E-6	1	7.45E-02	1.34E-03
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
8OPTRNBE	OPERATOR FAILS TO ALIGN AND START TRAIN B FOR OPERATION - EXHAUST		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
60) 8FN528HW*	TANK 48 EXHAUST FAN Y348-52-8 FAILS TO RUN DUE TO MECHANICAL FAULT	8.0E-6	1	7.01E-02	1.26E-03
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
8OPTRNBE	OPERATOR FAILS TO ALIGN AND START TRAIN B FOR OPERATION - EXHAUST		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
61) 8FN528HW*	TANK 48 EXHAUST FAN Y348-52-8 FAILS TO RUN DUE TO MECHANICAL FAULT	8.0E-6	1	7.01E-02	1.26E-03
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
8OPTRNBE	OPERATOR FAILS TO ALIGN AND START TRAIN B FOR OPERATION - EXHAUST		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
62) 8FSNFAHW*	TANK 48 NITROGEN FLOW SENSOR FOR LINE A FAILS DUE TO LOCAL FAULTS	1.2E-4	2	2.10E+00	2.27E-03
8FSNFBHW	TANK 48 NITROGEN FLOW SENSOR FOR LINE B FAILS DUE TO LOCAL FAULTS	1.2E-4	7	2.00E-02	
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
8OPC-HS	OPERATOR FAILS TO ENTER FIELD CONTROL MODE (HIGH STRESS LEVELS)		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
63) 8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	1.04E-03
8PRREGHW*	TANK 48 FAILURE OF PRESSURE REGULATING VALVE 1217PV	2.2E-6	1	1.93E-02	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
64) 8AZO21HW*	TANK 48 O2 ANALYZER 1 HARDWARE FAULTS	3.0E-4	2	5.26E+00	1.02E-03
8AZO22TM	TANK 48 O2 ANALYZER 2 UNAVAILABLE DUE TO MAINTENANCE	1.8E-3	2	3.60E-03	
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
65) 9FLHP2HW*	LOCAL FAULT OF TANK 49 HEPA FILTER 2	1.0E-6	1	8.76E-03	7.88E-04
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
66) 8DMDEMHW*	LOCAL FAULTS OF TANK 48 DEMISTER	3.6E-6	1	3.15E-02	5.68E-04
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
8HOUSE02	NO ACTION TAKEN FOR 48 HOURS		1	1.00E+00	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
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IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
67) 8DMDEMHW*	LOCAL FAULTS OF TANK 48 DEMISTER	3.6E-6	1	3.15E-02	5.68E-04
8HOUSE02	NO ACTION TAKEN FOR 48 HOURS		1	1.00E+00	
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
68) 8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	5.52E-04
8VSVACHW*	TANK 48 VACUUM SENSOR FAILS AND CLOSES FAN FLOW CONTROL VALVES	3.5E-6	1	3.07E-02	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
69) 8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	5.52E-04
8VSVACHW*	TANK 48 VACUUM SENSOR FAILS AND CLOSES FAN FLOW CONTROL VALVES	3.5E-6	1	3.07E-02	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
70) 8CNCONHW*	LOCAL FAULTS OF TANK 48 CONDENSER	3.0E-6	1	2.63E-02	4.73E-04
8HOUSE02	NO ACTION TAKEN FOR 48 HOURS		1	1.00E+00	
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
71) 8CNCONHW*	LOCAL FAULTS OF TANK 48 CONDENSER	3.0E-6	1	2.63E-02	4.73E-04
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
8HOUSE02	NO ACTION TAKEN FOR 48 HOURS		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
72) 8FLHP2HW*	LOCAL FAULT OF HEPA FILTER 2	1.0E-6	1	8.76E-03	4.73E-04
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
73) 8FSNFAHW*	TANK 48 NITROGEN FLOW SENSOR FOR LINE A FAILS DUE TO LOCAL FAULTS	1.2E-4	2	2.10E+00	7.55E-04
8FSNFBHW	TANK 48 NITROGEN FLOW SENSOR FOR LINE B FAILS DUE TO LOCAL FAULTS	1.2E-4	7	2.00E-02	
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
8OPC-HS	OPERATOR FAILS TO ENTER FIELD CONTROL MODE (HIGH STRESS LEVELS)		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
74) 8FSNFAHW*	TANK 48 NITROGEN FLOW SENSOR FOR LINE A FAILS DUE TO LOCAL FAULTS	1.2E-4	2	2.10E+00	7.55E-04
8FSNFBHW	TANK 48 NITROGEN FLOW SENSOR FOR LINE B FAILS DUE TO LOCAL FAULTS	1.2E-4	7	2.00E-02	
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
8OPC-HS	OPERATOR FAILS TO ENTER FIELD CONTROL MODE (HIGH STRESS LEVELS)		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
75) 8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	3.47E-04
8PRREGHW*	TANK 48 FAILURE OF PRESSURE REGULATING VALVE 1217PV	2.2E-6	1	1.93E-02	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
76) 8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	3.47E-04
8PRREGHW*	TANK 48 FAILURE OF PRESSURE REGULATING VALVE 1217PV	2.2E-6	1	1.93E-02	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
77) 8AZO21HW*	TANK 48 O2 ANALYZER 1 HARDWARE FAULTS	3.0E-4	2	5.26E+00	3.41E-04
8AZO22TM	TANK 48 O2 ANALYZER 2 UNAVAILABLE DUE TO MAINTENANCE	1.8E-3	2	3.60E-03	
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
78) 8AZO21HW*	TANK 48 O2 ANALYZER 1 HARDWARE FAULTS	3.0E-4	2	5.26E+00	3.41E-04
8AZO22TM	TANK 48 O2 ANALYZER 2 UNAVAILABLE DUE TO MAINTENANCE	1.8E-3	2	3.60E-03	
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
79) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	3.23E-04
NOPTRNBS	OPERATOR FAILS TO ALIGN TRAIN B FOR OPERATION - SUPPLY SIDE		1	1.00E+00	
NVPVPAHW*	FAILURE OF VAPORIZER A DUE TO HARDWARE FAULTS	4.1E-7	1	3.59E-03	
80) 8FLHP2HW*	LOCAL FAULT OF HEPA FILTER 2	1.0E-6	1	8.76E-03	1.58E-04
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
81) 8FLHP2HW*	LOCAL FAULT OF HEPA FILTER 2	1.0E-6	1	8.76E-03	1.58E-04
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
82) 9FC121HW*	MECHANICAL FAULT OF TANK 49 FLOW CONTROL VALVE 1251FV	8.5E-6	2	1.49E-01	9.65E-05
9PRPV2TM	TANK 49 PRESSURE REGULATING VALVE 1255PV2 UNAVAILABLE DUE TO MAINT	3.6E-3	2	7.20E-03	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
83) 9FC121HW*	MECHANICAL FAULT OF TANK 49 FLOW CONTROL VALVE 1251FV	8.5E-6	2	1.49E-01	9.65E-05
9FC122TM	TANK 49 FLOW CONTROL VALVE 1252FV UNAVAILABLE DUE TO MAINTENANCE	3.6E-3	2	7.20E-03	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
84) 9FC511HW	FLOW CONTROL VALVE 1251PV1 MECHANICAL FAULT	8.5E-6	3	9.18E-03	6.15E-05
9FC512HW*	FLOW CONTROL VALVE 1251PV2 MECHANICAL FAULT	8.5E-6	1	7.45E-02	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
85) 8FC121HW*	MECHANICAL FAULT OF TANK 48 FLOW CONTROL VALVE 1201FV	8.5E-6	2	1.49E-01	5.79E-05
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
8PRPV2TM	TANK 48 PRESSURE REGULATING VALVE 1205PV2 UNAVAILABLE DUE TO MAINT	3.6E-3	2	7.20E-03	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
86) 8FC121HW*	MECHANICAL FAULT OF TANK 48 FLOW CONTROL VALVE 1201FV	8.5E-6	2	1.49E-01	5.79E-05
8FC122TM	TANK 48 FLOW CONTROL VALVE 1202FV UNAVAILABLE DUE TO MAINTENANCE	3.6E-3	2	7.20E-03	
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
87) 9FC511HW	FLOW CONTROL VALVE 1251PV1 MECHANICAL FAULT	8.5E-6	3	9.18E-03	5.79E-05
9FN512HW*	TANK 49 EXHAUST FAN Y349-52-12 FAILS TO RUN DUE TO MECHANICAL FAUL	8.0E-6	1	7.01E-02	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
88) 9FC511TM	FLOW CONTROL VALVE 1251PV1 MAINTENANCE	3.6E-3	2	7.20E-03	4.83E-05
9FC512HW*	FLOW CONTROL VALVE 1251PV2 MECHANICAL FAULT	8.5E-6	1	7.45E-02	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
89) 9FC511TM	FLOW CONTROL VALVE 1251PV1 MAINTENANCE	3.6E-3	2	7.20E-03	4.54E-05
9FN512HW*	TANK 49 EXHAUST FAN Y349-52-12 FAILS TO RUN DUE TO MECHANICAL FAUL	8.0E-6	1	7.01E-02	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
90) 8FC111HW	FLOW CONTROL VALVE 1211PV1 MECHANICAL FAULT (MODE C)	8.5E-6	3	9.18E-03	3.69E-05
8FC112HW*	FLOW CONTROL VALVE 1211PV2 MECHANICAL FAULT	8.5E-6	1	7.45E-02	
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
91) 8FC111HW	FLOW CONTROL VALVE 1211PV1 MECHANICAL FAULT (MODE C)	8.5E-6	3	9.18E-03	3.47E-05
8FN528HW*	TANK 48 EXHAUST FAN Y348-52-8 FAILS TO RUN DUE TO MECHANICAL FAULT	8.0E-6	1	7.01E-02	
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
92) 8FC111TM	FLOW CONTROL VALVE 1211PV1 MAINTENANCE	3.6E-3	2	7.20E-03	2.90E-05
8FC112HW*	FLOW CONTROL VALVE 1211PV2 MECHANICAL FAULT	8.5E-6	1	7.45E-02	
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
93) 8FC111TM	FLOW CONTROL VALVE 1211PV1 MAINTENANCE	3.6E-3	2	7.20E-03	2.72E-05
8FN528HW*	TANK 48 EXHAUST FAN Y348-52-8 FAILS TO RUN DUE TO MECHANICAL FAULT	8.0E-6	1	7.01E-02	
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
94) 9FC122TM	TANK 49 FLOW CONTROL VALVE 1252FV UNAVAILABLE DUE TO MAINTENANCE	3.6E-3	2	7.20E-03	2.50E-05
9PRPV1HW*	MECHANICAL FAULTS OF TANK 49 PRESSURE REGULATING VALVE 1255PV1	2.2E-6	2	3.85E-02	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
95) 9PRPV1HW*	MECHANICAL FAULTS OF TANK 49 PRESSURE REGULATING VALVE 1255PV1	2.2E-6	2	3.85E-02	2.50E-05
9PRPV2TM	TANK 49 PRESSURE REGULATING VALVE 1255PV2 UNAVAILABLE DUE TO MAINT	3.6E-3	2	7.20E-03	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
96) 9FC512HW*	FLOW CONTROL VALVE 1251PV2 MECHANICAL FAULT	8.5E-6	1	7.45E-02	2.41E-05
9FN511TM	TANK 49 EXHAUST FAN Y349-52-11 UNAVAILABLE DUE TO MAINTENANCE	1.8E-3	2	3.60E-03	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
97) 9FN511TM	TANK 49 EXHAUST FAN Y349-52-11 UNAVAILABLE DUE TO MAINTENANCE	1.8E-3	2	3.60E-03	2.27E-05
9FN512HW*	TANK 49 EXHAUST FAN Y349-52-12 FAILS TO RUN DUE TO MECHANICAL FAUL	8.0E-6	1	7.01E-02	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
98) 8FC121HW*	MECHANICAL FAULT OF TANK 48 FLOW CONTROL VALVE 1201FV	8.5E-6	2	1.49E-01	1.93E-05
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
8PRPV2TM	TANK 48 PRESSURE REGULATING VALVE 1205PV2 UNAVAILABLE DUE TO MAINT	3.6E-3	2	7.20E-03	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
99) 8FC121HW*	MECHANICAL FAULT OF TANK 48 FLOW CONTROL VALVE 1201FV	8.5E-6	2	1.49E-01	1.93E-05
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
8PRPV2TM	TANK 48 PRESSURE REGULATING VALVE 1205PV2 UNAVAILABLE DUE TO MAINT	3.6E-3	2	7.20E-03	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
100) 8FC121HW*	MECHANICAL FAULT OF TANK 48 FLOW CONTROL VALVE 1201FV	8.5E-6	2	1.49E-01	1.93E-05
8FC122TM	TANK 48 FLOW CONTROL VALVE 1202FV UNAVAILABLE DUE TO MAINTENANCE	3.6E-3	2	7.20E-03	
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
101) 8FC121HW*	MECHANICAL FAULT OF TANK 48 FLOW CONTROL VALVE 1201FV	8.5E-6	2	1.49E-01	1.93E-05
8FC122TM	TANK 48 FLOW CONTROL VALVE 1202FV UNAVAILABLE DUE TO MAINTENANCE	3.6E-3	2	7.20E-03	
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
102) 9FC121HW*	MECHANICAL FAULT OF TANK 49 FLOW CONTROL VALVE 1251FV	8.5E-6	2	1.49E-01	1.91E-05
9FC122HW	MECHANICAL FAULT OF TANK 49 FLOW CONTROL VALVE 1252FV	8.5E-6	7	1.43E-03	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
103) 9HOUSE02	NO ACTION TAKEN FOR 48 HRS		1	1.00E+00	1.58E-05
9HTHTRHW*	LOCAL MECHANICAL FAULTS OF TANK 49 HEATER	2.0E-8	1	1.75E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
104) 8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	1.50E-05
8PRPV1HW*	MECHANICAL FAULTS OF TANK 48 PRESSURE REGULATING VALVE 1205PV1	2.2E-6	2	3.85E-02	
8PRPV2TM	TANK 48 PRESSURE REGULATING VALVE 1205PV2 UNAVAILABLE DUE TO MAINT	3.6E-3	2	7.20E-03	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
105) 8FC122TM	TANK 48 FLOW CONTROL VALVE 1202FV UNAVAILABLE DUE TO MAINTENANCE	3.6E-3	2	7.20E-03	1.50E-05
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
8PRPV1HW*	MECHANICAL FAULTS OF TANK 48 PRESSURE REGULATING VALVE 1205PV1	2.2E-6	2	3.85E-02	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
106) 8FC112HW*	IGNITION FLOW CONTROL VALVE 1211PV2 MECHANICAL FAULT	8.5E-6	.09 1	9.00E-02 7.45E-02	1.45E-05
8FN527TM	TANK 48 EXHAUST FAN Y348-52-7 UNAVAILABLE DUE TO MAINTENANCE	1.8E-3	2	3.60E-03	
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
107) 8FN527TM	TANK 48 EXHAUST FAN Y348-52-7 UNAVAILABLE DUE TO MAINTENANCE	1.8E-3	2	3.60E-03	1.36E-05
8FN528HW*	TANK 48 EXHAUST FAN Y348-52-8 FAILS TO RUN DUE TO MECHANICAL FAULT	8.0E-6	1	7.01E-02	
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
108) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	1.25E-05
NPR245TM	PRESSURE REGULATING VALVE 2045PV MAINTENANCE	3.6E-3	2	7.20E-03	
NPR246HW*	PRESSURE REGULATING VALVE 2046PV FAILS	2.2E-6	1	1.93E-02	
109) 8FC111HW	FLOW CONTROL VALVE 1211PV1 MECHANICAL FAULT (MODE C)	8.5E-6	3	9.18E-03	1.23E-05
8FC112HW*	FLOW CONTROL VALVE 1211PV2 MECHANICAL FAULT	8.5E-6	1	7.45E-02	
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
110) 8FC111HW	FLOW CONTROL VALVE 1211PV1 MECHANICAL FAULT (MODE C)	8.5E-6	3	9.18E-03	1.23E-05
8FC112HW*	FLOW CONTROL VALVE 1211PV2 MECHANICAL FAULT	8.5E-6	1	7.45E-02	
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
111) 8FC111HW	FLOW CONTROL VALVE 1211PV1 MECHANICAL FAULT (MODE C)	8.5E-6	3	9.18E-03	1.16E-05
8FN528HW*	TANK 48 EXHAUST FAN Y348-52-8 FAILS TO RUN DUE TO MECHANICAL FAULT	8.0E-6	1	7.01E-02	
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
112) 8FC111HW	FLOW CONTROL VALVE 1211PV1 MECHANICAL FAULT (MODE C)	8.5E-6	3	9.18E-03	1.16E-05
8FN528HW*	TANK 48 EXHAUST FAN Y348-52-8 FAILS TO RUN DUE TO MECHANICAL FAULT	8.0E-6	1	7.01E-02	
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
113) 8FC121HW*	MECHANICAL FAULT OF TANK 48 FLOW CONTROL VALVE 1201FV	8.5E-6	2	1.49E-01	1.15E-05
8FC122HW	MECHANICAL FAULT OF TANK 48 FLOW CONTROL VALVE 1202FV	8.5E-6	7	1.43E-03	
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
114) 9OPTRNBE	OPERATOR FAILS TO ALIGN AND START TRAIN B FOR OPERATION - EXHAUST		1	1.00E+00	1.10E-05
9XVV22PG*	MANUAL VALVE T49-HV22 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
115) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	1.10E-05
NXVN12PG*	VALVE N12 FROM THE NITROGEN SUPPLY FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
116) 9OPTRNBE	OPERATOR FAILS TO ALIGN AND START TRAIN B FOR OPERATION - EXHAUST		1	1.00E+00	1.10E-05
9XVV20PG*	MANUAL VALVE T49-HV20 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
117) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	1.10E-05
NOPTRNBS	OPERATOR FAILS TO ALIGN TRAIN B FOR OPERATION - SUPPLY SIDE		1	1.00E+00	
NXVN20PG*	PATH A OUTLET VALVE N20 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
118) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	1.10E-05
NOPTRNBS	OPERATOR FAILS TO ALIGN TRAIN B FOR OPERATION - SUPPLY SIDE		1	1.00E+00	
NXVN24PG*	PATH A INLET VALVE N24 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
119) 9XVV33PG*	MANUAL VALVE T49-HV33 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	1.10E-05
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
120) 9XVV17PG*	MANUAL VALVE T49-HV17 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	1.10E-05
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
121) 9XVN24PG*	TANK 49 TANK INLET VALVE T49-N24 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	1.10E-05
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
122) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	1.10E-05
NOPTRNBS	OPERATOR FAILS TO ALIGN TRAIN B FOR OPERATION - SUPPLY SIDE		1	1.00E+00	
NXVN46PG*	MANUAL VALVE N46 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
123) 9XVHV9PG*	TANK 49 O2 ANALYZER DISCHARGE VALVE T49-HV9 FAILS TO REMAIN OPEN (	1.4E-8	1	1.23E-04	1.10E-05
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
124) 9XVHV2PG*	MANUAL VALVE T49-HV2 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	1.10E-05
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
125) 9XVN10PG*	MANUAL VALVE T49-N10 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	1.10E-05
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
126) 9XVV15PG*	MANUAL VALVE T49-HV15 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	1.10E-05
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
127) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	1.10E-05
NOPTRNBS	OPERATOR FAILS TO ALIGN TRAIN B FOR OPERATION - SUPPLY SIDE		1	1.00E+00	
NXVN26PG*	MANUAL VALVE N26 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
128) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	1.10E-05
NOPTRNBS	OPERATOR FAILS TO ALIGN TRAIN B FOR OPERATION - SUPPLY SIDE		1	1.00E+00	
NXV032PG*	MANUAL VALVE N32 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
129) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	1.10E-05
NXVN92PG*	MANUAL VALVE N92 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
130) 8FC111TM	FLOW CONTROL VALVE 1211PV1 MAINTENANCE	3.6E-3	2	7.20E-03	9.65E-06
8FC112HW*	FLOW CONTROL VALVE 1211PV2 MECHANICAL FAULT	8.5E-6	1	7.45E-02	
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
131) 8FC111TM	FLOW CONTROL VALVE 1211PV1 MAINTENANCE	3.6E-3	2	7.20E-03	9.65E-06
8FC112HW*	FLOW CONTROL VALVE 1211PV2 MECHANICAL FAULT	8.5E-6	1	7.45E-02	
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
132) 8HOUSE02	NO ACTION TAKEN FOR 48 HOURS		1	1.00E+00	9.46E-06
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
8HTHTRHW*	LOCAL MECHANICAL FAULTS OF TANK 48 HEATER	2.0E-8	1	1.75E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
133) 8FC111TM	FLOW CONTROL VALVE 1211PV1 MAINTENANCE	3.6E-3	2	7.20E-03	9.08E-06
8FN528HW*	TANK 48 EXHAUST FAN Y348-52-8 FAILS TO RUN DUE TO MECHANICAL FAULT	8.0E-6	1	7.01E-02	
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
134) 8FC111TM	FLOW CONTROL VALVE 1211PV1 MAINTENANCE	3.6E-3	2	7.20E-03	9.08E-06
8FN528HW*	TANK 48 EXHAUST FAN Y348-52-8 FAILS TO RUN DUE TO MECHANICAL FAULT	8.0E-6	1	7.01E-02	
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
135) 9FC512HW*	FLOW CONTROL VALVE 1251PV2 MECHANICAL FAULT	8.5E-6	1	7.45E-02	9.00E-06

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
9FN511HW	TANK 49 EXHAUST FAN Y349-52-11 FAILS TO RUN DUE TO MECHANICAL FAUL	8.0E-6	7	1.34E-03	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
136) 9FN511HW	TANK 49 EXHAUST FAN Y349-52-11 FAILS TO RUN DUE TO MECHANICAL FAUL	8.0E-6	7	1.34E-03	8.47E-06
9FN512HW*	TANK 49 EXHAUST FAN Y349-52-12 FAILS TO RUN DUE TO MECHANICAL FAUL	8.0E-6	1	7.01E-02	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
137) 8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	6.62E-06
8XVV15PG*	MANUAL VALVE T48-HV15 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
138) 8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	6.62E-06
8XVV17PG*	MANUAL VALVE T48-HV17 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
139) 8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	6.62E-06
8XVHV9PG*	TANK 48 O2 ANALYZER DISCHARGE VALVE T48-HV9 FAILS TO REMAIN OPEN (	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
140) 8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	6.62E-06
8XVHV2PG*	MANUAL VALVE T48-HV2 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
141) 8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	6.62E-06
8XVN31PG*	TANK 48 TANK INLET VALVE T48-N31 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
142) 8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	6.62E-06
8XV8N2PG*	TANK 48 VALVE T48-N2 FROM THE NITROGEN SUPPLY FAILS TO REMAIN OPEN	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
143) 8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	6.62E-06
8XVV33PG*	MANUAL VALVE T48-HV33 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
144) 8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	6.62E-06
8OPTRNBE	OPERATOR FAILS TO ALIGN AND START TRAIN B FOR OPERATION - EXHAUST		1	1.00E+00	
8XVV20PG*	MANUAL VALVE T48-HV20 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
145) 8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	6.62E-06
8OPTRNBE	OPERATOR FAILS TO ALIGN AND START TRAIN B FOR OPERATION - EXHAUST		1	1.00E+00	
8XVV22PG*	MANUAL VALVE T48-HV22 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
146) 8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	6.62E-06
8XVV22PG*	MANUAL VALVE T48-HV22 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
147) 8FC112HW*	PRESSURE REGULATING VALVE 2046PV FAILS	2.2E-6	1	1.93E-02	
8FN527HW	FAILURE OF VAPORIZER B DUE TO HARDWARE FAULTS	4.1E-7	7	6.89E-05	
8FC112HW*	FLOW CONTROL VALVE 1211PV2 MECHANICAL FAULT	8.5E-6	1	7.45E-02	5.40E-06
8FN527HW	TANK 48 EXHAUST FAN Y348-52-7 FAILS TO RUN FOR 6 DAYS	8.0E-6	7	1.34E-03	
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
148) 8FN527HW	TANK 48 EXHAUST FAN Y348-52-7 FAILS TO RUN FOR 6 DAYS	8.0E-6	7	1.34E-03	5.08E-06
8FN528HW*	TANK 48 EXHAUST FAN Y348-52-8 FAILS TO RUN DUE TO MECHANICAL FAULT	8.0E-6	1	7.01E-02	
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
149) 8FC122TM	TANK 48 FLOW CONTROL VALVE 1202FV UNAVAILABLE DUE TO MAINTENANCE	3.6E-3	2	7.20E-03	5.00E-06

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
8PRPV1HW*	MECHANICAL FAULTS OF TANK 48 PRESSURE REGULATING VALVE 1205PV1	2.2E-6	2	3.85E-02	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
150) 8FC122TM	TANK 48 FLOW CONTROL VALVE 1202FV UNAVAILABLE DUE TO MAINTENANCE	3.6E-3	2	7.20E-03	5.00E-06
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
8PRPV1HW*	MECHANICAL FAULTS OF TANK 48 PRESSURE REGULATING VALVE 1205PV1	2.2E-6	2	3.85E-02	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
151) 8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	5.00E-06
8PRPV1HW*	MECHANICAL FAULTS OF TANK 48 PRESSURE REGULATING VALVE 1205PV1	2.2E-6	2	3.85E-02	
8PRPV2TM	TANK 48 PRESSURE REGULATING VALVE 1205PV2 UNAVAILABLE DUE TO MAINT	3.6E-3	2	7.20E-03	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
152) 8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	5.00E-06
8PRPV1HW*	MECHANICAL FAULTS OF TANK 48 PRESSURE REGULATING VALVE 1205PV1	2.2E-6	2	3.85E-02	
8PRPV2TM	TANK 48 PRESSURE REGULATING VALVE 1205PV2 UNAVAILABLE DUE TO MAINT	3.6E-3	2	7.20E-03	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
153) 9FC122HW	MECHANICAL FAULT OF TANK 49 FLOW CONTROL VALVE 1252FV	8.5E-6	7	1.43E-03	4.95E-06
9PRPV1HW*	MECHANICAL FAULTS OF TANK 49 PRESSURE REGULATING VALVE 1255PV1	2.2E-6	2	3.85E-02	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
154) 9FC121HW*	MECHANICAL FAULT OF TANK 49 FLOW CONTROL VALVE 1251FV	8.5E-6	2	1.49E-01	4.95E-06
9PRPV2HW	MECHANICAL FAULTS OF TANK 49 PRESSURE REGULATING VALVE 1255PV2	2.2E-6	7	3.70E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
155) 8FC112HW*	FLOW CONTROL VALVE 1211PV2 MECHANICAL FAULT	8.5E-6	1	7.45E-02	4.83E-06
8FN527TM	TANK 48 EXHAUST FAN Y348-52-7 UNAVAILABLE DUE TO MAINTENANCE	1.8E-3	2	3.60E-03	
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
156) 8FC112HW*	FLOW CONTROL VALVE 1211PV2 MECHANICAL FAULT	8.5E-6	1	7.45E-02	4.83E-06
8FN527TM	TANK 48 EXHAUST FAN Y348-52-7 UNAVAILABLE DUE TO MAINTENANCE	1.8E-3	2	3.60E-03	
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
157) 8FN527TM	TANK 48 EXHAUST FAN Y348-52-7 UNAVAILABLE DUE TO MAINTENANCE	1.8E-3	2	3.60E-03	4.54E-06
8FN528HW*	TANK 48 EXHAUST FAN Y348-52-8 FAILS TO RUN DUE TO MECHANICAL FAULT	8.0E-6	1	7.01E-02	
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
158) 8FN527TM	TANK 48 EXHAUST FAN Y348-52-7 UNAVAILABLE DUE TO MAINTENANCE	1.8E-3	2	3.60E-03	4.54E-06
8FN528HW*	TANK 48 EXHAUST FAN Y348-52-8 FAILS TO RUN DUE TO MECHANICAL FAULT	8.0E-6	1	7.01E-02	
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
159) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	4.12E-06
NPR245HW	PRESSURE REGULATING VALVE 2045PV FAILS	2.2E-6	3	2.38E-03	
NPR246HW*	PRESSURE REGULATING VALVE 2046PV FAILS	2.2E-6	1	1.93E-02	
160) 8FC121HW*	MECHANICAL FAULT OF TANK 48 FLOW CONTROL VALVE 1201FV	8.5E-6	2	1.49E-01	3.83E-06
8FC122HW	MECHANICAL FAULT OF TANK 48 FLOW CONTROL VALVE 1202FV	8.5E-6	7	1.43E-03	
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
161) 8FC121HW*	MECHANICAL FAULT OF TANK 48 FLOW CONTROL VALVE 1201FV	8.5E-6	2	1.49E-01	3.83E-06
8FC122HW	MECHANICAL FAULT OF TANK 48 FLOW CONTROL VALVE 1202FV	8.5E-6	7	1.43E-03	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
162) 9FC512HW*	FLOW CONTROL VALVE 1251PV2 MECHANICAL FAULT	8.5E-6	1	7.45E-02	3.22E-06
9FN511ST	TANK 49 EXHAUST FAN Y349-52-11 FAILS TO START DUE TO MECHANICAL FA	4.8E-4	1	4.80E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
163) 8HOUSE02	NO ACTION TAKEN FOR 48 HOURS		1	1.00E+00	3.15E-06
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
8HTHTRHW*	LOCAL MECHANICAL FAULTS OF TANK 48 HEATER	2.0E-8	1	1.75E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
164) 8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	3.15E-06
8HOUSE02	NO ACTION TAKEN FOR 48 HOURS		1	1.00E+00	
8HTHTRHW*	LOCAL MECHANICAL FAULTS OF TANK 48 HEATER	2.0E-8	1	1.75E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
165) 9FN511ST	TANK 49 EXHAUST FAN Y349-52-11 FAILS TO START DUE TO MECHANICAL FA	4.8E-4	1	4.80E-04	3.03E-06
9FN512HW*	TANK 49 EXHAUST FAN Y349-52-12 FAILS TO RUN DUE TO MECHANICAL FAUL	8.0E-6	1	7.01E-02	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
166) 8FC122HW	MECHANICAL FAULT OF TANK 48 FLOW CONTROL VALVE 1202FV	8.5E-6	7	1.43E-03	2.97E-06
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
8PRPV1HW*	MECHANICAL FAULTS OF TANK 48 PRESSURE REGULATING VALVE 1205PV1	2.2E-6	2	3.85E-02	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SCURCE PRESENT		.09	9.00E-02	
167) 8FC121HW*	MECHANICAL FAULT OF TANK 48 FLOW CONTROL VALVE 1201FV	8.5E-6	2	1.49E-01	2.97E-06
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
8PRPV2HW	MECHANICAL FAULTS OF TANK 48 PRESSURE REGULATING VALVE 1205PV2	2.2E-6	7	3.70E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
168) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	2.33E-06
NPR245TM	PRESSURE REGULATING VALVE 2045PV MAINTENANCE	3.6E-3	2	7.20E-03	
NVPVPAHW*	FAILURE OF VAPORIZER A DUE TO HARDWARE FAULTS	4.1E-7	1	3.59E-03	
169) 8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	2.21E-06
8XVV33PG*	MANUAL VALVE T48-HV33 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
170) 8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	2.21E-06
8XV8N2PG*	TANK 48 VALVE T48-N2 FROM THE NITROGEN SUPPLY FAILS TO REMAIN OPEN	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
171) 8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	2.21E-06
8XVV15PG*	MANUAL VALVE T48-HV15 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
172) 8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	2.21E-06
8XVV15PG*	MANUAL VALVE T48-HV15 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
173) 8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	2.21E-06
8XVV17PG*	MANUAL VALVE T48-HV17 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
174) 8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	2.21E-06
8XVN31PG*	TANK 48 TANK INLET VALVE T48-N31 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
175) 8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	2.21E-06

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
8XVN31PG*	TANK 48 TANK INLET VALVE T48-N31 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
176) 8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	2.21E-06
8XVHV2PG*	MANUAL VALVE T48-HV2 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
177) 8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	2.21E-06
8XVHV9PG*	TANK 48 O2 ANALYZER DISCHARGE VALVE T48-HV9 FAILS TO REMAIN OPEN (	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
178) 8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	2.21E-06
8OPTRNBE	OPERATOR FAILS TO ALIGN AND START TRAIN B FOR OPERATION - EXHAUST		1	1.00E+00	
8XVV22PG*	MANUAL VALVE T48-HV22 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
179) 8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	2.21E-06
8XV8N2PG*	TANK 48 VALVE T48-N2 FROM THE NITROGEN SUPPLY FAILS TO REMAIN OPEN	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
180) 8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	2.21E-06
8XVHV2PG*	MANUAL VALVE T48-HV2 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
181) 8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	2.21E-06
8XVHV9PG*	TANK 48 O2 ANALYZER DISCHARGE VALVE T48-HV9 FAILS TO REMAIN OPEN (	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
182) 8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	2.21E-06
8XVV17PG*	MANUAL VALVE T48-HV17 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
183) 8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	2.21E-06
8OPTRNBE	OPERATOR FAILS TO ALIGN AND START TRAIN B FOR OPERATION - EXHAUST		1	1.00E+00	
8XVV20PG*	MANUAL VALVE T48-HV20 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
184) 8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	2.21E-06
8XVV33PG*	MANUAL VALVE T48-HV33 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
185) 8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	2.21E-06
8OPTRNBE	OPERATOR FAILS TO ALIGN AND START TRAIN B FOR OPERATION - EXHAUST		1	1.00E+00	
8XVV20PG*	MANUAL VALVE T48-HV20 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
186) 8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	2.21E-06
8OPTRNBE	OPERATOR FAILS TO ALIGN AND START TRAIN B FOR OPERATION - EXHAUST		1	1.00E+00	
8XVV22PG*	MANUAL VALVE T48-HV22 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
187) 8FC112HW*	FLOW CONTROL VALVE 1211PV2 MECHANICAL FAULT	8.5E-6	1	7.45E-02	1.93E-06
8FN527ST	TANK 48 EXHAUST FAN Y348-52-7 FAILS TO START DUE TO MECHANICAL FAU	4.8E-4	1	4.80E-04	
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
188) 8FN527ST	TANK 48 EXHAUST FAN Y348-52-7 FAILS TO START DUE TO MECHANICAL FAU	4.8E-4	1	4.80E-04	1.82E-06
8FN528HW*	TANK 48 EXHAUST FAN Y348-52-8 FAILS TO RUN DUE TO MECHANICAL FAULT	8.0E-6	1	7.01E-02	
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
	IGNITION		.09	9.00E-02	
189) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	1.81E-06
NTKTKAHW*	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT	2.3E-9	1	2.01E-05	
190) 8FC112HW*	NITROGEN STORAGE TANK 1 LEAKS	8.5E-6	1	7.45E-02	1.80E-06
8FN527HW	FLOW CONTROL VALVE 1211PV2 MECHANICAL FAULT	8.0E-6	7	1.34E-03	
8HOUSE01	TANK 48 EXHAUST FAN Y348-52-7 FAILS TO RUN FOR 6 DAYS		.2	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.09	9.00E-02	
191) 8FC112HW*	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT	8.5E-6	1	7.45E-02	1.80E-06
8FN527HW	FLOW CONTROL VALVE 1211PV2 MECHANICAL FAULT	8.0E-6	7	1.34E-03	
8HOUSE03	TANK 48 EXHAUST FAN Y348-52-7 FAILS TO RUN FOR 6 DAYS		.20	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.09	9.00E-02	
192) 8FN527HW	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT	8.0E-6	7	1.34E-03	1.69E-06
8FN528HW*	TANK 48 EXHAUST FAN Y348-52-7 FAILS TO RUN FOR 6 DAYS	8.0E-6	1	7.01E-02	
8HOUSE01	TANK 48 EXHAUST FAN Y348-52-8 FAILS TO RUN DUE TO MECHANICAL FAULT		.2	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.09	9.00E-02	
193) 8FN527HW	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT	8.0E-6	7	1.34E-03	1.69E-06
8FN528HW*	TANK 48 EXHAUST FAN Y348-52-7 FAILS TO RUN FOR 6 DAYS	8.0E-6	1	7.01E-02	
8HOUSE03	TANK 48 EXHAUST FAN Y348-52-8 FAILS TO RUN DUE TO MECHANICAL FAULT		.20	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.09	9.00E-02	
194) 9PRPV1HW*	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT	2.2E-6	2	3.85E-02	1.28E-06
9PRPV2HW	MECHANICAL FAULTS OF TANK 49 PRESSURE REGULATING VALVE 1255PV1	2.2E-6	7	3.70E-04	
IGNITION	MECHANICAL FAULTS OF TANK 49 PRESSURE REGULATING VALVE 1255PV2		.09	9.00E-02	
195) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	2.23E-08
NVPVPAHW*	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT	4.1E-7	1	3.59E-03	
NVPVPBHW	FAILURE OF VAPORIZER A DUE TO HARDWARE FAULTS	4.1E-7	7	6.89E-05	
196) 9AZO21HW*	FAILURE OF VAPORIZER B DUE TO HARDWARE FAULTS	3.0E-4	2	5.26E+00	1.11E-06
9XVV11PG	TANK 49 O2 ANALYZER 1 HARDWARE FAULTS	1.4E-8	7	2.35E-06	
IGNITION	MANUAL VALVE T49-HV11 FAILS TO REMAIN OPEN (PLUG)		.09	9.00E-02	
197) 9AZO21HW*	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT	3.0E-4	2	5.26E+00	1.11E-06
9XVHV4PG	TANK 49 O2 ANALYZER 1 HARDWARE FAULTS	1.4E-8	7	2.35E-06	
IGNITION	MANUAL VALVE T49-HV4 FAILS TO REMAIN OPEN (PLUG)		.09	9.00E-02	
198) 9AZO22HW	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT	3.0E-4	7	4.92E-02	1.09E-06
9XVV10PG*	TANK 49 O2 ANALYZER 2 HARDWARE FAULTS	1.4E-8	2	2.45E-04	
IGNITION	MANUAL VALVE T49-HV10 FAILS TO REMAIN OPEN (PLUG)		.09	9.00E-02	
199) 9AZO22HW	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT	3.0E-4	7	4.92E-02	1.09E-06
9XVHV3PG*	TANK 49 O2 ANALYZER 2 HARDWARE FAULTS	1.4E-8	2	2.45E-04	
IGNITION	MANUAL VALVE T49-HV3 FAILS TO REMAIN OPEN (PLUG)		.09	9.00E-02	
200) 9FC512HW*	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT	8.5E-6	1	7.45E-02	1.07E-06
9XVV19HW	FLOW CONTROL VALVE 1251PV2 MECHANICAL FAULT	1.6E-4	1	1.60E-04	
IGNITION	MANUAL VALVE T49-HV19 FAILS TO OPEN ON DEMAND		.09	9.00E-02	
201) 9FN512HW*	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT	8.0E-6	1	7.01E-02	1.01E-06
9XVV19HW	TANK 49 EXHAUST FAN Y349-52-12 FAILS TO RUN DUE TO MECHANICAL FAUL	1.6E-4	1	1.60E-04	
IGNITION	MANUAL VALVE T49-HV19 FAILS TO OPEN ON DEMAND		.09	9.00E-02	
202) 8FC122HW	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT	8.5E-6	7	1.43E-03	9.90E-07
8HOUSE01	MECHANICAL FAULT OF TANK 48 FLOW CONTROL VALVE 1202FV		.2	2.00E-01	
8PRPV1HW*	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)	2.2E-6	2	3.85E-02	
	MECHANICAL FAULTS OF TANK 48 PRESSURE REGULATING VALVE 1205PV1				

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
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	IGNITION		.09	9.00E-02	
203) 8FC122HW	MECHANICAL FAULT OF TANK 48 FLOW CONTROL VALVE 1202FV	8.5E-6	7	1.43E-03	9.90E-07
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
8PRPV1HW*	MECHANICAL FAULTS OF TANK 48 PRESSURE REGULATING VALVE 1205PV1	2.2E-6	2	3.85E-02	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
204) 8FC121HW*	MECHANICAL FAULT OF TANK 48 FLOW CONTROL VALVE 1201FV	8.5E-6	2	1.49E-01	9.91E-07
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
8PRPV2HW	MECHANICAL FAULTS OF TANK 48 PRESSURE REGULATING VALVE 1205PV2	2.2E-6	7	3.70E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
205) 8FC121HW*	MECHANICAL FAULT OF TANK 48 FLOW CONTROL VALVE 1201FV	8.5E-6	2	1.49E-01	9.91E-07
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
8PRPV2HW	MECHANICAL FAULTS OF TANK 48 PRESSURE REGULATING VALVE 1205PV2	2.2E-6	7	3.70E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
206) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	7.88E-07
NPPNONBK*	NON-ISOLABLE GUILLOTINE PIPE BREAK	1.0E-9	1	8.76E-06	
207) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	7.88E-07
NPPDIVBK*	ISOLABLE GUILLOTINE PIPE BREAK	1.0E-9	1	8.76E-06	
208) 8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	7.69E-07
8PRPV1HW*	MECHANICAL FAULTS OF TANK 48 PRESSURE REGULATING VALVE 1205PV1	2.2E-6	2	3.85E-02	
8PRPV2HW	MECHANICAL FAULTS OF TANK 48 PRESSURE REGULATING VALVE 1205PV2	2.2E-6	7	3.70E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
209) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	7.68E-07
NPR245HW	PRESSURE REGULATING VALVE 2045PV FAILS	2.2E-6	3	2.38E-03	
NVPVPAHW*	FAILURE OF VAPORIZER A DUE TO HARDWARE FAULTS	4.1E-7	1	3.59E-03	
210) 8AZO21HW*	TANK 48 O2 ANALYZER 1 HARDWARE FAULTS	3.0E-4	2	5.26E+00	6.68E-07
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
8XVV11PGA	MANUAL VALVE T48-HV11 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	7	2.35E-06	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
211) 8AZO21HW*	TANK 48 O2 ANALYZER 1 HARDWARE FAULTS	3.0E-4	2	5.26E+00	6.68E-07
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
8XVHV4PGA	MANUAL VALVE T48-HV4 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	7	2.35E-06	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
212) 8AZO22HWA	TANK 48 O2 ANALYZER 2 HARDWARE FAULTS	3.0E-4	7	4.92E-02	6.51E-07
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
8XVV10PG*	MANUAL VALVE T48-HV10 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	2	2.45E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
213) 8AZO22HWA	TANK 48 O2 ANALYZER 2 HARDWARE FAULTS	3.0E-4	7	4.92E-02	6.51E-07
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
8XVHV3PG*	MANUAL VALVE T48-HV3 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	2	2.45E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
214) 8FC112HW*	FLOW CONTROL VALVE 1211PV2 MECHANICAL FAULT	8.5E-6	1	7.45E-02	6.43E-07
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
8XVV19HW	MANUAL VALVE T48-HV19 FAILS TO OPEN ON DEMAND	1.6E-4	1	1.60E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
215) 8FC112HW*	FLOW CONTROL VALVE 1211PV2 MECHANICAL FAULT	8.5E-6	1	7.45E-02	6.43E-07
8FN527ST	TANK 48 EXHAUST FAN Y348-52-7 FAILS TO START DUE TO MECHANICAL FAU	4.8E-4	1	4.80E-04	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
216) 8FC112HW*	FLOW CONTROL VALVE 1211PV2 MECHANICAL FAULT	8.5E-6	1	7.45E-02	6.43E-07
8FN527ST	TANK 48 EXHAUST FAN Y348-52-7 FAILS TO START DUE TO MECHANICAL FAU	4.8E-4	1	4.80E-04	
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
217) 8FN527ST	TANK 48 EXHAUST FAN Y348-52-7 FAILS TO START DUE TO MECHANICAL FAU	4.8E-4	1	4.80E-04	6.05E-07
8FN528HW*	TANK 48 EXHAUST FAN Y348-52-8 FAILS TO RUN DUE TO MECHANICAL FAULT	8.0E-6	1	7.01E-02	
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
218) 8FN527ST	TANK 48 EXHAUST FAN Y348-52-7 FAILS TO START DUE TO MECHANICAL FAU	4.8E-4	1	4.80E-04	6.05E-07
8FN528HW*	TANK 48 EXHAUST FAN Y348-52-8 FAILS TO RUN DUE TO MECHANICAL FAULT	8.0E-6	1	7.01E-02	
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
219) 8FN528HW*	TANK 48 EXHAUST FAN Y348-52-8 FAILS TO RUN DUE TO MECHANICAL FAULT	8.0E-6	1	7.01E-02	6.05E-07
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
8XV19HW	MANUAL VALVE T48-HV19 FAILS TO OPEN ON DEMAND	1.6E-4	1	1.60E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
220) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	2.78E-07
NPR246HW*	PRESSURE REGULATING VALVE 2046PV FAILS	2.2E-6	1	1.93E-02	
NXVN16HW	MANUAL VALVE N16 FAILS TO OPEN ON DEMAND	1.6E-4	1	1.60E-04	
221) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	2.78E-07
NPR246HW*	PRESSURE REGULATING VALVE 2046PV FAILS	2.2E-6	1	1.93E-02	
NXVN47HW	MANUAL VALVE N47 FAILS TO OPEN ON DEMAND	1.6E-4	1	1.60E-04	
222) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	2.78E-07
NPR246HW*	PRESSURE REGULATING VALVE 2046PV FAILS	2.2E-6	1	1.93E-02	
NXVN15HW	MANUAL VALVE N15 FAILS TO OPEN	1.6E-4	1	1.60E-04	
223) 8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	2.56E-07
8PRPV1HW*	MECHANICAL FAULTS OF TANK 48 PRESSURE REGULATING VALVE 1205PV1	2.2E-6	2	3.85E-02	
8PRPV2HW	MECHANICAL FAULTS OF TANK 48 PRESSURE REGULATING VALVE 1205PV2	2.2E-6	7	3.70E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
224) 8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	2.56E-07
8PRPV1HW*	MECHANICAL FAULTS OF TANK 48 PRESSURE REGULATING VALVE 1205PV1	2.2E-6	2	3.85E-02	
8PRPV2HW	MECHANICAL FAULTS OF TANK 48 PRESSURE REGULATING VALVE 1205PV2	2.2E-6	7	3.70E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
225) 8AZO21HW*	TANK 48 O2 ANALYZER 1 HARDWARE FAULTS	3.0E-4	2	5.26E+00	2.23E-07
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
8XV11PGA	MANUAL VALVE T48-HV11 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	7	2.35E-06	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
226) 8AZO21HW*	TANK 48 O2 ANALYZER 1 HARDWARE FAULTS	3.0E-4	2	5.26E+00	2.23E-07
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
8XVHV4PGA	MANUAL VALVE T48-HV4 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	7	2.35E-06	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
227) 8AZO21HW*	TANK 48 O2 ANALYZER 1 HARDWARE FAULTS	3.0E-4	2	5.26E+00	2.23E-07
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
8XV11PGA	MANUAL VALVE T48-HV11 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	7	2.35E-06	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
228) 8AZO21HW*	IGNITION TANK 48 O2 ANALYZER 1 HARDWARE FAULTS	3.0E-4	.09 2	9.00E-02 5.26E+00	2.23E-07
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
8XVHV4PGA	MANUAL VALVE T48-HV4 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	7	2.35E-06	
229) 8AZO22HWA	IGNITION TANK 48 O2 ANALYZER 2 HARDWARE FAULTS	3.0E-4	.09 7	9.00E-02 4.92E-02	2.17E-07
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
8XVV10PG*	MANUAL VALVE T48-HV10 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	2	2.45E-04	
230) 8AZO22HWA	IGNITION TANK 48 O2 ANALYZER 2 HARDWARE FAULTS	3.0E-4	.09 7	9.00E-02 4.92E-02	2.17E-07
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
8XVHV3PG*	MANUAL VALVE T48-HV3 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	2	2.45E-04	
231) 8AZO22HWA	IGNITION TANK 48 O2 ANALYZER 2 HARDWARE FAULTS	3.0E-4	.09 7	9.00E-02 4.92E-02	2.17E-07
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
8XVV10PG*	MANUAL VALVE T48-HV10 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	2	2.45E-04	
232) 8AZO22HWA	IGNITION TANK 48 O2 ANALYZER 2 HARDWARE FAULTS	3.0E-4	.09 7	9.00E-02 4.92E-02	2.17E-07
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
8XVHV3PG*	MANUAL VALVE T48-HV3 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	2	2.45E-04	
233) 8FC112HW*	IGNITION FLOW CONTROL VALVE 1211PV2 MECHANICAL FAULT	8.5E-6	.09 1	9.00E-02 7.45E-02	2.14E-07
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
8XVV19HW	MANUAL VALVE T48-HV19 FAILS TO OPEN ON DEMAND	1.6E-4	1	1.60E-04	
234) 8FC112HW*	IGNITION FLOW CONTROL VALVE 1211PV2 MECHANICAL FAULT	8.5E-6	.09 1	9.00E-02 7.45E-02	2.14E-07
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
8XVV19HW	MANUAL VALVE T48-HV19 FAILS TO OPEN ON DEMAND	1.6E-4	1	1.60E-04	
235) 8FN528HW*	IGNITION TANK 48 EXHAUST FAN Y348-52-8 FAILS TO RUN DUE TO MECHANICAL FAULT	8.0E-6	.09 1	9.00E-02 7.01E-02	2.02E-07
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
8XVV19HW	MANUAL VALVE T48-HV19 FAILS TO OPEN ON DEMAND	1.6E-4	1	1.60E-04	
236) 8FN528HW*	IGNITION TANK 48 EXHAUST FAN Y348-52-8 FAILS TO RUN DUE TO MECHANICAL FAULT	8.0E-6	.09 1	9.00E-02 7.01E-02	2.02E-07
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
8XVV19HW	MANUAL VALVE T48-HV19 FAILS TO OPEN ON DEMAND	1.6E-4	1	1.60E-04	
237) 9FC122TM	IGNITION TANK 49 FLOW CONTROL VALVE 1252FV UNAVAILABLE DUE TO MAINTENANCE	3.6E-3	.09 2	9.00E-02 7.20E-03	1.59E-07
9XVN16PG*	TANK 49 PATH A DISCHARGE VALVE T49-N16 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	2	2.45E-04	
238) 9PRPV2TM	IGNITION TANK 49 PRESSURE REGULATING VALVE 1255PV2 UNAVAILABLE DUE TO MAINT	3.6E-3	.09 2	9.00E-02 7.20E-03	1.59E-07
9XVN19PG*	TANK 49 PATH A INLET VALVE T49-N19 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	2	2.45E-04	
239) 9FC122TM	IGNITION TANK 49 FLOW CONTROL VALVE 1252FV UNAVAILABLE DUE TO MAINTENANCE	3.6E-3	.09 2	9.00E-02 7.20E-03	1.59E-07
9XVN19PG*	TANK 49 PATH A INLET VALVE T49-N19 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	2	2.45E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
240) 9PRPV2TM	TANK 49 PRESSURE REGULATING VALVE 1255PV2 UNAVAILABLE DUE TO MAINT	3.6E-3	2	7.20E-03	1.59E-07
9XVN16PG*	TANK 49 PATH A DISCHARGE VALVE T49-N16 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	2	2.45E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
241) 9FCS11HW	FLOW CONTROL VALVE 1251PV1 MECHANICAL FAULT	8.5E-6	3	9.18E-03	1.01E-07
9XVV22PG*	MANUAL VALVE T49-HV22 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
242) 9FCS11HW	FLOW CONTROL VALVE 1251PV1 MECHANICAL FAULT	8.5E-6	3	9.18E-03	1.01E-07
9XVV20PG*	MANUAL VALVE T49-HV20 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
243) 8FC122TM	TANK 48 FLOW CONTROL VALVE 1202FV UNAVAILABLE DUE TO MAINTENANCE	3.6E-3	2	7.20E-03	9.54E-08
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
8XVN22PG*	TANK 48 PATH A INLET MANUAL VALVE T48-N22 FAILS TO REMAIN OPEN (	1.4E-8	2	2.45E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
244) 8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	9.54E-08
8PRPV2TM	TANK 48 PRESSURE REGULATING VALVE 1205PV2 UNAVAILABLE DUE TO MAINT	3.6E-3	2	7.20E-03	
8XVN22PG*	TANK 48 PATH A INLET MANUAL VALVE T48-N22 FAILS TO REMAIN OPEN (	1.4E-8	2	2.45E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
245) 8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	9.54E-08
8PRPV2TM	TANK 48 PRESSURE REGULATING VALVE 1205PV2 UNAVAILABLE DUE TO MAINT	3.6E-3	2	7.20E-03	
8XVN24PG*	TANK 48 PATH A DISCHARGE VALVE T48-N24 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	2	2.45E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
246) 8FC122TM	TANK 48 FLOW CONTROL VALVE 1202FV UNAVAILABLE DUE TO MAINTENANCE	3.6E-3	2	7.20E-03	9.54E-08
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
8XVN24PG*	TANK 48 PATH A DISCHARGE VALVE T48-N24 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	2	2.45E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
247) 9FCS11TM	FLOW CONTROL VALVE 1251PV1 MAINTENANCE	3.6E-3	2	7.20E-03	7.95E-08
9XVV22PG*	MANUAL VALVE T49-HV22 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
248) 9FCS11TM	FLOW CONTROL VALVE 1251PV1 MAINTENANCE	3.6E-3	2	7.20E-03	7.95E-08
9XVV20PG*	MANUAL VALVE T49-HV20 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
249) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	7.95E-08
NPR245TM	PRESSURE REGULATING VALVE 2045PV MAINTENANCE	3.6E-3	2	7.20E-03	
NXVN20PG*	PATH A OUTLET VALVE N20 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
250) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	7.95E-08
NPR245TM	PRESSURE REGULATING VALVE 2045PV MAINTENANCE	3.6E-3	2	7.20E-03	
NXVN46PG*	MANUAL VALVE N46 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
251) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	7.95E-08
NPR245TM	PRESSURE REGULATING VALVE 2045PV MAINTENANCE	3.6E-3	2	7.20E-03	
NXVN26PG*	MANUAL VALVE N26 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
252) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	7.95E-08
NPR245TM	PRESSURE REGULATING VALVE 2045PV MAINTENANCE	3.6E-3	2	7.20E-03	
NXVN24PG*	PATH A INLET VALVE N24 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
253) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	7.95E-08
NPR245TM	PRESSURE REGULATING VALVE 2045PV MAINTENANCE	3.6E-3	2	7.20E-03	
NXV032PG*	MANUAL VALVE N32 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
254) 9AZO22TM	TANK 49 O2 ANALYZER 2 UNAVAILABLE DUE TO MAINTENANCE	1.8E-3	2	3.60E-03	7.95E-08
9XVV10PG*	MANUAL VALVE T49-HV10 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	2	2.45E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
255) 9AZO22TM	TANK 49 O2 ANALYZER 2 UNAVAILABLE DUE TO MAINTENANCE	1.8E-3	2	3.60E-03	7.95E-08
9XVHV3PG*	MANUAL VALVE T49-HV3 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	2	2.45E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
256) 8FC111HW	FLOW CONTROL VALVE 1211PV1 MECHANICAL FAULT (MODE C)	8.5E-6	3	9.18E-03	6.08E-08
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
8XVV20PG*	MANUAL VALVE T48-HV20 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
257) 8FC111HW	FLOW CONTROL VALVE 1211PV1 MECHANICAL FAULT (MODE C)	8.5E-6	3	9.18E-03	6.08E-08
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
8XVV22PG*	MANUAL VALVE T48-HV22 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
258) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	5.17E-08
NVPVPAHW*	FAILURE OF VAPORIZER A DUE TO HARDWARE FAULTS	4.1E-7	1	3.59E-03	
NXVN15HW	MANUAL VALVE N15 FAILS TO OPEN	1.6E-4	1	1.60E-04	
259) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	5.17E-08
NVPVPAHW*	FAILURE OF VAPORIZER A DUE TO HARDWARE FAULTS	4.1E-7	1	3.59E-03	
NXVN16HW	MANUAL VALVE N16 FAILS TO OPEN ON DEMAND	1.6E-4	1	1.60E-04	
260) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	5.17E-08
NVPVPAHW*	FAILURE OF VAPORIZER A DUE TO HARDWARE FAULTS	4.1E-7	1	3.59E-03	
NXVN47HW	MANUAL VALVE N47 FAILS TO OPEN ON DEMAND	1.6E-4	1	1.60E-04	
261) 8FC111TM	FLOW CONTROL VALVE 1211PV1 MAINTENANCE	3.6E-3	2	7.20E-03	4.77E-08
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
8XVV20PG*	MANUAL VALVE T48-HV20 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
262) 8FC111TM	FLOW CONTROL VALVE 1211PV1 MAINTENANCE	3.6E-3	2	7.20E-03	4.77E-08
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
8XVV22PG*	MANUAL VALVE T48-HV22 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
263) 8AZO22TM	TANK 48 O2 ANALYZER 2 UNAVAILABLE DUE TO MAINTENANCE	1.8E-3	2	3.60E-03	4.77E-08
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
9XVV10PG*	MANUAL VALVE T48-HV10 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	2	2.45E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
264) 8AZO22TM	TANK 48 O2 ANALYZER 2 UNAVAILABLE DUE TO MAINTENANCE	1.8E-3	2	3.60E-03	4.77E-08
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
8XVHV3PG*	MANUAL VALVE T48-HV3 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	2	2.45E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
265) 9FN511TM	TANK 49 EXHAUST FAN Y349-52-11 UNAVAILABLE DUE TO MAINTENANCE	1.8E-3	2	3.60E-03	3.97E-08
9XVV22PG*	MANUAL VALVE T49-HV22 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
266) 9FN511TM	TANK 49 EXHAUST FAN Y349-52-11 UNAVAILABLE DUE TO MAINTENANCE	1.8E-3	2	3.60E-03	3.97E-08
9XVV20PG*	MANUAL VALVE T49-HV20 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
267) Ignition	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	7.60E-10

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
	nvvpbbhw	4.1E-7	7	6.89E-05	
	nxvn20pg*	1.4E-8	1	1.23E-04	
268)	ignition		.09	9.00E-02	7.60E-10
	nvvpbbhw	4.1E-7	7	6.89E-05	
	nxvn24pg*	1.4E-8	1	1.23E-04	
269)	ignition		.09	9.00E-02	7.60E-10
	nvvpbbhw	4.1E-7	7	6.89E-05	
	nxvn46pg*	1.4E-8	1	1.23E-04	
270)	ignition		.09	9.00E-02	7.60E-10
	nvvpbbhw	4.1E-7	7	6.89E-05	
	nxvn26pg*	1.4E-8	1	1.23E-04	
271)	ignition		.09	9.00E-02	7.60E-10
	nvvpbbhw	4.1E-7	7	6.89E-05	
	nxv032pg*	1.4E-8	1	1.23E-04	
272)	8FC122TM	3.6E-3	2	7.20E-03	3.18E-08
	8HOUSE03		.20	2.00E-01	
	8XVN24PG*	1.4E-8	2	2.45E-04	
	IGNITION		.09	9.00E-02	
273)	8HOUSE03		.20	2.00E-01	3.18E-08
	8PRPV2TM	3.6E-3	2	7.20E-03	
	8XVN22PG*	1.4E-8	2	2.45E-04	
	IGNITION		.09	9.00E-02	
274)	8HOUSE03		.20	2.00E-01	3.18E-08
	8PRPV2TM	3.6E-3	2	7.20E-03	
	8XVN24PG*	1.4E-8	2	2.45E-04	
	IGNITION		.09	9.00E-02	
275)	8FC122TM	3.6E-3	2	7.20E-03	3.18E-08
	8HOUSE03		.20	2.00E-01	
	8XVN22PG*	1.4E-8	2	2.45E-04	
	IGNITION		.09	9.00E-02	
276)	8HOUSE01		.2	2.00E-01	3.18E-08
	8PRPV2TM	3.6E-3	2	7.20E-03	
	8XVN22PG*	1.4E-8	2	2.45E-04	
	IGNITION		.09	9.00E-02	
277)	8FC122TM	3.6E-3	2	7.20E-03	3.18E-08
	8HOUSE01		.2	2.00E-01	
	8XVN22PG*	1.4E-8	2	2.45E-04	
	IGNITION		.09	9.00E-02	
278)	8HOUSE01		.2	2.00E-01	3.18E-08
	8PRPV2TM	3.6E-3	2	7.20E-03	
	8XVN24PG*	1.4E-8	2	2.45E-04	
	IGNITION		.09	9.00E-02	
279)	8FC122TM	3.6E-3	2	7.20E-03	3.18E-08
	8HOUSE01		.2	2.00E-01	
	8XVN24PG*	1.4E-8	2	2.45E-04	
	IGNITION		.09	9.00E-02	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
280) 9FC122HW 9XVN19PG* IGNITION	MECHANICAL FAULT OF TANK 49 FLOW CONTROL VALVE 1252FV TANK 49 PATH A INLET VALVE T49-N19 FAILS TO REMAIN OPEN (PLUG) CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT	8.5E-6 1.4E-8 .09	7 2 0.09	1.43E-03 2.45E-04 9.00E-02	3.15E-08
281) 9FC122HW 9XVN16PG* IGNITION	MECHANICAL FAULT OF TANK 49 FLOW CONTROL VALVE 1252FV TANK 49 PATH A DISCHARGE VALVE T49-N16 FAILS TO REMAIN OPEN (PLUG) CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT	8.5E-6 1.4E-8 .09	7 2 0.09	1.43E-03 2.45E-04 9.00E-02	3.15E-08
282) 9FC121HW* 9XVN15PG IGNITION	MECHANICAL FAULT OF TANK 49 FLOW CONTROL VALVE 1251FV TANK 49 PATH B DISCHARGE VALVE T49-N15 FAILS TO REMAIN OPEN (PLUG) CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT	8.5E-6 1.4E-8 .09	2 7 0.09	1.49E-01 2.35E-06 9.00E-02	3.15E-08
283) 9FC121HW* 9XVN13PG IGNITION	MECHANICAL FAULT OF TANK 49 FLOW CONTROL VALVE 1251FV MANUAL VALVE T49-N13 FAILS TO REMAIN OPEN (PLUG) CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT	8.5E-6 1.4E-8 .09	2 7 0.09	1.49E-01 2.35E-06 9.00E-02	3.15E-08
284) IGNITION NPR245HW NXV032PG*	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT PRESSURE REGULATING VALVE 2045PV FAILS MANUAL VALVE N32 FAILS TO REMAIN OPEN (PLUG)	.09 2.2E-6 1.4E-8	.09 3 1	9.00E-02 2.38E-03 1.23E-04	2.62E-08
285) IGNITION NPR245HW NXVN26PG*	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT PRESSURE REGULATING VALVE 2045PV FAILS MANUAL VALVE N26 FAILS TO REMAIN OPEN (PLUG)	.09 2.2E-6 1.4E-8	.09 3 1	9.00E-02 2.38E-03 1.23E-04	2.62E-08
286) IGNITION NPR245HW NXVN20PG*	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT PRESSURE REGULATING VALVE 2045PV FAILS PATH A OUTLET VALVE N20 FAILS TO REMAIN OPEN (PLUG)	.09 2.2E-6 1.4E-8	.09 3 1	9.00E-02 2.38E-03 1.23E-04	2.62E-08
287) IGNITION NPR245HW NXVN24PG*	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT PRESSURE REGULATING VALVE 2045PV FAILS PATH A INLET VALVE N24 FAILS TO REMAIN OPEN (PLUG)	.09 2.2E-6 1.4E-8	.09 3 1	9.00E-02 2.38E-03 1.23E-04	2.62E-08
288) IGNITION NPR245HW NXVN46PG*	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT PRESSURE REGULATING VALVE 2045PV FAILS MANUAL VALVE N46 FAILS TO REMAIN OPEN (PLUG)	.09 2.2E-6 1.4E-8	.09 3 1	9.00E-02 2.38E-03 1.23E-04	2.62E-08
289) 8FN527TM 8HOUSE04 8XVV20PG*	TANK 48 EXHAUST FAN Y348-52-7 UNAVAILABLE DUE TO MAINTENANCE CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T MANUAL VALVE T48-HV20 FAILS TO REMAIN OPEN (PLUG)	1.8E-3 1.4E-8 .09	2 1 0.09	3.60E-03 1.23E-04 9.00E-02	2.38E-08
290) 8FN527TM 8HOUSE04 8XVV22PG*	TANK 48 EXHAUST FAN Y348-52-7 UNAVAILABLE DUE TO MAINTENANCE CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T MANUAL VALVE T48-HV22 FAILS TO REMAIN OPEN (PLUG)	1.8E-3 1.4E-8 .09	2 1 0.09	3.60E-03 1.23E-04 9.00E-02	2.38E-08
291) 8FC111HW 8HOUSE03 8XVV20PG*	FLOW CONTROL VALVE 1211PV1 MECHANICAL FAULT (MODE C) CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE MANUAL VALVE T48-HV20 FAILS TO REMAIN OPEN (PLUG)	8.5E-6 1.4E-8 .09	3 1 0.09	9.18E-03 2.00E-01 1.23E-04	2.03E-08
292) 8FC111HW 8HOUSE03 8XVV22PG*	FLOW CONTROL VALVE 1211PV1 MECHANICAL FAULT (MODE C) CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE MANUAL VALVE T48-HV22 FAILS TO REMAIN OPEN (PLUG)	8.5E-6 1.4E-8 .09	3 1 0.09	9.18E-03 2.00E-01 1.23E-04	2.03E-08
293) 8FC111HW 8HOUSE01 8XVV20PG*	FLOW CONTROL VALVE 1211PV1 MECHANICAL FAULT (MODE C) CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP) MANUAL VALVE T48-HV20 FAILS TO REMAIN OPEN (PLUG)	8.5E-6 1.4E-8 1	3 .2 1	9.18E-03 2.00E-01 1.23E-04	2.03E-08

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
294) 8FC111HW	FLOW CONTROL VALVE 1211PV1 MECHANICAL FAULT (MODE C)	8.5E-6	3	9.18E-03	2.03E-08
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
8XV22PG*	MANUAL VALVE T48-HV22 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
295) 8FC122HW	MECHANICAL FAULT OF TANK 48 FLOW CONTROL VALVE 1202FV	8.5E-6	7	1.43E-03	1.89E-08
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
8XV22PG*	TANK 48 PATH A INLET MANUAL VALVE T48-N24 FAILS TO REMAIN OPEN (	1.4E-8	2	2.45E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
296) 8FC122HW	MECHANICAL FAULT OF TANK 48 FLOW CONTROL VALVE 1202FV	8.5E-6	7	1.43E-03	1.89E-08
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
8XV24PG*	TANK 48 PATH A DISCHARGE VALVE T48-N24 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	2	2.45E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
297) 8FC121HW*	MECHANICAL FAULT OF TANK 48 FLOW CONTROL VALVE 1201FV	8.5E-6	2	1.49E-01	1.89E-08
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
8XV8N8PG	MANUAL VALVE T48-N8 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	7	2.35E-06	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
298) 8FC121HW*	MECHANICAL FAULT OF TANK 48 FLOW CONTROL VALVE 1201FV	8.5E-6	2	1.49E-01	1.89E-08
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
8XV8N5PG	MANUAL VALVE T48-N5 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	7	2.35E-06	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
299) 8FC111TM	FLOW CONTROL VALVE 1211PV1 MAINTENANCE	3.6E-3	2	7.20E-03	1.59E-08
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
8XV20PG*	MANUAL VALVE T48-HV20 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
300) 8FC111TM	FLOW CONTROL VALVE 1211PV1 MAINTENANCE	3.6E-3	2	7.20E-03	1.59E-08
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
8XV22PG*	MANUAL VALVE T48-HV22 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
301) 8FC111TM	FLOW CONTROL VALVE 1211PV1 MAINTENANCE	3.6E-3	2	7.20E-03	1.59E-08
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
8XV20PG*	MANUAL VALVE T48-HV20 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
302) 8FC111TM	FLOW CONTROL VALVE 1211PV1 MAINTENANCE	3.6E-3	2	7.20E-03	1.59E-08
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
8XV22PG*	MANUAL VALVE T48-HV22 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
303) 8AZO22TM	TANK 48 O2 ANALYZER 2 UNAVAILABLE DUE TO MAINTENANCE	1.8E-3	2	3.60E-03	1.59E-08
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
8XV10PG*	MANUAL VALVE T48-HV10 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	2	2.45E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
304) 8AZO22TM	TANK 48 O2 ANALYZER 2 UNAVAILABLE DUE TO MAINTENANCE	1.8E-3	2	3.60E-03	1.59E-08
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
8XVHV3PG*	MANUAL VALVE T48-HV3 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	2	2.45E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
305) 8AZO22TM	TANK 48 O2 ANALYZER 2 UNAVAILABLE DUE TO MAINTENANCE	1.8E-3	2	3.60E-03	1.59E-08

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
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8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
8XVV10PG*	MANUAL VALVE T48-HV10 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	2	2.45E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
306) 8AZO22TM	TANK 48 O2 ANALYZER 2 UNAVAILABLE DUE TO MAINTENANCE	1.8E-3	2	3.60E-03	1.59E-08
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
8XVHV3PG*	MANUAL VALVE T48-HV3 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	2	2.45E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
307) 9FC512HW*	FLOW CONTROL VALVE 1251PV2 MECHANICAL FAULT	8.5E-6	1	7.45E-02	1.58E-08
9XVV21PG	MANUAL VALVE T49-HV21 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	7	2.35E-06	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
308) 9FN511HW	TANK 49 EXHAUST FAN Y349-52-11 FAILS TO RUN DUE TO MECHANICAL FAUL	8.0E-6	7	1.34E-03	1.48E-08
9XVV22PG*	MANUAL VALVE T49-HV22 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
309) 9FN511HW	TANK 49 EXHAUST FAN Y349-52-11 FAILS TO RUN DUE TO MECHANICAL FAUL	8.0E-6	7	1.34E-03	1.48E-08
9XVV20PG*	MANUAL VALVE T49-HV20 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
310) 9FN512HW*	TANK 49 EXHAUST FAN Y349-52-12 FAILS TO RUN DUE TO MECHANICAL FAUL	8.0E-6	1	7.01E-02	1.48E-08
9XVV21PG	MANUAL VALVE T49-HV21 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	7	2.35E-06	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	

APPENDIX B.2

CUTSETS FOR QUANTIFIED FAULT TREE

WITH RECOVERY ACTIONS AND REPAIR ACTIVITIES INCLUDED

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
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1) 1TP000*					*7.21E-08
1) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	1.83E-08
NCPDCSHW*	LOCAL MECHANICAL FAULTS OF DCS COMPUTER	9.0E-5	1	7.88E-01	
NOPC-HS	OPERATOR FAILS TO ENTER FIELD CONTROL MODE (HIGH STRESS LEVELS)		1	1.00E+00	
REPAIRN	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
2) 9AZO21HW*	TANK 49 O2 ANALYZER 1 HARDWARE FAULTS	3.0E-4	2	5.26E+00	6.01E-09
9AZO22HW	TANK 49 O2 ANALYZER 2 HARDWARE FAULTS	3.0E-4	7	4.92E-02	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
3) 9HOUSE02	NO ACTION TAKEN FOR 48 HRS		1	1.00E+00	5.72E-09
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
NSSSTMHW*	LOSS OF STEAM SUPPLY TO HEATER	3.0E-4	1	2.63E+00	
HEPA	PROBABILITY OF NOT REPLACING/REPAIRING HEPA FILTER IS NEGLIGIBLE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
4) 9AZO2SCM*	COMMON MODE SENSOR MISCALIBRATION FAILURE FOR O2 ANALYZERS	2.38E-1	1	2.38E-01	5.54E-09
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
5) 8HOUSE02	NO ACTION TAKEN FOR 48 HOURS		1	1.00E+00	3.43E-09
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
NSSSTMHW*	LOSS OF STEAM SUPPLY TO HEATER	3.0E-4	1	2.63E+00	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
6) 9FSEXHHW*	TANK 49 NITROGEN FLOW SENSOR FOR EXHAUST LINE FAILS	1.2E-4	1	1.05E+00	2.29E-09
9OPC-HS	OPERATOR FAILS TO ENTER MODE C - FIELD CONTROL (HIGH STRESS LEVELS		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
7) 9FSHEPHW*	FLOW SENSOR ACROSS HEPA FILTER FAILS DUE TO MECHANICAL FAULT	1.2E-4	1	1.05E+00	2.29E-09
9OPC-HS	OPERATOR FAILS TO ENTER MODE C - FIELD CONTROL (HIGH STRESS LEVELS		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
8) 9FC512HW*	FLOW CONTROL VALVE 1251PV2 MECHANICAL FAULT	8.5E-6	1	7.45E-02	1.73E-09
9OPTRNBE	OPERATOR FAILS TO ALIGN AND START TRAIN B FOR OPERATION - EXHAUST		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
9) 9FN512HW*	TANK 49 EXHAUST FAN Y349-52-12 FAILS TO RUN DUE TO MECHANICAL FAUL	8.0E-6	1	7.01E-02	1.63E-09
9OPTRNBE	OPERATOR FAILS TO ALIGN AND START TRAIN B FOR OPERATION - EXHAUST		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
10) 8FSEXHHW*	TANK 48 NITROGEN FLOW SENSOR FOR EXHAUST LINE FAILS	1.2E-4	1	1.05E+00	1.37E-09
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
8OPC-HS	OPERATOR FAILS TO ENTER FIELD CONTROL MODE (HIGH STRESS LEVELS)		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
11) 8FSHEPHW*	FLOW SENSOR ACROSS HEPA FILTER FAILS DUE TO MECHANICAL FAULT	1.2E-4	1	1.05E+00	1.37E-09
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
8OPC-HS	OPERATOR FAILS TO ENTER FIELD CONTROL MODE (HIGH STRESS LEVELS)		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
12) 8AZO21HW*	TANK 48 O2 ANALYZER 1 HARDWARE FAULTS	3.0E-4	2	5.26E+00	1.20E-09
8AZO22HWA	TANK 48 O2 ANALYZER 2 HARDWARE FAULTS	3.0E-4	7	4.92E-02	
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
13) 8AZO21HW*	TANK 48 O2 ANALYZER 1 HARDWARE FAULTS	3.0E-4	2	5.26E+00	1.20E-09
8AZO22HWA	TANK 48 O2 ANALYZER 2 HARDWARE FAULTS	3.0E-4	7	4.92E-02	
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
14) 8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	1.14E-09
8HOUSE02	NO ACTION TAKEN FOR 48 HOURS		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
NSSSTMHW*	LOSS OF STEAM SUPPLY TO HEATER	3.0E-4	1	2.63E+00	
HEPA	PROBABILITY OF NOT REPLACING/REPAIRING HEPA FILTER IS NEGLIGIBLE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
15) 8HOUSE02	NO ACTION TAKEN FOR 48 HOURS		1	1.00E+00	1.14E-09
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
NSSSTMHW*	LOSS OF STEAM SUPPLY TO HEATER	3.0E-4	1	2.63E+00	
HEPA	PROBABILITY OF NOT REPLACING/REPAIRING HEPA FILTER IS NEGLIGIBLE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
16) 8HOUSE03	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	1.14E-09
NELGRDHW*	LOSS OF H-AREA POWER	3.43E-5	1	3.00E-01	
RECPWR	PROBABILITY OF NOT RECOVERING OFFSITE POWER		1.8E-3	1.80E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
17) 8AZO2SCM*	COMMON MODE SENSOR MISCALIBRATION FAILURE FOR O2 ANALYZERS	2.38E-1	1	2.38E-01	1.11E-09
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
18) 8AZO2SCM*	COMMON MODE SENSOR MISCALIBRATION FAILURE FOR O2 ANALYZERS	2.38E-1	1	2.38E-01	1.11E-09

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
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8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRM	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
19) 9FSNFSCM*	BOTH NITROGEN FLOW SENSORS FAIL DUE TO COMMON MODE MISCALIBRATION	4.4E-1	1	4.40E-01	9.59E-10
9OPC-HS	OPERATOR FAILS TO ENTER MODE C - FIELD CONTROL (HIGH STRESS LEVELS		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
20) 9OPC-HS	OPERATOR FAILS TO ENTER MODE C - FIELD CONTROL (HIGH STRESS LEVELS	4.4E-1	1	1.00E+00	9.59E-10
9SFFANCM*	COMMON MODE MISCALIBRATION FAILURE OF SENSORS DETECTING FAN OPERAT		1	4.40E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
21) 9ILFANHW*	INTERLOCK FAILURE (FAN EXHAUST FLOW METER) CLOSES FLOW CONTROL VAL	4.6E-5	1	4.03E-01	8.78E-10
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
22) 8FSNFSCM*	BOTH NITROGEN FLOW SENSORS FAIL DUE TO COMMON MODE MISCALIBRATION	4.4E-1	1	4.40E-01	5.75E-10
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
8OPC-HS	OPERATOR FAILS TO ENTER FIELD CONTROL MODE (HIGH STRESS LEVELS)		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
23) 8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	5.75E-10
8OPC-HS	OPERATOR FAILS TO ENTER FIELD CONTROL MODE (HIGH STRESS LEVELS)		1	1.00E+00	
8SFFANCM*	COMMON MODE MISCALIBRATION FAILURE OF SENSORS DETECTING FAN OPERAT	4.4E-1	1	4.40E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
24) 8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	5.27E-10
8ILFANHW*	INTERLOCK FAILURE (FAN EXHAUST FLOW METER) CLOSES FLOW CONTROL VAL	4.6E-5	1	4.03E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
25) 9HOUSE02	NO ACTION TAKEN FOR 48 HRS		1	1.00E+00	4.77E-10
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
NCWCHRHW*	MECHANICAL FAULTS IN CHROMATED COOLING WATER SYSTEM	2.5E-5	1	2.19E-01	
HEPA	PROBABILITY OF NOT REPLACING/REPAIRING HEPA FILTER IS NEGLIGIBLE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
26) 8FSEXHHW*	TANK 48 NITROGEN FLOW SENSOR FOR EXHAUST LINE FAILS	1.2E-4	1	1.05E+00	4.58E-10
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
8OPC-HS	OPERATOR FAILS TO ENTER FIELD CONTROL MODE (HIGH STRESS LEVELS)		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
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27) 8FSEXHHW*	TANK 48 NITROGEN FLOW SENSOR FOR EXHAUST LINE FAILS	1.2E-4	1	1.05E+00	4.58E-10
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
8OPC-HS	OPERATOR FAILS TO ENTER FIELD CONTROL MODE (HIGH STRESS LEVELS)		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
28) 8FSHEPHW*	FLOW SENSOR ACROSS HEPA FILTER FAILS DUE TO MECHANICAL FAULT	1.2E-4	1	1.05E+00	4.58E-10
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
8OPC-HS	OPERATOR FAILS TO ENTER FIELD CONTROL MODE (HIGH STRESS LEVELS)		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
29) 8FSHEPHW*	FLOW SENSOR ACROSS HEPA FILTER FAILS DUE TO MECHANICAL FAULT	1.2E-4	1	1.05E+00	4.58E-10
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
8OPC-HS	OPERATOR FAILS TO ENTER FIELD CONTROL MODE (HIGH STRESS LEVELS)		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
30) 9PRREGHW*	TANK 49 FAILURE OF PRESSURE REGULATING VALVE 1257PV	2.2E-6	1	1.93E-02	4.48E-10
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRM	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
31) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	4.48E-10
NOPTNRBS	OPERATOR FAILS TO ALIGN TRAIN B FOR OPERATION - SUPPLY SIDE		1	1.00E+00	
NPR246HW*	PRESSURE REGULATING VALVE 2046PV FAILS	2.2E-6	1	1.93E-02	
REPAIRM	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
32) 9AZO21HW*	TANK 49 O2 ANALYZER 1 HARDWARE FAULTS	3.0E-4	2	5.26E+00	4.40E-10
9AZO22TM	TANK 49 O2 ANALYZER 2 UNAVAILABLE DUE TO MAINTENANCE	1.8E-3	2	3.60E-03	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRM	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
33) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	4.08E-10
NHOUSE01	CONDITIONAL PROBABILITY OF OUTSIDE TEMPERATURE BEING > 80 F		0.125	1.25E-01	
NHVCOMHW*	LOSS OF HVAC TO ROOM CONTAINING DCS COMPUTER	1.6E-5	1	1.40E-01	
NOPC-HS	OPERATOR FAILS TO ENTER FIELD CONTROL MODE (HIGH STRESS LEVELS)		1	1.00E+00	
REPAIRM	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
34) 9OPC-MS	OPERATOR FAILS TO ENTER MODE C - FIELD CONTROL (MODERATE STRESS LE		1	1.00E+00	4.01E-10
9SFFANHW*	SENSOR DETECTING FAN OPERATION FOR NORMALLY RUNNING FAN FAILS	2.1E-5	1	1.84E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
35) 8FC112HW*	FLOW CONTROL VALVE 1211PV2 MECHANICAL FAULT	8.5E-6	1	7.45E-02	3.46E-10
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
8OPTNRBE	OPERATOR FAILS TO ALIGN AND START TRAIN B FOR OPERATION - EXHAUST		1	1.00E+00	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
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	IGNITION		.09	9.00E-02	
	REPAIR		.011	1.10E-02	
	EPVNTINT		2.35E-5	2.35E-05	
36) 8FC112HW*	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR	8.5E-6	1	7.45E-02	3.46E-10
	FLOW CONTROL VALVE 1211PV2 MECHANICAL FAULT				
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
8OPTRNBE	OPERATOR FAILS TO ALIGN AND START TRAIN B FOR OPERATION - EXHAUST		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIR	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
37) 8AZO21HW*	TANK 48 O2 ANALYZER 1 HARDWARE FAULTS	3.0E-4	2	5.26E+00	3.38E-10
8AZO22HWA	TANK 48 O2 ANALYZER 2 HARDWARE FAULTS	3.0E-4	7	4.92E-02	
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIR	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
38) 8FN528HW*	TANK 48 EXHAUST FAN Y348-52-8 FAILS TO RUN DUE TO MECHANICAL FAULT	8.0E-6	1	7.01E-02	3.26E-10
			.20	2.00E-01	
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		1	1.00E+00	
8OPTRNBE	OPERATOR FAILS TO ALIGN AND START TRAIN B FOR OPERATION - EXHAUST		.09	9.00E-02	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.011	1.10E-02	
REPAIR	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		2.35E-5	2.35E-05	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		1	7.01E-02	3.26E-10
39) 8FN528HW*	TANK 48 EXHAUST FAN Y348-52-8 FAILS TO RUN DUE TO MECHANICAL FAULT	8.0E-6	1	7.01E-02	3.26E-10
			.2	2.00E-01	
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		1	1.00E+00	
8OPTRNBE	OPERATOR FAILS TO ALIGN AND START TRAIN B FOR OPERATION - EXHAUST		.09	9.00E-02	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.011	1.10E-02	
REPAIR	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		2.35E-5	2.35E-05	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		1	2.38E-01	3.11E-10
40) 8AZO2SCM*	COMMON MODE SENSOR MISCALIBRATION FAILURE FOR O2 ANALYZERS	2.38E-1	.60	6.00E-01	
			.09	9.00E-02	
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		1.03E-3	1.03E-03	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		2.35E-5	2.35E-05	
REPAIR	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1	1.00E+00	2.86E-10
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		.60	6.00E-01	
41) 8HOUSE02	NO ACTION TAKEN FOR 48 HOURS		.09	9.00E-02	
			1	2.19E-01	
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		1.03E-3	1.03E-03	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		2.35E-5	2.35E-05	
NCWCHRRHW*	MECHANICAL FAULTS IN CHROMATED COOLING WATER SYSTEM	2.5E-5	.60	6.00E-01	2.40E-10
REPAIR	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1	1.00E+00	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		1	1.84E-01	
42) 8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.09	9.00E-02	
			1.03E-3	1.03E-03	
8OPC-MS	OPERATOR FAILS TO ENTER FIELD CONTROL MODE (MODERATE STRESS LEVELS		2.35E-5	2.35E-05	
8SFANHW*	SENSOR DETECTING FAN OPERATION FOR NORMALLY RUNNING FAN FAILS	2.1E-5	1	4.40E-01	1.92E-10
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.20	2.00E-01	
REPAIR	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE				
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR				
43) 8FSNFSCM*	BOTH NITROGEN FLOW SENSORS FAIL DUE TO COMMON MODE MISCALIBRATION	4.4E-1			
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE				

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
80PC-HS	OPERATOR FAILS TO ENTER FIELD CONTROL MODE (HIGH STRESS LEVELS)		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
44) 8FSNFSCM*	BOTH NITROGEN FLOW SENSORS FAIL DUE TO COMMON MODE MISCALIBRATION	4.4E-1	1	4.40E-01	1.92E-10
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
80PC-HS	OPERATOR FAILS TO ENTER FIELD CONTROL MODE (HIGH STRESS LEVELS)		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
45) 8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	1.92E-10
80PC-HS	OPERATOR FAILS TO ENTER FIELD CONTROL MODE (HIGH STRESS LEVELS)		1	1.00E+00	
8SFFANCM*	COMMON MODE MISCALIBRATION FAILURE OF SENSORS DETECTING FAN OPERAT	4.4E-1	1	4.40E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
46) 8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	1.92E-10
80PC-HS	OPERATOR FAILS TO ENTER FIELD CONTROL MODE (HIGH STRESS LEVELS)		1	1.00E+00	
8SFFANCM*	COMMON MODE MISCALIBRATION FAILURE OF SENSORS DETECTING FAN OPERAT	4.4E-1	1	4.40E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
47) 8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	1.76E-10
8ILFANHW*	INTERLOCK FAILURE (FAN EXHAUST FLOW METER) CLOSES FLOW CONTROL VAL	4.6E-5	1	4.03E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
48) 8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	1.76E-10
8ILFANHW*	INTERLOCK FAILURE (FAN EXHAUST FLOW METER) CLOSES FLOW CONTROL VAL	4.6E-5	1	4.03E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
49) 8FC112HW*	FLOW CONTROL VALVE 1211PV2 MECHANICAL FAULT	8.5E-6	1	7.45E-02	9.73E-11
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
80PTRNBE	OPERATOR FAILS TO ALIGN AND START TRAIN B FOR OPERATION - EXHAUST		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
50) 8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	9.54E-11
8HOUSE02	NO ACTION TAKEN FOR 48 HOURS		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
NCWCHRHW*	MECHANICAL FAULTS IN CHROMATED COOLING WATER SYSTEM	2.5E-5	1	2.19E-01	
HEPA	PROBABILITY OF NOT REPLACING/REPAIRING HEPA FILTER IS NEGLIGIBLE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
51) 8HOUSE02	NO ACTION TAKEN FOR 48 HOURS		1	1.00E+00	9.54E-11
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
NCWCHRW*	MECHANICAL FAULTS IN CHROMATED COOLING WATER SYSTEM	2.5E-5	1	2.19E-01	
HEPA	PROBABILITY OF NOT REPLACING/REPAIRING HEPA FILTER IS NEGLIGIBLE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
52) 8FN528HW*	TANK 48 EXHAUST FAN Y348-52-8 FAILS TO RUN DUE TO MECHANICAL FAULT	8.0E-6	1	7.01E-02	9.16E-11
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
8OPTRNBE	OPERATOR FAILS TO ALIGN AND START TRAIN B FOR OPERATION - EXHAUST		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
53) 8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	8.97E-11
8PRREGHW*	TANK 48 FAILURE OF PRESSURE REGULATING VALVE 1217PV	2.2E-6	1	1.93E-02	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
54) 8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	8.97E-11
8PRREGHW*	TANK 48 FAILURE OF PRESSURE REGULATING VALVE 1217PV	2.2E-6	1	1.93E-02	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
55) 8AZO21HW*	TANK 48 O2 ANALYZER 1 HARDWARE FAULTS	3.0E-4	2	5.26E+00	8.80E-11
8AZO22TM	TANK 48 O2 ANALYZER 2 UNAVAILABLE DUE TO MAINTENANCE	1.8E-3	2	3.60E-03	
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
56) 8AZO21HW*	TANK 48 O2 ANALYZER 1 HARDWARE FAULTS	3.0E-4	2	5.26E+00	8.80E-11
8AZO22TM	TANK 48 O2 ANALYZER 2 UNAVAILABLE DUE TO MAINTENANCE	1.8E-3	2	3.60E-03	
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
57) 8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	8.01E-11
8OPC-MS	OPERATOR FAILS TO ENTER FIELD CONTROL MODE (MODERATE STRESS LEVELS		1	1.00E+00	
8SFFANHW*	SENSOR DETECTING FAN OPERATION FOR NORMALLY RUNNING FAN FAILS	2.1E-5	1	1.84E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
58) 8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	8.01E-11
8OPC-MS	OPERATOR FAILS TO ENTER FIELD CONTROL MODE (MODERATE STRESS LEVELS		1	1.00E+00	
8SFFANHW*	SENSOR DETECTING FAN OPERATION FOR NORMALLY RUNNING FAN FAILS	2.1E-5	1	1.84E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
59) 9DMDMHW*	LOCAL FAULTS OF TANK 49 DEMISTER	3.6E-6	1	3.15E-02	6.87E-11
9HOUSE02	NO ACTION TAKEN FOR 48 HRS		1	1.00E+00	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
	IGNITION		.09	9.00E-02	
	HEPA		1.03E-3	1.03E-03	
	EPVNTINT		2.35E-5	2.35E-05	
60)	9VSVACHW*	3.5E-6	1	3.07E-02	6.68E-11
	IGNITION		.09	9.00E-02	
	REPAIR		1.03E-3	1.03E-03	
	EPVNTINT		2.35E-5	2.35E-05	
61)	9CNCONHW*	3.0E-6	1	2.63E-02	5.72E-11
	9HOUSE02		1	1.00E+00	
	IGNITION		.09	9.00E-02	
	HEPA		1.03E-3	1.03E-03	
	EPVNTINT		2.35E-5	2.35E-05	
62)	9FSNFAHW*	1.2E-4	2	2.10E+00	9.14E-11
	9FSNFBHW	1.2E-4	7	2.00E-02	
	9OPC-HS		1	1.00E+00	
	IGNITION		.09	9.00E-02	
	REPAIR		1.03E-3	1.03E-03	
	EPVNTINT		2.35E-5	2.35E-05	
63)	8DMDEMHW*	3.6E-6	1	3.15E-02	4.12E-11
	8HOUSE02		1	1.00E+00	
	8HOUSE04		.60	6.00E-01	
	IGNITION		.09	9.00E-02	
	REPAIR		1.03E-3	1.03E-03	
	EPVNTINT		2.35E-5	2.35E-05	
64)	8HOUSE04	3.5E-6	.60	6.00E-01	4.01E-11
	8VSVACHW*		1	3.07E-02	
	IGNITION		.09	9.00E-02	
	REPAIR		1.03E-3	1.03E-03	
	EPVNTINT		2.35E-5	2.35E-05	
65)	8CNCONHW*	3.0E-6	1	2.63E-02	3.43E-11
	8HOUSE02		1	1.00E+00	
	8HOUSE04		.60	6.00E-01	
	IGNITION		.09	9.00E-02	
	REPAIR		1.03E-3	1.03E-03	
	EPVNTINT		2.35E-5	2.35E-05	
66)	8FSNFAHW*	1.2E-4	2	2.10E+00	5.48E-11
	8FSNFBHW	1.2E-4	7	2.00E-02	
	8HOUSE04		.60	6.00E-01	
	8OPC-HS		1	1.00E+00	
	IGNITION		.09	9.00E-02	
	REPAIR		1.03E-3	1.03E-03	
	EPVNTINT		2.35E-5	2.35E-05	
67)	8HOUSE04	2.2E-6	.60	6.00E-01	2.52E-11
	8PRREGHW*		1	1.93E-02	
	IGNITION		.09	9.00E-02	
	REPAIR		1.03E-3	1.03E-03	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
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EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
68) 9FC121HW*	MECHANICAL FAULT OF TANK 49 FLOW CONTROL VALVE 1251FV	8.5E-6	2	1.49E-01	2.49E-11
9FC122TM	TANK 49 FLOW CONTROL VALVE 1252FV UNAVAILABLE DUE TO MAINTENANCE	3.6E-3	2	7.20E-03	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRM	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
69) 9FC121HW*	MECHANICAL FAULT OF TANK 49 FLOW CONTROL VALVE 1251FV	8.5E-6	2	1.49E-01	2.49E-11
9PRPV2TM	TANK 49 PRESSURE REGULATING VALVE 1255PV2 UNAVAILABLE DUE TO MAINT	3.6E-3	2	7.20E-03	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRM	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
70) 8AZO21HW*	TANK 48 O2 ANALYZER 1 HARDWARE FAULTS	3.0E-4	2	5.26E+00	2.47E-11
8AZO22TM	TANK 48 O2 ANALYZER 2 UNAVAILABLE DUE TO MAINTENANCE	1.8E-3	2	3.60E-03	
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
71) 9FLHP2HW*	LOCAL FAULT OF TANK 49 HEPA FILTER 2	1.0E-6	1	8.76E-03	1.91E-11
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
HEPA	PROBABILITY OF NOT REPLACING/REPAIRING HEPA FILTER IS NEGLIGIBLE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
72) 9FC511HW	FLOW CONTROL VALVE 1251PV1 MECHANICAL FAULT	8.5E-6	3	9.18E-03	1.59E-11
9FC512HW*	FLOW CONTROL VALVE 1251PV2 MECHANICAL FAULT	8.5E-6	1	7.45E-02	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRM	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
73) 9FC511HW	FLOW CONTROL VALVE 1251PV1 MECHANICAL FAULT	8.5E-6	3	9.18E-03	1.50E-11
9FN512HW*	TANK 49 EXHAUST FAN Y349-52-12 FAILS TO RUN DUE TO MECHANICAL FAUL	8.0E-6	1	7.01E-02	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRM	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
74) 8DMDMHW*	LOCAL FAULTS OF TANK 48 DEMISTER	3.6E-6	1	3.15E-02	1.37E-11
8HOUSE02	NO ACTION TAKEN FOR 48 HOURS		1	1.00E+00	
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
HEPA	PROBABILITY OF NOT REPLACING/REPAIRING HEPA FILTER IS NEGLIGIBLE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
75) 8DMDMHW*	LOCAL FAULTS OF TANK 48 DEMISTER	3.6E-6	1	3.15E-02	1.37E-11
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
8HOUSE02	NO ACTION TAKEN FOR 48 HOURS		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
HEPA	PROBABILITY OF NOT REPLACING/REPAIRING HEPA FILTER IS NEGLIGIBLE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
76) 8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	1.34E-11
8VSVACHW*	TANK 48 VACUUM SENSOR FAILS AND CLOSES FAN FLOW CONTROL VALVES	3.5E-6	1	3.07E-02	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
77) 8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	1.34E-11
8VSVACHW*	TANK 48 VACUUM SENSOR FAILS AND CLOSES FAN FLOW CONTROL VALVES	3.5E-6	1	3.07E-02	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
78) 9FCS11TM	FLOW CONTROL VALVE 1251PV1 MAINTENANCE	3.6E-3	2	7.20E-03	1.25E-11
9FCS12HW*	FLOW CONTROL VALVE 1251PV2 MECHANICAL FAULT	8.5E-6	1	7.45E-02	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
79) 9FCS11TM	FLOW CONTROL VALVE 1251PV1 MAINTENANCE	3.6E-3	2	7.20E-03	1.17E-11
9FN512HW*	TANK 49 EXHAUST FAN Y349-52-12 FAILS TO RUN DUE TO MECHANICAL FAUL	8.0E-6	1	7.01E-02	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
80) 8CNCONHW*	LOCAL FAULTS OF TANK 48 CONDENSER	3.0E-6	1	2.63E-02	1.14E-11
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
8HOUSE02	NO ACTION TAKEN FOR 48 HOURS		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
HEPA	PROBABILITY OF NOT REPLACING/REPAIRING HEPA FILTER IS NEGLIGIBLE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
81) 8CNCONHW*	LOCAL FAULTS OF TANK 48 CONDENSER	3.0E-6	1	2.63E-02	1.14E-11
8HOUSE02	NO ACTION TAKEN FOR 48 HOURS		1	1.00E+00	
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
HEPA	PROBABILITY OF NOT REPLACING/REPAIRING HEPA FILTER IS NEGLIGIBLE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
82) 8FLHP2HW*	LOCAL FAULT OF HEPA FILTER 2	1.0E-6	1	8.76E-03	1.14E-11
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
83) 8FSNFAHW*	TANK 48 NITROGEN FLOW SENSOR FOR LINE A FAILS DUE TO LOCAL FAULTS	1.2E-4	2	2.10E+00	1.83E-11
8FSNFBHW	TANK 48 NITROGEN FLOW SENSOR FOR LINE B FAILS DUE TO LOCAL FAULTS	1.2E-4	7	2.00E-02	
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
8OPC-HS	OPERATOR FAILS TO ENTER FIELD CONTROL MODE (HIGH STRESS LEVELS)		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
84) 8FSNFAHW*	TANK 48 NITROGEN FLOW SENSOR FOR LINE A FAILS DUE TO LOCAL FAULTS	1.2E-4	2	2.10E+00	1.83E-11
8FSNFBHW	TANK 48 NITROGEN FLOW SENSOR FOR LINE B FAILS DUE TO LOCAL FAULTS	1.2E-4	7	2.00E-02	
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
8OPC-HS	OPERATOR FAILS TO ENTER FIELD CONTROL MODE (HIGH STRESS LEVELS)		1	1.00E+00	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
85) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	7.82E-12
NOPTRNBS	OPERATOR FAILS TO ALIGN TRAIN B FOR OPERATION - SUPPLY SIDE		1	1.00E+00	
NVPVPAHW*	FAILURE OF VAPORIZER A DUE TO HARDWARE FAULTS	4.1E-7	1	3.59E-03	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
86) 9FC122TM	TANK 49 FLOW CONTROL VALVE 1252FV UNAVAILABLE DUE TO MAINTENANCE	3.6E-3	2	7.20E-03	6.46E-12
9PRPV1HW*	MECHANICAL FAULTS OF TANK 49 PRESSURE REGULATING VALVE 1255PV1	2.2E-6	2	3.85E-02	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
87) 9PRPV1HW*	MECHANICAL FAULTS OF TANK 49 PRESSURE REGULATING VALVE 1255PV1	2.2E-6	2	3.85E-02	6.46E-12
9PRPV2TM	TANK 49 PRESSURE REGULATING VALVE 1255PV2 UNAVAILABLE DUE TO MAINT	3.6E-3	2	7.20E-03	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
88) 9FC512HW*	FLOW CONTROL VALVE 1251PV2 MECHANICAL FAULT	8.5E-6	1	7.45E-02	6.24E-12
9FN511TM	TANK 49 EXHAUST FAN Y349-52-11 UNAVAILABLE DUE TO MAINTENANCE	1.8E-3	2	3.60E-03	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
89) 9FN511TM	TANK 49 EXHAUST FAN Y349-52-11 UNAVAILABLE DUE TO MAINTENANCE	1.8E-3	2	3.60E-03	5.87E-12
9FN512HW*	TANK 49 EXHAUST FAN Y349-52-12 FAILS TO RUN DUE TO MECHANICAL FAUL	8.0E-6	1	7.01E-02	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
90) 8FC121HW*	MECHANICAL FAULT OF TANK 48 FLOW CONTROL VALVE 1201FV	8.5E-6	2	1.49E-01	4.99E-12
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
8PRPV2TM	TANK 48 PRESSURE REGULATING VALVE 1205PV2 UNAVAILABLE DUE TO MAINT	3.6E-3	2	7.20E-03	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
91) 8FC121HW*	MECHANICAL FAULT OF TANK 48 FLOW CONTROL VALVE 1201FV	8.5E-6	2	1.49E-01	4.99E-12
8FC122TM	TANK 48 FLOW CONTROL VALVE 1202FV UNAVAILABLE DUE TO MAINTENANCE	3.6E-3	2	7.20E-03	
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
92) 8FC121HW*	MECHANICAL FAULT OF TANK 48 FLOW CONTROL VALVE 1201FV	8.5E-6	2	1.49E-01	4.99E-12
8FC122TM	TANK 48 FLOW CONTROL VALVE 1202FV UNAVAILABLE DUE TO MAINTENANCE	3.6E-3	2	7.20E-03	
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
93) 8FC121HW*	MECHANICAL FAULT OF TANK 48 FLOW CONTROL VALVE 1201FV	8.5E-6	2	1.49E-01	4.99E-12

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
8PRPV2TM	TANK 48 PRESSURE REGULATING VALVE 1205PV2 UNAVAILABLE DUE TO MAINT	3.6E-3	2	7.20E-03	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRM	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
94) 9FC121HW*	MECHANICAL FAULT OF TANK 49 FLOW CONTROL VALVE 1251FV	8.5E-6	2	1.49E-01	4.94E-12
9FC122HW	MECHANICAL FAULT OF TANK 49 FLOW CONTROL VALVE 1252FV	8.5E-6	7	1.43E-03	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRM	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
95) 8FLHP2HW*	LOCAL FAULT OF HEPA FILTER 2	1.0E-6	1	8.76E-03	3.82E-12
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
HEPA	PROBABILITY OF NOT REPLACING/REPAIRING HEPA FILTER IS NEGLIGIBLE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
96) 8FLHP2HW*	LOCAL FAULT OF HEPA FILTER 2	1.0E-6	1	8.76E-03	3.82E-12
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
HEPA	PROBABILITY OF NOT REPLACING/REPAIRING HEPA FILTER IS NEGLIGIBLE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
97) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	3.23E-12
NPR245TM	PRESSURE REGULATING VALVE 2045PV MAINTENANCE	3.6E-3	2	7.20E-03	
NPR246HW*	PRESSURE REGULATING VALVE 2046PV FAILS	2.2E-6	1	1.93E-02	
REPAIRM	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
98) 8FC111HW	FLOW CONTROL VALVE 1211PV1 MECHANICAL FAULT (MODE C)	8.5E-6	3	9.18E-03	3.18E-12
8FC112HW*	FLOW CONTROL VALVE 1211PV2 MECHANICAL FAULT	8.5E-6	1	7.45E-02	
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRM	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
99) 8FC111HW	FLOW CONTROL VALVE 1211PV1 MECHANICAL FAULT (MODE C)	8.5E-6	3	9.18E-03	3.18E-12
8FC112HW*	FLOW CONTROL VALVE 1211PV2 MECHANICAL FAULT	8.5E-6	1	7.45E-02	
6HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRM	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
100) 8FC111HW	FLOW CONTROL VALVE 1211PV1 MECHANICAL FAULT (MODE C)	8.5E-6	3	9.18E-03	2.99E-12
8FN528HW*	TANK 48 EXHAUST FAN Y348-52-8 FAILS TO RUN DUE TO MECHANICAL FAULT	8.0E-6	1	7.01E-02	
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRM	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
101) 8FC111HW	FLOW CONTROL VALVE 1211PV1 MECHANICAL FAULT (MODE C)	8.5E-6	3	9.18E-03	2.99E-12
8FN528HW*	TANK 48 EXHAUST FAN Y348-52-8 FAILS TO RUN DUE TO MECHANICAL FAULT	8.0E-6	1	7.01E-02	
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
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	IGNITION		.09	9.00E-02	
	REPAIR		.011	1.10E-02	
	EPVNTINT		2.35E-5	2.35E-05	
102)	8FC111TM	3.6E-3	2	7.20E-03	2.49E-12
	8FC112HW*	8.5E-6	1	7.45E-02	
	8HOUSE01		.2	2.00E-01	
	IGNITION		.09	9.00E-02	
	REPAIR		.011	1.10E-02	
	EPVNTINT		2.35E-5	2.35E-05	
103)	8FC111TM	3.6E-3	2	7.20E-03	2.49E-12
	8FC112HW*	8.5E-6	1	7.45E-02	
	8HOUSE03		.20	2.00E-01	
	IGNITION		.09	9.00E-02	
	REPAIR		.011	1.10E-02	
	EPVNTINT		2.35E-5	2.35E-05	
104)	8FC111TM	3.6E-3	2	7.20E-03	2.35E-12
	8FN528HW*	8.0E-6	1	7.01E-02	
	8HOUSE01		.2	2.00E-01	
	IGNITION		.09	9.00E-02	
	REPAIR		.011	1.10E-02	
	EPVNTINT		2.35E-5	2.35E-05	
105)	8FC111TM	3.6E-3	2	7.20E-03	2.35E-12
	8FN528HW*	8.0E-6	1	7.01E-02	
	8HOUSE03		.20	2.00E-01	
	IGNITION		.09	9.00E-02	
	REPAIR		.011	1.10E-02	
	EPVNTINT		2.35E-5	2.35E-05	
106)	9FC512HW*	8.5E-6	1	7.45E-02	2.33E-12
	9FN511HW	8.0E-6	7	1.34E-03	
	IGNITION		.09	9.00E-02	
	REPAIR		.011	1.10E-02	
	EPVNTINT		2.35E-5	2.35E-05	
107)	9FN511HW	8.0E-6	7	1.34E-03	2.19E-12
	9FN512HW*	8.0E-6	1	7.01E-02	
	IGNITION		.09	9.00E-02	
	REPAIR		.011	1.10E-02	
	EPVNTINT		2.35E-5	2.35E-05	
108)	8FC121HW*	8.5E-6	2	1.49E-01	1.40E-12
	8FC122TM	3.6E-3	2	7.20E-03	
	8HOUSE04		.60	6.00E-01	
	IGNITION		.09	9.00E-02	
	REPAIR		1.03E-3	1.03E-03	
	EPVNTINT		2.35E-5	2.35E-05	
109)	8FC121HW*	8.5E-6	2	1.49E-01	1.40E-12
	8HOUSE04		.60	6.00E-01	
	8PRPV2TM	3.6E-3	2	7.20E-03	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
	IGNITION		.09	9.00E-02	
	REPAIR		1.03E-3	1.03E-03	
	EPVNTINT		2.35E-5	2.35E-05	
110) 8FC122TM	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR	3.6E-3	2	7.20E-03	1.29E-12
	TANK 48 FLOW CONTROL VALVE 1202FV UNAVAILABLE DUE TO MAINTENANCE				
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
8PRPV1HW*	MECHANICAL FAULTS OF TANK 48 PRESSURE REGULATING VALVE 1205PV1	2.2E-6	2	3.85E-02	
	IGNITION		.09	9.00E-02	
	REPAIR		.011	1.10E-02	
	EPVNTINT		2.35E-5	2.35E-05	
111) 8FC122TM	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR	3.6E-3	2	7.20E-03	1.29E-12
	TANK 48 FLOW CONTROL VALVE 1202FV UNAVAILABLE DUE TO MAINTENANCE				
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
8PRPV1HW*	MECHANICAL FAULTS OF TANK 48 PRESSURE REGULATING VALVE 1205PV1	2.2E-6	2	3.85E-02	
	IGNITION		.09	9.00E-02	
	REPAIR		.011	1.10E-02	
	EPVNTINT		2.35E-5	2.35E-05	
112) 8HOUSE01	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR	2.2E-6	2	3.85E-02	1.29E-12
	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)				
8PRPV1HW*	MECHANICAL FAULTS OF TANK 48 PRESSURE REGULATING VALVE 1205PV1	2.2E-6	2	3.85E-02	
8PRPV2TM	TANK 48 PRESSURE REGULATING VALVE 1205PV2 UNAVAILABLE DUE TO MAINT	3.6E-3	2	7.20E-03	
	IGNITION		.09	9.00E-02	
	REPAIR		.011	1.10E-02	
	EPVNTINT		2.35E-5	2.35E-05	
113) 8HOUSE03	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		.20	2.00E-01	1.29E-12
	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE				
8PRPV1HW*	MECHANICAL FAULTS OF TANK 48 PRESSURE REGULATING VALVE 1205PV1	2.2E-6	2	3.85E-02	
8PRPV2TM	TANK 48 PRESSURE REGULATING VALVE 1205PV2 UNAVAILABLE DUE TO MAINT	3.6E-3	2	7.20E-03	
	IGNITION		.09	9.00E-02	
	REPAIR		.011	1.10E-02	
	EPVNTINT		2.35E-5	2.35E-05	
114) 9FC121HW*	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR	8.5E-6	2	1.49E-01	1.28E-12
	MECHANICAL FAULT OF TANK 49 FLOW CONTROL VALVE 1251FV				
9PRPV2HW	MECHANICAL FAULTS OF TANK 49 PRESSURE REGULATING VALVE 1255PV2	2.2E-6	7	3.70E-04	
	IGNITION		.09	9.00E-02	
	REPAIR		.011	1.10E-02	
	EPVNTINT		2.35E-5	2.35E-05	
115) 9FC122HW	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR	8.5E-6	7	1.43E-03	1.28E-12
	MECHANICAL FAULT OF TANK 49 FLOW CONTROL VALVE 1252FV				
9PRPV1HW*	MECHANICAL FAULTS OF TANK 49 PRESSURE REGULATING VALVE 1255PV1	2.2E-6	2	3.85E-02	
	IGNITION		.09	9.00E-02	
	REPAIR		.011	1.10E-02	
	EPVNTINT		2.35E-5	2.35E-05	
116) 8FC112HW*	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR	8.5E-6	1	7.45E-02	1.25E-12
	FLOW CONTROL VALVE 1211PV2 MECHANICAL FAULT				
8FN527TM	TANK 48 EXHAUST FAN Y348-52-7 UNAVAILABLE DUE TO MAINTENANCE	1.8E-3	2	3.60E-03	
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
	IGNITION		.09	9.00E-02	
	REPAIR		.011	1.10E-02	
	EPVNTINT		2.35E-5	2.35E-05	
117) 8FC112HW*	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR	8.5E-6	1	7.45E-02	1.25E-12
	FLOW CONTROL VALVE 1211PV2 MECHANICAL FAULT				
8FN527TM	TANK 48 EXHAUST FAN Y348-52-7 UNAVAILABLE DUE TO MAINTENANCE	1.8E-3	2	3.60E-03	
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
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IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRM	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
118) 8FN527TM	TANK 48 EXHAUST FAN Y348-52-7 UNAVAILABLE DUE TO MAINTENANCE	1.8E-3	2	3.60E-03	1.17E-12
8FN528HW*	TANK 48 EXHAUST FAN Y348-52-8 FAILS TO RUN DUE TO MECHANICAL FAULT	8.0E-6	1	7.01E-02	
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRM	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
119) 8FN527TM	TANK 48 EXHAUST FAN Y348-52-7 UNAVAILABLE DUE TO MAINTENANCE	1.8E-3	2	3.60E-03	1.17E-12
8FN528HW*	TANK 48 EXHAUST FAN Y348-52-8 FAILS TO RUN DUE TO MECHANICAL FAULT	8.0E-6	1	7.01E-02	
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRM	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
120) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	1.07E-12
NPR245HW	PRESSURE REGULATING VALVE 2045PV FAILS	2.2E-6	3	2.38E-03	
NPR246HW*	PRESSURE REGULATING VALVE 2046PV FAILS	2.2E-6	1	1.93E-02	
REPAIRM	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
121) 8FC121HW*	MECHANICAL FAULT OF TANK 48 FLOW CONTROL VALVE 1201FV	8.5E-6	2	1.49E-01	9.89E-13
8FC122HW	MECHANICAL FAULT OF TANK 48 FLOW CONTROL VALVE 1202FV	8.5E-6	7	1.43E-03	
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRM	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
122) 8FC121HW*	MECHANICAL FAULT OF TANK 48 FLOW CONTROL VALVE 1201FV	8.5E-6	2	1.49E-01	9.89E-13
8FC122HW	MECHANICAL FAULT OF TANK 48 FLOW CONTROL VALVE 1202FV	8.5E-6	7	1.43E-03	
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRM	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
123) 8FC111HW	FLOW CONTROL VALVE 1211PV1 MECHANICAL FAULT (MODE C)	8.5E-6	3	9.18E-03	8.93E-13
8FC112HW*	FLOW CONTROL VALVE 1211PV2 MECHANICAL FAULT	8.5E-6	1	7.45E-02	
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRM	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
124) 8FC111HW	FLOW CONTROL VALVE 1211PV1 MECHANICAL FAULT (MODE C)	8.5E-6	3	9.18E-03	8.41E-13
8FN528HW*	TANK 48 EXHAUST FAN Y348-52-8 FAILS TO RUN DUE TO MECHANICAL FAULT	8.0E-6	1	7.01E-02	
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRM	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
125) 9FC512HW*	FLOW CONTROL VALVE 1251PV2 MECHANICAL FAULT	8.5E-6	1	7.45E-02	8.32E-13
9FN511ST	TANK 49 EXHAUST FAN Y349-52-11 FAILS TO START DUE TO MECHANICAL FA	4.8E-4	1	4.80E-04	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
	IGNITION		.09	9.00E-02	
	REPAIR		.011	1.10E-02	
	EPVNTINT		2.35E-5	2.35E-05	
126)	9FN511ST	4.8E-4	1	4.80E-04	7.83E-13
	9FN512HW*	8.0E-6	1	7.01E-02	
	IGNITION		.09	9.00E-02	
	REPAIR		.011	1.10E-02	
	EPVNTINT		2.35E-5	2.35E-05	
127)	8FC111TM	3.6E-3	2	7.20E-03	7.01E-13
	8FC112HW*	8.5E-6	1	7.45E-02	
	8HOUSE04		.60	6.00E-01	
	IGNITION		.09	9.00E-02	
	REPAIR		1.03E-3	1.03E-03	
	EPVNTINT		2.35E-5	2.35E-05	
128)	8FC111TM	3.6E-3	2	7.20E-03	6.60E-13
	8FN528HW*	8.0E-6	1	7.01E-02	
	8HOUSE04		.60	6.00E-01	
	IGNITION		.09	9.00E-02	
	REPAIR		1.03E-3	1.03E-03	
	EPVNTINT		2.35E-5	2.35E-05	
129)	IGNITION		.09	9.00E-02	4.69E-13
	NTKTKAHW*	2.3E-9	1	2.01E-05	
	REPAIR		.011	1.10E-02	
	EPVNTINT		2.35E-5	2.35E-05	
130)	8FC112HW*	8.5E-6	1	7.45E-02	4.65E-13
	8FN527HW	8.0E-6	7	1.34E-03	
	8HOUSE01		.2	2.00E-01	
	IGNITION		.09	9.00E-02	
	REPAIR		.011	1.10E-02	
	EPVNTINT		2.35E-5	2.35E-05	
131)	8FC112HW*	8.5E-6	1	7.45E-02	4.65E-13
	8FN527HW	8.0E-6	7	1.34E-03	
	8HOUSE03		.20	2.00E-01	
	IGNITION		.09	9.00E-02	
	REPAIR		.011	1.10E-02	
	EPVNTINT		2.35E-5	2.35E-05	
132)	8FN527HW	8.0E-6	7	1.34E-03	4.38E-13
	8FN528HW*	8.0E-6	1	7.01E-02	
	8HOUSE03		.20	2.00E-01	
	IGNITION		.09	9.00E-02	
	REPAIR		.011	1.10E-02	
	EPVNTINT		2.35E-5	2.35E-05	
133)	8FN527HW	8.0E-6	7	1.34E-03	4.38E-13
	8FN528HW*	8.0E-6	1	7.01E-02	
	8HOUSE01		.2	2.00E-01	
	IGNITION		.09	9.00E-02	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
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REPAIRM	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
134) 9HOUSE02	NO ACTION TAKEN FOR 48 HRS		1	1.00E+00	3.82E-13
9HTHTRHW*	LOCAL MECHANICAL FAULTS OF TANK 49 HEATER	2.0E-8	1	1.75E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
HEPA	PROBABILITY OF NOT REPLACING/REPAIRING HEPA FILTER IS NEGLIGIBLE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
135) 8FC122TM	TANK 48 FLOW CONTROL VALVE 1202FV UNAVAILABLE DUE TO MAINTENANCE	3.6E-3	2	7.20E-03	3.63E-13
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
8PRPV1HW*	MECHANICAL FAULTS OF TANK 48 PRESSURE REGULATING VALVE 1205PV1	2.2E-6	2	3.85E-02	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRM	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
136) 8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	3.63E-13
8PRPV1HW*	MECHANICAL FAULTS OF TANK 48 PRESSURE REGULATING VALVE 1205PV1	2.2E-6	2	3.85E-02	
8PRPV2TM	TANK 48 PRESSURE REGULATING VALVE 1205PV2 UNAVAILABLE DUE TO MAINT	3.6E-3	2	7.20E-03	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRM	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
137) 8FC112HW*	FLOW CONTROL VALVE 1211PV2 MECHANICAL FAULT	8.5E-6	1	7.45E-02	3.50E-13
8FN527TM	TANK 48 EXHAUST FAN Y348-52-7 UNAVAILABLE DUE TO MAINTENANCE	1.8E-3	2	3.60E-03	
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRM	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
138) 9PRPV1HW*	MECHANICAL FAULTS OF TANK 49 PRESSURE REGULATING VALVE 1255PV1	2.2E-6	2	3.85E-02	3.31E-13
9PRPV2HW	MECHANICAL FAULTS OF TANK 49 PRESSURE REGULATING VALVE 1255PV2	2.2E-6	7	3.70E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRM	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
139) 8FN527TM	TANK 48 EXHAUST FAN Y348-52-7 UNAVAILABLE DUE TO MAINTENANCE	1.8E-3	2	3.60E-03	3.30E-13
8FN528HW*	TANK 48 EXHAUST FAN Y348-52-8 FAILS TO RUN DUE TO MECHANICAL FAULT	8.0E-6	1	7.01E-02	
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRM	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
140) 8FC121HW*	MECHANICAL FAULT OF TANK 48 FLOW CONTROL VALVE 1201FV	8.5E-6	2	1.49E-01	2.78E-13
8FC122HW	MECHANICAL FAULT OF TANK 48 FLOW CONTROL VALVE 1202FV	8.5E-6	7	1.43E-03	
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRM	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
141) 9OPTRNBE	OPERATOR FAILS TO ALIGN AND START TRAIN B FOR OPERATION - EXHAUST		1	1.00E+00	2.67E-13
9XVV22PG*	MANUAL VALVE T49-HV22 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRM	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	

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142) EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
9OPTNRNBE	OPERATOR FAILS TO ALIGN AND START TRAIN B FOR OPERATION - EXHAUST		1	1.00E+00	2.67E-13
9XVV20PG*	MANUAL VALVE T49-HV20 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
143) 9XVHV2PG*	MANUAL VALVE T49-HV2 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	2.67E-13
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
144) 9XVHV9PG*	TANK 49 O2 ANALYZER DISCHARGE VALVE T49-HV9 FAILS TO REMAIN OPEN (	1.4E-8	1	1.23E-04	2.67E-13
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
145) 9XVN10PG*	MANUAL VALVE T49-N10 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	2.67E-13
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
146) 9XVN24PG*	TANK 49 TANK INLET VALVE T49-N24 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	2.67E-13
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
147) 9XVV15PG*	MANUAL VALVE T49-HV15 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	2.67E-13
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
148) 9XVV17PG*	MANUAL VALVE T49-HV17 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	2.67E-13
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
149) 9XVV33PG*	MANUAL VALVE T49-HV33 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	2.67E-13
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
150) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	2.67E-13
NOPTRNBS	OPERATOR FAILS TO ALIGN TRAIN B FOR OPERATION - SUPPLY SIDE		1	1.00E+00	
NXVN24PG*	PATH A INLET VALVE N24 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
151) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	2.67E-13
NOPTRNBS	OPERATOR FAILS TO ALIGN TRAIN B FOR OPERATION - SUPPLY SIDE		1	1.00E+00	
NXVN20PG*	PATH A OUTLET VALVE N20 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
152) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	2.67E-13
NOPTRNBS	OPERATOR FAILS TO ALIGN TRAIN B FOR OPERATION - SUPPLY SIDE		1	1.00E+00	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.				
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	NXVN46PG* REPAIRN EPVNTINT	1.4E-8	1 1.03E-3 2.35E-5	1.23E-04 1.03E-03 2.35E-05					
153)	IGNITION NOPTRNBS NXVN26PG* REPAIRN EPVNTINT		.09 1 1 1.03E-3 2.35E-5	9.00E-02 1.00E+00 1.23E-04 1.03E-03 2.35E-05	2.67E-13				
	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT								
154)	IGNITION NXVN12PG* REPAIRN EPVNTINT	1.4E-8	1 1.03E-3 2.35E-5	1.23E-04 1.03E-03 2.35E-05	2.67E-13				
	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02					
155)	IGNITION NXVN92PG* REPAIRN EPVNTINT	1.4E-8	1 1.03E-3 2.35E-5	1.23E-04 1.03E-03 2.35E-05	2.67E-13				
	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02					
156)	IGNITION NOPTRNBS NXV032PG* REPAIRN EPVNTINT	1.4E-8	1 1.03E-3 2.35E-5	1.23E-04 1.03E-03 2.35E-05	2.67E-13				
	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02					
157)	8FC121HW* 8HOUSE01 8PRPV2HW IGNITION REPAIRN EPVNTINT	8.5E-6 2.2E-6	2 7 .09	1.49E-01 3.70E-04 9.00E-02	2.56E-13				
	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01					
158)	8FC121HW* 8HOUSE03 8PRPV2HW IGNITION REPAIRN EPVNTINT	8.5E-6	2 .20	1.49E-01 2.00E-01	2.56E-13				
	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01					
159)	8FC122HW 8HOUSE03 8PRPV1HW* IGNITION REPAIRN EPVNTINT	8.5E-6 2.2E-6	7 2 .09	1.43E-03 3.85E-02 9.00E-02	2.56E-13				
	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02					
160)	8FC122HW 8HOUSE01 8PRPV1HW* IGNITION REPAIRN EPVNTINT	8.5E-6	7 .2	1.43E-03 2.00E-01	2.56E-13				
	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01					
161)	8HOUSE02	2.2E-6	2 .09 2.35E-5	3.85E-02 9.00E-02 2.35E-05	2.29E-13				
	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02					
	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02					
	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05					
	MECHANICAL FAULT OF TANK 48 FLOW CONTROL VALVE 1202FV		7	1.43E-03					
	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01					
	MECHANICAL FAULTS OF TANK 48 PRESSURE REGULATING VALVE 1205PV1		2	3.85E-02					
	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02					
	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02					
	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05					
	NO ACTION TAKEN FOR 48 HOURS		1	1.00E+00					

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
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8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
8HTHTRHW*	LOCAL MECHANICAL FAULTS OF TANK 48 HEATER	2.0E-8	1	1.75E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
162) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	2.04E-13
NPPNONBK*	NON-ISOLABLE GUILLOTINE PIPE BREAK	1.0E-9	1	8.76E-06	
REPAIRM	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
163) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	2.04E-13
NPPDIVBK*	ISOLABLE GUILLOTINE PIPE BREAK	1.0E-9	1	8.76E-06	
REPAIRM	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
164) 8FC112HW*	FLOW CONTROL VALVE 1211PV2 MECHANICAL FAULT	8.5E-6	1	7.45E-02	1.66E-13
8FN527ST	TANK 48 EXHAUST FAN Y348-52-7 FAILS TO START DUE TO MECHANICAL FAU	4.8E-4	1	4.80E-04	
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRM	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
165) 8FC112HW*	FLOW CONTROL VALVE 1211PV2 MECHANICAL FAULT	8.5E-6	1	7.45E-02	1.66E-13
8FN527ST	TANK 48 EXHAUST FAN Y348-52-7 FAILS TO START DUE TO MECHANICAL FAU	4.8E-4	1	4.80E-04	
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRM	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
166) 8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	1.60E-13
8XVV17PG*	MANUAL VALVE T48-HV17 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
167) 8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	1.60E-13
8XVHV9PG*	TANK 48 O2 ANALYZER DISCHARGE VALVE T48-HV9 FAILS TO REMAIN OPEN (	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
168) 8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	1.60E-13
8XVHV2PG*	MANUAL VALVE T48-HV2 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
169) 8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	1.60E-13
8XVN31PG*	TANK 48 TANK INLET VALVE T48-N31 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
170) 8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	1.60E-13

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
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8XV8N2PG*	TANK 48 VALVE T48-N2 FROM THE NITROGEN SUPPLY FAILS TO REMAIN OPEN	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
171) 8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	1.60E-13
8XVV33PG*	MANUAL VALVE T48-HV33 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
172) 8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	1.60E-13
8OPTRNBE	OPERATOR FAILS TO ALIGN AND START TRAIN B FOR OPERATION - EXHAUST		1	1.00E+00	
8XVV20PG*	MANUAL VALVE T48-HV20 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
173) 8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	1.60E-13
8OPTRNBE	OPERATOR FAILS TO ALIGN AND START TRAIN B FOR OPERATION - EXHAUST		1	1.00E+00	
8XVV22PG*	MANUAL VALVE T48-HV22 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
174) 8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	1.60E-13
8XVV15PG*	MANUAL VALVE T48-HV15 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
175) 8FN527ST	TANK 48 EXHAUST FAN Y348-52-7 FAILS TO START DUE TO MECHANICAL FAU	4.8E-4	1	4.80E-04	1.57E-13
8FN528HW*	TANK 48 EXHAUST FAN Y348-52-8 FAILS TO RUN DUE TO MECHANICAL FAULT	8.0E-6	1	7.01E-02	
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRM	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
176) 8FN527ST	TANK 48 EXHAUST FAN Y348-52-7 FAILS TO START DUE TO MECHANICAL FAU	4.8E-4	1	4.80E-04	1.57E-13
8FN528HW*	TANK 48 EXHAUST FAN Y348-52-8 FAILS TO RUN DUE TO MECHANICAL FAULT	8.0E-6	1	7.01E-02	
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRM	PROBABILITY OF NOT PERFORMING A MODERATE REPAIR PROCEDURE		.011	1.10E-02	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
177) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	2.89E-15
NPR246HW*	PRESSURE REGULATING VALVE 2046PV FAILS	2.2E-6	1	1.93E-02	
NVPVPBHW	FAILURE OF VAPORIZER B DUE TO HARDWARE FAULTS	4.1E-7	7	6.89E-05	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
178) 8FC112HW*	FLOW CONTROL VALVE 1211PV2 MECHANICAL FAULT	8.5E-6	1	7.45E-02	1.31E-13
8FN527HW	TANK 48 EXHAUST FAN Y348-52-7 FAILS TO RUN FOR 6 DAYS	8.0E-6	7	1.34E-03	
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
	IGNITION		.09	9.00E-02	
	REPAIRN		1.03E-3	1.03E-03	
	EPVNTINT		2.35E-5	2.35E-05	
179)	8FN527HW	8.0E-6	7	1.34E-03	1.23E-13
	8FN528HW*	8.0E-6	1	7.01E-02	
	8HOUSE04		.60	6.00E-01	
	IGNITION		.09	9.00E-02	
	REPAIRN		1.03E-3	1.03E-03	
	EPVNTINT		2.35E-5	2.35E-05	
180)	8HOUSE01		.2	2.00E-01	7.63E-14
	8HOUSE02		1	1.00E+00	
	8HTHTRHW*	2.0E-8	1	1.75E-04	
	IGNITION		.09	9.00E-02	
	HEPA		1.03E-3	1.03E-03	
	EPVNTINT		2.35E-5	2.35E-05	
181)	8HOUSE02		1	1.00E+00	7.63E-14
	8HOUSE03		.20	2.00E-01	
	8HTHTRHW*	2.0E-8	1	1.75E-04	
	IGNITION		.09	9.00E-02	
	HEPA		1.03E-3	1.03E-03	
	EPVNTINT		2.35E-5	2.35E-05	
182)	8FC121HW*	8.5E-6	2	1.49E-01	7.19E-14
	8HOUSE04		.60	6.00E-01	
	8PRPV2HW	2.2E-6	7	3.70E-04	
	IGNITION		.09	9.00E-02	
	REPAIRN		1.03E-3	1.03E-03	
	EPVNTINT		2.35E-5	2.35E-05	
183)	8FC122HW	8.5E-6	7	1.43E-03	7.19E-14
	8HOUSE04		.60	6.00E-01	
	8PRPV1HW*	2.2E-6	2	3.85E-02	
	IGNITION		.09	9.00E-02	
	REPAIRN		1.03E-3	1.03E-03	
	EPVNTINT		2.35E-5	2.35E-05	
184)	8HOUSE01		.2	2.00E-01	6.63E-14
	8PRPV1HW*	2.2E-6	2	3.85E-02	
	8PRPV2HW	2.2E-6	7	3.70E-04	
	IGNITION		.09	9.00E-02	
	REPAIRM		.011	1.10E-02	
	EPVNTINT		2.35E-5	2.35E-05	
185)	8HOUSE03		.20	2.00E-01	6.63E-14
	8PRPV1HW*	2.2E-6	2	3.85E-02	
	8PRPV2HW	2.2E-6	7	3.70E-04	
	IGNITION		.09	9.00E-02	
	REPAIRM		.011	1.10E-02	
	EPVNTINT		2.35E-5	2.35E-05	
186)	IGNITION		.09	9.00E-02	5.68E-14

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
NPR245TM	PRESSURE REGULATING VALVE 2045PV MAINTENANCE	3.6E-3	2	7.20E-03	
NVPVPAHW*	FAILURE OF VAPORIZER A DUE TO HARDWARE FAULTS	4.1E-7	1	3.59E-03	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
187) 8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	5.34E-14
8OPTRNBE	OPERATOR FAILS TO ALIGN AND START TRAIN B FOR OPERATION - EXHAUST		1	1.00E+00	
8XVV22PG*	MANUAL VALVE T48-HV22 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
188) 8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	5.34E-14
8XVN31PG*	TANK 48 TANK INLET VALVE T48-N31 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
189) 8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	5.34E-14
8XVV33PG*	MANUAL VALVE T48-HV33 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
190) 8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	5.34E-14
8XVHV2PG*	MANUAL VALVE T48-HV2 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
191) 8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	5.34E-14
8OPTRNBE	OPERATOR FAILS TO ALIGN AND START TRAIN B FOR OPERATION - EXHAUST		1	1.00E+00	
8XVV20PG*	MANUAL VALVE T48-HV20 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
192) 8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	5.34E-14
8XV8N2PG*	TANK 48 VALVE T48-N2 FROM THE NITROGEN SUPPLY FAILS TO REMAIN OPEN	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
193) 8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	5.34E-14
8XVV15PG*	MANUAL VALVE T48-HV15 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
194) 8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	5.34E-14
8XVHV9PG*	TANK 48 O2 ANALYZER DISCHARGE VALVE T48-HV9 FAILS TO REMAIN OPEN (	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
195) 8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	5.34E-14
8XVV17PG*	MANUAL VALVE T48-HV17 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
196) 8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	5.34E-14
8XVV33PG*	MANUAL VALVE T48-HV33 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
197) 8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	5.34E-14
8XVV17PG*	MANUAL VALVE T48-HV17 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
198) 8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	5.34E-14
8XVHV9PG*	TANK 48 O2 ANALYZER DISCHARGE VALVE T48-HV9 FAILS TO REMAIN OPEN (	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
199) 8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	5.34E-14
8XVN31PG*	TANK 48 TANK INLET VALVE T48-N31 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
200) 8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	5.34E-14
8OPTRNBE	OPERATOR FAILS TO ALIGN AND START TRAIN B FOR OPERATION - EXHAUST		1	1.00E+00	
8XVV20PG*	MANUAL VALVE T48-HV20 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
201) 8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	5.34E-14
8XVHV2PG*	MANUAL VALVE T48-HV2 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
202) 8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	5.34E-14
8OPTRNBE	OPERATOR FAILS TO ALIGN AND START TRAIN B FOR OPERATION - EXHAUST		1	1.00E+00	
8XVV22PG*	MANUAL VALVE T48-HV22 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
203) 8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	5.34E-14
8XV8N2PG*	TANK 48 VALVE T48-N2 FROM THE NITROGEN SUPPLY FAILS TO REMAIN OPEN	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
204) EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	5.34E-14
8XVV15PG*	MANUAL VALVE T48-HV15 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
205) 8FC112HW*	FLOW CONTROL VALVE 1211PV2 MECHANICAL FAULT	8.5E-6	1	7.45E-02	4.67E-14
8FN527ST	TANK 48 EXHAUST FAN Y348-52-7 FAILS TO START DUE TO MECHANICAL FAU	4.8E-4	1	4.80E-04	
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
206) 8FN527ST	TANK 48 EXHAUST FAN Y348-52-7 FAILS TO START DUE TO MECHANICAL FAU	4.8E-4	1	4.80E-04	4.40E-14
8FN528HW*	TANK 48 EXHAUST FAN Y348-52-8 FAILS TO RUN DUE TO MECHANICAL FAULT	8.0E-6	1	7.01E-02	
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
207) ignition	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	5.39E-16
nvpvpahw*	FAILURE OF VAPORIZER A DUE TO HARDWARE FAULTS	4.1E-7	1	3.59E-03	
nvpvpbhw	FAILURE OF VAPORIZER B DUE TO HARDWARE FAULTS	4.1E-7	7	6.89E-05	
repairn	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
epvntint	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
208) 9AZO21HW*	TANK 49 O2 ANALYZER 1 HARDWARE FAULTS	3.0E-4	2	5.26E+00	2.69E-14
9XVHV4PG	MANUAL VALVE T49-HV4 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	7	2.35E-06	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
209) 9AZO21HW*	TANK 49 O2 ANALYZER 1 HARDWARE FAULTS	3.0E-4	2	5.26E+00	2.69E-14
9XVV11PG	MANUAL VALVE T49-HV11 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	7	2.35E-06	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
210) 9AZO22HW	TANK 49 O2 ANALYZER 2 HARDWARE FAULTS	3.0E-4	7	4.92E-02	2.63E-14
9XVV10PG*	MANUAL VALVE T49-HV10 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	2	2.45E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
211) 9AZO22HW	TANK 49 O2 ANALYZER 2 HARDWARE FAULTS	3.0E-4	7	4.92E-02	2.63E-14
9XVHV3PG*	MANUAL VALVE T49-HV3 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	2	2.45E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
212) 9FC512HW*	FLOW CONTROL VALVE 1251PV2 MECHANICAL FAULT	8.5E-6	1	7.45E-02	2.60E-14
9XVV19HW	MANUAL VALVE T49-HV19 FAILS TO OPEN ON DEMAND	1.6E-4	1	1.60E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
213) 9FN512HW*	TANK 49 EXHAUST FAN Y349-52-12 FAILS TO RUN DUE TO MECHANICAL FAUL	8.0E-6	1	7.01E-02	2.44E-14
9XVV19HW	MANUAL VALVE T49-HV19 FAILS TO OPEN ON DEMAND	1.6E-4	1	1.60E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
214) 8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	1.86E-14
8PRPV1HW*	MECHANICAL FAULTS OF TANK 48 PRESSURE REGULATING VALVE 1205PV1	2.2E-6	2	3.85E-02	
8PRPV2HW	MECHANICAL FAULTS OF TANK 48 PRESSURE REGULATING VALVE 1205PV2	2.2E-6	7	3.70E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
215) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	1.86E-14
NPR245HW	PRESSURE REGULATING VALVE 2045PV FAILS	2.2E-6	3	2.38E-03	
NVPVPAHW*	FAILURE OF VAPORIZER A DUE TO HARDWARE FAULTS	4.1E-7	1	3.59E-03	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
216) 8AZO21HW*	TANK 48 O2 ANALYZER 1 HARDWARE FAULTS	3.0E-4	2	5.26E+00	1.62E-14
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
8XVV11PGA	MANUAL VALVE T48-HV11 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	7	2.35E-06	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
217) 8AZO21HW*	TANK 48 O2 ANALYZER 1 HARDWARE FAULTS	3.0E-4	2	5.26E+00	1.62E-14
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
8XVHV4PGA	MANUAL VALVE T48-HV4 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	7	2.35E-06	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
218) 8AZO22HWA	TANK 48 O2 ANALYZER 2 HARDWARE FAULTS	3.0E-4	7	4.92E-02	1.58E-14
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
8XVV10PG*	MANUAL VALVE T48-HV10 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	2	2.45E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
219) 8AZO22HWA	TANK 48 O2 ANALYZER 2 HARDWARE FAULTS	3.0E-4	7	4.92E-02	1.58E-14
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
8XVHV3PG*	MANUAL VALVE T48-HV3 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	2	2.45E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
220) 8FC112HW*	FLOW CONTROL VALVE 1211PV2 MECHANICAL FAULT	8.5E-6	1	7.45E-02	1.56E-14
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
8XVV19HW	MANUAL VALVE T48-HV19 FAILS TO OPEN ON DEMAND	1.6E-4	1	1.60E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
221) 8FNS28HW*	TANK 48 EXHAUST FAN Y348-52-8 FAILS TO RUN DUE TO MECHANICAL FAULT	8.0E-6	1	7.01E-02	1.47E-14
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
8XVV19HW	MANUAL VALVE T48-HV19 FAILS TO OPEN ON DEMAND	1.6E-4	1	1.60E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
222) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	6.72E-15
NPR246HW*	PRESSURE REGULATING VALVE 2046PV FAILS	2.2E-6	1	1.93E-02	
NXVN47HW	MANUAL VALVE N47 FAILS TO OPEN ON DEMAND	1.6E-4	1	1.60E-04	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
223) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	6.72E-15
NPR246HW*	PRESSURE REGULATING VALVE 2046PV FAILS	2.2E-6	1	1.93E-02	
NXVN16HW	MANUAL VALVE N16 FAILS TO OPEN ON DEMAND	1.6E-4	1	1.60E-04	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
224) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	6.72E-15
NPR246HW*	PRESSURE REGULATING VALVE 2046PV FAILS	2.2E-6	1	1.93E-02	
NXVN15HW	MANUAL VALVE N15 FAILS TO OPEN	1.6E-4	1	1.60E-04	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
225) 8AZO21HW*	TANK 48 O2 ANALYZER 1 HARDWARE FAULTS	3.0E-4	2	5.26E+00	5.39E-15
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
8XVV11PGA	MANUAL VALVE T48-HV11 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	7	2.35E-06	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
226) 8AZO21HW*	TANK 48 O2 ANALYZER 1 HARDWARE FAULTS	3.0E-4	2	5.26E+00	5.39E-15
8HOUSE01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
8XVHV4PGA	MANUAL VALVE T48-HV4 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	7	2.35E-06	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
227) 8AZO21HW*	TANK 48 O2 ANALYZER 1 HARDWARE FAULTS	3.0E-4	2	5.26E+00	5.39E-15
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
8XVHV4PGA	MANUAL VALVE T48-HV4 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	7	2.35E-06	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
228) 8AZO21HW*	TANK 48 O2 ANALYZER 1 HARDWARE FAULTS	3.0E-4	2	5.26E+00	5.39E-15
8HOUSE03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
8XVV11PGA	MANUAL VALVE T48-HV11 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	7	2.35E-06	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
229) 8AZO22HWA 8HOUSE01 8XVV10PG* IGNITION REPAIRN EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR TANK 48 02 ANALYZER 2 HARDWARE FAULTS CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP) MANUAL VALVE T48-HV10 FAILS TO REMAIN OPEN (PLUG) CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR	3.0E-4 1.4E-8	2.35E-5 7 .2 2 .09	2.35E-05 4.92E-02 2.00E-01 2.45E-04 9.00E-02	5.25E-15
230) 8AZO22HWA 8HOUSE01 8XVHV3PG* IGNITION REPAIRN EPVNTINT	TANK 48 02 ANALYZER 2 HARDWARE FAULTS CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP) MANUAL VALVE T48-HV3 FAILS TO REMAIN OPEN (PLUG) CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR	3.0E-4 1.4E-8	7 .2 2 .09 1.03E-3 2.35E-5	4.92E-02 2.00E-01 2.45E-04 9.00E-02 1.03E-03 2.35E-05	5.25E-15
231) 8AZO22HWA 8HOUSE03 8XVHV3PG* IGNITION REPAIRN EPVNTINT	TANK 48 02 ANALYZER 2 HARDWARE FAULTS CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE MANUAL VALVE T48-HV3 FAILS TO REMAIN OPEN (PLUG) CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR	3.0E-4 1.4E-8	7 .20 2 .09 1.03E-3 2.35E-5	4.92E-02 2.00E-01 2.45E-04 9.00E-02 1.03E-03 2.35E-05	5.25E-15
232) 8AZO22HWA 8HOUSE03 8XVV10PG* IGNITION REPAIRN EPVNTINT	TANK 48 02 ANALYZER 2 HARDWARE FAULTS CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE MANUAL VALVE T48-HV10 FAILS TO REMAIN OPEN (PLUG) CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR	3.0E-4 1.4E-8	7 .20 2 .09 1.03E-3 2.35E-5	4.92E-02 2.00E-01 2.45E-04 9.00E-02 1.03E-03 2.35E-05	5.25E-15
233) 8FC112HW* 8HOUSE03 8XVV19HW IGNITION REPAIRN EPVNTINT	FLOW CONTROL VALVE 1211PV2 MECHANICAL FAULT CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE MANUAL VALVE T48-HV19 FAILS TO OPEN ON DEMAND CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR	8.5E-6 1.6E-4	1 .20 1 .09 1.03E-3 2.35E-5	7.45E-02 2.00E-01 1.60E-04 9.00E-02 1.03E-03 2.35E-05	5.19E-15
234) 8FC112HW* 8HOUSE01 8XVV19HW IGNITION REPAIRN EPVNTINT	FLOW CONTROL VALVE 1211PV2 MECHANICAL FAULT CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP) MANUAL VALVE T48-HV19 FAILS TO OPEN ON DEMAND CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR	8.5E-6 1.6E-4	1 .2 1 .09 1.03E-3 2.35E-5	7.45E-02 2.00E-01 1.60E-04 9.00E-02 1.03E-03 2.35E-05	5.19E-15
235) 8FN528HW* 8HOUSE03 8XVV19HW IGNITION REPAIRN EPVNTINT	TANK 48 EXHAUST FAN Y348-52-8 FAILS TO RUN DUE TO MECHANICAL FAULT CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE MANUAL VALVE T48-HV19 FAILS TO OPEN ON DEMAND CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR	8.0E-6 1.6E-4	1 .20 1 .09 1.03E-3 2.35E-5	7.01E-02 2.00E-01 1.60E-04 9.00E-02 1.03E-03 2.35E-05	4.89E-15
236) 8FN528HW* 8HOUSE01 8XVV19HW	TANK 48 EXHAUST FAN Y348-52-8 FAILS TO RUN DUE TO MECHANICAL FAULT CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP) MANUAL VALVE T48-HV19 FAILS TO OPEN ON DEMAND	8.0E-6 1.6E-4	1 .2 1	7.01E-02 2.00E-01 1.60E-04	4.89E-15

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
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	IGNITION		.09	9.00E-02	
	REPAIRN		1.03E-3	1.03E-03	
	EPVNTINT		2.35E-5	2.35E-05	
237)	9FC122TM	3.6E-3	2	7.20E-03	3.85E-15
	9XVN19PG*	1.4E-8	2	2.45E-04	
	IGNITION		.09	9.00E-02	
	REPAIRN		1.03E-3	1.03E-03	
	EPVNTINT		2.35E-5	2.35E-05	
238)	9FC122TM	3.6E-3	2	7.20E-03	3.85E-15
	9XVN16PG*	1.4E-8	2	2.45E-04	
	IGNITION		.09	9.00E-02	
	REPAIRN		1.03E-3	1.03E-03	
	EPVNTINT		2.35E-5	2.35E-05	
239)	9PRPV2TM	3.6E-3	2	7.20E-03	3.85E-15
	9XVN19PG*	1.4E-8	2	2.45E-04	
	IGNITION		.09	9.00E-02	
	REPAIRN		1.03E-3	1.03E-03	
	EPVNTINT		2.35E-5	2.35E-05	
240)	9PRPV2TM	3.6E-3	2	7.20E-03	3.85E-15
	9XVN16PG*	1.4E-8	2	2.45E-04	
	IGNITION		.09	9.00E-02	
	REPAIRN		1.03E-3	1.03E-03	
	EPVNTINT		2.35E-5	2.35E-05	
241)	9FC511HW	8.5E-6	3	9.18E-03	2.45E-15
	9XVV20PG*	1.4E-8	1	1.23E-04	
	IGNITION		.09	9.00E-02	
	REPAIRN		1.03E-3	1.03E-03	
	EPVNTINT		2.35E-5	2.35E-05	
242)	9FC511HW	8.5E-6	3	9.18E-03	2.45E-15
	9XVV22PG*	1.4E-8	1	1.23E-04	
	IGNITION		.09	9.00E-02	
	REPAIRN		1.03E-3	1.03E-03	
	EPVNTINT		2.35E-5	2.35E-05	
243)	8FC122TM	3.6E-3	2	7.20E-03	2.31E-15
	8HOUSE04		.60	6.00E-01	
	9XVN22PG*	1.4E-8	2	2.45E-04	
	IGNITION		.09	9.00E-02	
	REPAIRN		1.03E-3	1.03E-03	
	EPVNTINT		2.35E-5	2.35E-05	
244)	8FC122TM	3.6E-3	2	7.20E-03	2.31E-15
	8HOUSE04		.60	6.00E-01	
	9XVN24PG*	1.4E-8	2	2.45E-04	
	IGNITION		.09	9.00E-02	
	REPAIRN		1.03E-3	1.03E-03	
	EPVNTINT		2.35E-5	2.35E-05	
245)	8HOUSE04		.60	6.00E-01	2.31E-15

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
8PRPV2TM	TANK 48 PRESSURE REGULATING VALVE 1205PV2 UNAVAILABLE DUE TO MAINT	3.6E-3	2	7.20E-03	
8XVN24PG*	TANK 48 PATH A DISCHARGE VALVE T48-N24 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	2	2.45E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
246) 8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	2.31E-15
8PRPV2TM	TANK 48 PRESSURE REGULATING VALVE 1205PV2 UNAVAILABLE DUE TO MAINT	3.6E-3	2	7.20E-03	
8XVN22PG*	TANK 48 PATH A INLET MANUAL VALVE T48-N22 FAILS TO REMAIN OPEN (	1.4E-8	2	2.45E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
247) 9AZO22TM	TANK 49 O2 ANALYZER 2 UNAVAILABLE DUE TO MAINTENANCE	1.8E-3	2	3.60E-03	1.92E-15
9XVV10PG*	MANUAL VALVE T49-HV10 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	2	2.45E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
248) 9AZO22TM	TANK 49 O2 ANALYZER 2 UNAVAILABLE DUE TO MAINTENANCE	1.8E-3	2	3.60E-03	1.92E-15
9XVHV3PG*	MANUAL VALVE T49-HV3 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	2	2.45E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
249) 9FC511TM	FLOW CONTROL VALVE 1251PV1 MAINTENANCE	3.6E-3	2	7.20E-03	1.92E-15
9XVV22PG*	MANUAL VALVE T49-HV22 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
250) 9FC511TM	FLOW CONTROL VALVE 1251PV1 MAINTENANCE	3.6E-3	2	7.20E-03	1.92E-15
9XVV20PG*	MANUAL VALVE T49-HV20 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
251) 9FC511TM	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	1.92E-15
NPR245TM	PRESSURE REGULATING VALVE 2045PV MAINTENANCE	3.6E-3	2	7.20E-03	
NXVN26PG*	MANUAL VALVE N26 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
252) 9FC511TM	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	1.92E-15
NPR245TM	PRESSURE REGULATING VALVE 2045PV MAINTENANCE	3.6E-3	2	7.20E-03	
NXV032PG*	MANUAL VALVE N32 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
253) 9FC511TM	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	1.92E-15
NPR245TM	PRESSURE REGULATING VALVE 2045PV MAINTENANCE	3.6E-3	2	7.20E-03	
NXVN24PG*	PATH A INLET VALVE N24 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
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254) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	1.92E-15
NPR245TM	PRESSURE REGULATING VALVE 2045PV MAINTENANCE	3.6E-3	2	7.20E-03	
NXVN46PG*	MANUAL VALVE N46 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
255) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	1.92E-15
NPR245TM	PRESSURE REGULATING VALVE 2045PV MAINTENANCE	3.6E-3	2	7.20E-03	
NXVN20PG*	PATH A OUTLET VALVE N20 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
256) 8FC111HW	FLOW CONTROL VALVE 1211PV1 MECHANICAL FAULT (MODE C)	8.5E-6	3	9.18E-03	1.47E-15
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
8XVV22PG*	MANUAL VALVE T48-HV22 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
257) 8FC111HW	FLOW CONTROL VALVE 1211PV1 MECHANICAL FAULT (MODE C)	8.5E-6	3	9.18E-03	1.47E-15
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
8XVV20PG*	MANUAL VALVE T48-HV20 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
258) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	1.25E-15
NVPVPAHW*	FAILURE OF VAPORIZER A DUE TO HARDWARE FAULTS	4.1E-7	1	3.59E-03	
NXVN15HW	MANUAL VALVE N15 FAILS TO OPEN	1.6E-4	1	1.60E-04	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
259) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	1.25E-15
NVPVPAHW*	FAILURE OF VAPORIZER A DUE TO HARDWARE FAULTS	4.1E-7	1	3.59E-03	
NXVN16HW	MANUAL VALVE N16 FAILS TO OPEN ON DEMAND	1.6E-4	1	1.60E-04	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
260) IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	1.25E-15
NVPVPAHW*	FAILURE OF VAPORIZER A DUE TO HARDWARE FAULTS	4.1E-7	1	3.59E-03	
NXVN47HW	MANUAL VALVE N47 FAILS TO OPEN ON DEMAND	1.6E-4	1	1.60E-04	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
261) 8AZO22TM	TANK 48 O2 ANALYZER 2 UNAVAILABLE DUE TO MAINTENANCE	1.8E-3	*2	3.60E-03	1.15E-15
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
8XVHV3PG*	MANUAL VALVE T48-HV3 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	2	2.45E-04	
IGNITION	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
REPAIRN	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
EPVNTINT	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
262) 8AZO22TM	TANK 48 O2 ANALYZER 2 UNAVAILABLE DUE TO MAINTENANCE	1.8E-3	2	3.60E-03	1.15E-15
8HOUSE04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
8XVV10PG*	MANUAL VALVE T48-HV10 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	2	2.45E-04	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
	IGNITION		.09	9.00E-02	
	REPAIRN		1.03E-3	1.03E-03	
	EPVNTINT		2.35E-5	2.35E-05	
263)	8FC111TM	3.6E-3	2	7.20E-03	1.15E-15
	8HOUSE04		.60	6.00E-01	
	8XVV22PG*	1.4E-8	1	1.23E-04	
	IGNITION		.09	9.00E-02	
	REPAIRN		1.03E-3	1.03E-03	
	EPVNTINT		2.35E-5	2.35E-05	
264)	8FC111TM	3.6E-3	2	7.20E-03	1.15E-15
	8HOUSE04		.60	6.00E-01	
	8XVV20PG*	1.4E-8	1	1.23E-04	
	IGNITION		.09	9.00E-02	
	REPAIRN		1.03E-3	1.03E-03	
	EPVNTINT		2.35E-5	2.35E-05	
265)	9fn511tm	1.8E-3	2	3.60E-03	9.62E-16
	9xvv22pg*	1.4E-8	1	1.23E-04	
	ignition		.09	9.00E-02	
	repairn		1.03E-3	1.03E-03	
	epvntint		2.35E-5	2.35E-05	
266)	9fn511tm	1.8E-3	2	3.60E-03	9.62E-16
	9xvv20pg*	1.4E-8	1	1.23E-04	
	ignition		.09	9.00E-02	
	repairn		1.03E-3	1.03E-03	
	epvntint		2.35E-5	2.35E-05	
267)	ignition		.09	9.00E-02	1.84E-17
	nvpvpbbhw	4.1E-7	7	6.89E-05	
	nxvn26pg*	1.4E-8	1	1.23E-04	
	repairn		1.03E-3	1.03E-03	
	epvntint		2.35E-5	2.35E-05	
268)	ignition		.09	9.00E-02	1.84E-17
	nvpvpbbhw	4.1E-7	7	6.89E-05	
	nxv032pg*	1.4E-8	1	1.23E-04	
	repairn		1.03E-3	1.03E-03	
	epvntint		2.35E-5	2.35E-05	
269)	ignition		.09	9.00E-02	1.84E-17
	nvpvpbbhw	4.1E-7	7	6.89E-05	
	nxvn24pg*	1.4E-8	1	1.23E-04	
	repairn		1.03E-3	1.03E-03	
	epvntint		2.35E-5	2.35E-05	
270)	ignition		.09	9.00E-02	1.84E-17
	nvpvpbbhw	4.1E-7	7	6.89E-05	
	nxvn20pg*	1.4E-8	1	1.23E-04	
	repairn		1.03E-3	1.03E-03	
	epvntint		2.35E-5	2.35E-05	
271)	ignition		.09	9.00E-02	1.84E-17

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
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	nvppvbbhw	4.1E-7	7	6.89E-05	
	nxvn46pg*	1.4E-8	1	1.23E-04	
	repairn		1.03E-3	1.03E-03	
	epvntint		2.35E-5	2.35E-05	
272)	8fcl22tm	3.6E-3	2	7.20E-03	7.69E-16
	8house03		.20	2.00E-01	
	8xvn22pg*	1.4E-8	2	2.45E-04	
	ignition		.09	9.00E-02	
	repairn		1.03E-3	1.03E-03	
	epvntint		2.35E-5	2.35E-05	
273)	8fcl22tm	3.6E-3	2	7.20E-03	7.69E-16
	8house01		.2	2.00E-01	
	8xvn22pg*	1.4E-8	2	2.45E-04	
	ignition		.09	9.00E-02	
	repairn		1.03E-3	1.03E-03	
	epvntint		2.35E-5	2.35E-05	
274)	8fcl22tm	3.6E-3	2	7.20E-03	7.69E-16
	8house03		.20	2.00E-01	
	8xvn24pg*	1.4E-8	2	2.45E-04	
	ignition		.09	9.00E-02	
	repairn		1.03E-3	1.03E-03	
	epvntint		2.35E-5	2.35E-05	
275)	8fcl22tm	3.6E-3	2	7.20E-03	7.69E-16
	8house01		.2	2.00E-01	
	8xvn24pg*	1.4E-8	2	2.45E-04	
	ignition		.09	9.00E-02	
	repairn		1.03E-3	1.03E-03	
	epvntint		2.35E-5	2.35E-05	
276)	8house01		.2	2.00E-01	7.69E-16
	8prpv2tm	3.6E-3	2	7.20E-03	
	8xvn24pg*	1.4E-8	2	2.45E-04	
	ignition		.09	9.00E-02	
	repairn		1.03E-3	1.03E-03	
	epvntint		2.35E-5	2.35E-05	
277)	8house01		.2	2.00E-01	7.69E-16
	8prpv2tm	3.6E-3	2	7.20E-03	
	8xvr22pg*	1.4E-8	2	2.45E-04	
	ignition		.09	9.00E-02	
	repairn		1.03E-3	1.03E-03	
	epvntint		2.35E-5	2.35E-05	
278)	8house03		.20	2.00E-01	7.69E-16
	8prpv2tm	3.6E-3	2	7.20E-03	
	8xvn24pg*	1.4E-8	2	2.45E-04	
	ignition		.09	9.00E-02	
	repairn		1.03E-3	1.03E-03	
	epvntint		2.35E-5	2.35E-05	
	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR				

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
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279) 8house03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	7.69E-16
8prpv2tm	TANK 48 PRESSURE REGULATING VALVE 1205PV2 UNAVAILABLE DUE TO MAINT	3.6E-3	2	7.20E-03	
8xvn22pg*	TANK 48 PATH A INLET MANUAL VALVE T48-N22 FAILS TO REMAIN OPEN (	1.4E-8	2	2.45E-04	
ignition	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
repairn	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
epvntint	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
280) 9fcl21hw*	MECHANICAL FAULT OF TANK 49 FLOW CONTROL VALVE 1251FV	8.5E-6	2	1.49E-01	7.63E-16
9xvn15pg	TANK 49 PATH B DISCHARGE VALVE T49-N15 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	7	2.35E-06	
ignition	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
repairn	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
epvntint	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
281) 9fcl21hw*	MECHANICAL FAULT OF TANK 49 FLOW CONTROL VALVE 1251FV	8.5E-6	2	1.49E-01	7.63E-16
9xvn13pg	MANUAL VALVE T49-N13 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	7	2.35E-06	
ignition	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
repairn	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
epvntint	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
282) 9fcl22hw	MECHANICAL FAULT OF TANK 49 FLOW CONTROL VALVE 1252FV	8.5E-6	7	1.43E-03	7.62E-16
9xvn16pg*	TANK 49 PATH A DISCHARGE VALVE T49-N16 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	2	2.45E-04	
ignition	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
repairn	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
epvntint	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
283) 9fcl22hw	MECHANICAL FAULT OF TANK 49 FLOW CONTROL VALVE 1252FV	8.5E-6	7	1.43E-03	7.62E-16
9xvn19pg*	TANK 49 PATH A INLET VALVE T49-N19 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	2	2.45E-04	
ignition	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
repairn	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
epvntint	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
284) ignition	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	6.35E-16
npr245hw	PRESSURE REGULATING VALVE 2045PV FAILS	2.2E-6	3	2.38E-03	
nxvn20pg*	PATH A OUTLET VALVE N20 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
repairn	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
epvntint	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
285) ignition	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	6.35E-16
npr245hw	PRESSURE REGULATING VALVE 2045PV FAILS	2.2E-6	3	2.38E-03	
nxvn24pg*	PATH A INLET VALVE N24 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
repairn	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
epvntint	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
286) ignition	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	6.35E-16
npr245hw	PRESSURE REGULATING VALVE 2045PV FAILS	2.2E-6	3	2.38E-03	
nxvn26pg*	MANUAL VALVE N26 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
repairn	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
epvntint	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
287) ignition	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	6.35E-16
npr245hw	PRESSURE REGULATING VALVE 2045PV FAILS	2.2E-6	3	2.38E-03	
nxv032pg*	MANUAL VALVE N32 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
repairn	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
epvntint	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
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288) ignition	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	6.35E-16
npr245hw	PRESSURE REGULATING VALVE 2045PV FAILS	2.2E-6	3	2.38E-03	
nxvn46pg*	MANUAL VALVE N46 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
repairn	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
epvntint	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
289) 8fn527tm	TANK 48 EXHAUST FAN Y348-52-7 UNAVAILABLE DUE TO MAINTENANCE	1.8E-3	2	3.60E-03	5.77E-16
8house04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
8xvv22pg*	MANUAL VALVE T48-HV22 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
ignition	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
repairn	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
epvntint	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
290) 8fn527tm	TANK 48 EXHAUST FAN Y348-52-7 UNAVAILABLE DUE TO MAINTENANCE	1.8E-3	2	3.60E-03	5.77E-16
8house04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
8xvv20pg*	MANUAL VALVE T48-HV20 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
ignition	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
repairn	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
epvntint	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
291) 8fclllhw	FLOW CONTROL VALVE 1211PV1 MECHANICAL FAULT (MODE C)	8.5E-6	3	9.18E-03	4.91E-16
8house01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
8xvv22pg*	MANUAL VALVE T48-HV22 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
ignition	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
repairn	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
epvntint	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
292) 8fclllhw	FLOW CONTROL VALVE 1211PV1 MECHANICAL FAULT (MODE C)	8.5E-6	3	9.18E-03	4.91E-16
8house01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
8xvv20pg*	MANUAL VALVE T48-HV20 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
ignition	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
repairn	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
epvntint	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
293) 8fclllhw	FLOW CONTROL VALVE 1211PV1 MECHANICAL FAULT (MODE C)	8.5E-6	3	9.18E-03	4.91E-16
8house03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
8xvv22pg*	MANUAL VALVE T48-HV22 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
ignition	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
repairn	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
epvntint	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
294) 8fclllhw	FLOW CONTROL VALVE 1211PV1 MECHANICAL FAULT (MODE C)	8.5E-6	3	9.18E-03	4.91E-16
8house03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
8xvv20pg*	MANUAL VALVE T48-HV20 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	
ignition	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
repairn	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
epvntint	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
295) 8fcl21hw*	MECHANICAL FAULT OF TANK 48 FLOW CONTROL VALVE 1201FV	8.5E-6	2	1.49E-01	4.58E-16
8house04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
8xv8n5pg	MANUAL VALVE T48-N5 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	7	2.35E-06	
ignition	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
repairn	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
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296) epvntint	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
8fc121hw*	MECHANICAL FAULT OF TANK 48 FLOW CONTROL VALVE 1201FV	8.5E-6	2	1.49E-01	4.58E-16
8house04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
8xv8n8pg	MANUAL VALVE T48-N8 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	7	2.35E-06	
ignition	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
repairn	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
epvntint	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
297) 8fc122hw	MECHANICAL FAULT OF TANK 48 FLOW CONTROL VALVE 1202FV	8.5E-6	7	1.43E-03	4.57E-16
8house04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
8xvn22pg*	TANK 48 PATH A INLET MANUAL VALVE T48-N22 FAILS TO REMAIN OPEN (	1.4E-8	2	2.45E-04	
ignition	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
repairn	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
epvntint	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
298) 8fc122hw	MECHANICAL FAULT OF TANK 48 FLOW CONTROL VALVE 1202FV	8.5E-6	7	1.43E-03	4.57E-16
8house04	CONDITIONAL PROBABILITY OF BEING IN NORMAL PROCESSING MODE (40 C T		.60	6.00E-01	
8xvn24pg*	TANK 48 PATH A DISCHARGE VALVE T48-N24 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	2	2.45E-04	
ignition	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
repairn	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
epvntint	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
299) 8azo22tm	TANK 48 O2 ANALYZER 2 UNAVAILABLE DUE TO MAINTENANCE	1.8E-3	2	3.60E-03	3.85E-16
8house03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
8xvv10pg*	MANUAL VALVE T48-HV10 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	2	2.45E-04	
ignition	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
repairn	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
epvntint	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
300) 8azo22tm	TANK 48 O2 ANALYZER 2 UNAVAILABLE DUE TO MAINTENANCE	1.8E-3	2	3.60E-03	3.85E-16
8house01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
8xvv10pg*	MANUAL VALVE T48-HV10 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	2	2.45E-04	
ignition	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
repairn	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
epvntint	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
301) 8azo22tm	TANK 48 O2 ANALYZER 2 UNAVAILABLE DUE TO MAINTENANCE	1.8E-3	2	3.60E-03	3.85E-16
8house01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
8xvhv3pg*	MANUAL VALVE T48-HV3 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	2	2.45E-04	
ignition	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
repairn	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
epvntint	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
302) 8azo22tm	TANK 48 O2 ANALYZER 2 UNAVAILABLE DUE TO MAINTENANCE	1.8E-3	2	3.60E-03	3.85E-16
8house03	CONDITIONAL PROBABILITY OF BEING IN WASH CYCLE		.20	2.00E-01	
8xvhv3pg*	MANUAL VALVE T48-HV3 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	2	2.45E-04	
ignition	CONDITIONAL PROBABILITY OF HAVING AN IGNITION SOURCE PRESENT		.09	9.00E-02	
repairn	PROBABILITY OF NOT PERFORMING A SIMPLE REPAIR PROCEDURE		1.03E-3	1.03E-03	
epvntint	OPERATOR FAILS TO ALIGN OR START EMERGENCY PURGE VENT EQUIP OR HAR		2.35E-5	2.35E-05	
303) 8fc111tm	FLOW CONTROL VALVE 1211PV1 MAINTENANCE	3.6E-3	2	7.20E-03	3.85E-16
8house01	CONDITIONAL PROBABILITY OF TRANSFERRING SALT SOLUTION (70 C TEMP)		.2	2.00E-01	
8xvv20pg*	MANUAL VALVE T48-HV20 FAILS TO REMAIN OPEN (PLUG)	1.4E-8	1	1.23E-04	

A:IGN-09R.CUT
Filter: 'ALL'

Truncation Limit: 1.00E-15

CUTSET REPORT

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
-----	-----	----	-----	-----	-----
	ignition		.09	9.00E-02	
	repairn		1.03E-3	1.03E-03	
	epvntint		2.35E-5	2.35E-05	
304)	8fc111tm	3.6E-3	2	7.20E-03	3.85E-16
	8house03		.20	2.00E-01	
	8xvv22pg*	1.4E-8	1	1.23E-04	
	ignition		.09	9.00E-02	
	repairn		1.03E-3	1.03E-03	
	epvntint		2.35E-5	2.35E-05	
305)	8fc111tm	3.6E-3	2	7.20E-03	3.85E-16
	8house01		.2	2.00E-01	
	8xvv22pg*	1.4E-8	1	1.23E-04	
	ignition		.09	9.00E-02	
	repairn		1.03E-3	1.03E-03	
	epvntint		2.35E-5	2.35E-05	
306)	8fc111tm	3.6E-3	2	7.20E-03	3.85E-16
	8house03		.20	2.00E-01	
	8xvv20pg*	1.4E-8	1	1.23E-04	
	ignition		.09	9.00E-02	
	repairn		1.03E-3	1.03E-03	
	epvntint		2.35E-5	2.35E-05	
307)	9fc512hw*	8.5E-6	1	7.45E-02	3.82E-16
	9xvv21pg	1.4E-8	7	2.35E-06	
	ignition		.09	9.00E-02	
	repairn		1.03E-3	1.03E-03	
	epvntint		2.35E-5	2.35E-05	
308)	9fn512hw*	8.0E-6	1	7.01E-02	3.59E-16
	9xvv21pg	1.4E-8	7	2.35E-06	
	ignition		.09	9.00E-02	
	repairn		1.03E-3	1.03E-03	
	epvntint		2.35E-5	2.35E-05	
309)	9fn511hw	8.0E-6	7	1.34E-03	3.59E-16
	9xvv22pg*	1.4E-8	1	1.23E-04	
	ignition		.09	9.00E-02	
	repairn		1.03E-3	1.03E-03	
	epvntint		2.35E-5	2.35E-05	
310)	9fn511hw	8.0E-6	7	1.34E-03	3.59E-16
	9xvv20pg*	1.4E-8	1	1.23E-04	
	ignition		.09	9.00E-02	
	repairn		1.03E-3	1.03E-03	
	epvntint		2.35E-5	2.35E-05	

APPENDIX C

FAULT TREES AND CUTSETS FOR EXTERNAL AND RECOVERY EVENTS

- o (EXT100) Failure of Emergency Purge Ventilation Equipment (EPVE) to Start or Run (Page 1)

This fault tree models the failure to start or run of the EPVE. It is used in the event trees for: 1) severe winter storm, 2) seismic, high winds, 3) other (miscellaneous) external events and 4) recovery with internal events.

- o BE File for External Events Fault Trees

This section contains an alphabetical listing of the basic events used in the external event fault trees.

- o TC File for External Events Fault Trees

This section contains an alphabetical listing of the type code identifiers used in the external events fault trees.

- o Cutsets for External Events Fault Tree (EXT100) - No Recoveries Applied

The external events fault tree was quantified and its cutsets are included in this Appendix. Recoveries have not been applied to these cutsets except those recoveries included in the calculation for the common cause events.

TITLE EXTERNAL EVENTS RELATED FAULT TREES	
DRAWING NUMBER Page 1	DATE 7-15-93

TITLE	
EXTERNAL EVENTS RELATED FAULT TREES	
DRAWING NUMBER	DATE
Page 2	7-15-93

TITLE	
EXTERNAL EVENTS RELATED FAULT TREES	
DRAWING NUMBER	DATE
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TITLE
EXTERNAL EVENTS
RELATED FAULT TREES

DRAWING NUMBER

Page 4

DATE

7-15-93

BE FILE FOR EXTERNAL EVENT FAULT TREES

NAME	C	FACTOR	U	DESC	PROB
1 8AZO21HW	3		7	D TANK 48 O2 ANALYZER 1 HARDWARE FAULTS	4.92E-02
2 8AZO22HW	3		7	D TANK 48 O2 ANALYZER 2 HARDWARE FAULTS	4.92E-02
3 8AZO22TM	1		2	N TANK 48 O2 ANALYZER 2 UNAVAILABLE DUE TO MAINTENANCE	3.60E-03
4 8AZO25CM	3		7	D COMMON MODE SENSOR MISCALIBRATION FAILURE FOR O2 ANALYZERS	4.55E-03
5 8CNC0NHW	3		7	D LOCAL FAULTS OF TANK 48 CONDENSER	5.04E-04
6 8DMDEMHW	3		7	D LOCAL FAULTS OF TANK 48 DEMISTER	6.05E-04
7 8FC111HW	3		7	D FLOW CONTROL VALVE 1211PV1 MECHANICAL FAULT	1.43E-03
8 8FC111TM	1		2	N FLOW CONTROL VALVE 1211PV1 MAINTENANCE	7.20E-03
9 8FC112HW	3		7	D FLOW CONTROL VALVE 1211PV2 MECHANICAL FAULT	1.43E-03
10 8FC121HW	3		7	D MECHANICAL FAULT OF TANK 48 FLOW CONTROL VALVE 1201FV	1.43E-03
11 8FC122HW	3		7	D MECHANICAL FAULT OF TANK 48 FLOW CONTROL VALVE 1202FV	1.43E-03
12 8FC122TM	1		2	N TANK 48 FLOW CONTROL VALVE 1202FV UNAVAILABLE DUE TO MAINTENANCE	7.20E-03
13 8FLHP2HW	3		7	D LOCAL FAULT OF HEPA FILTER 2	1.68E-04
14 8FN527HW	3		7	D TANK 48 EXHAUST FAN Y348-52-7 FAILS TO RUN	1.34E-03
15 8FN527ST	1		1	N TANK 48 EXHAUST FAN Y348-52-7 FAILS TO START DUE TO MECHANICAL FAULTS	4.80E-04
16 8FN527TM	1		2	N TANK 48 EXHAUST FAN Y348-52-7 UNAVAILABLE DUE TO MAINTENANCE	3.60E-03
17 8FN528HW	3		7	D TANK 48 EXHAUST FAN Y348-52-8 FAILS DUE TO MECHANICAL FAULTS	1.34E-03
18 8FSEXHWW	3		7	D TANK 48 NITROGEN FLOW SENSOR FOR EXHAUST LINE FAILS	2.00E-02
19 8FSHEPHW	3		7	D FLOW SENSOR ACROSS HEPA FILTERS FAILS	2.00E-02
20 8FSNFAHW	3		7	D TANK 48 NITROGEN FLOW SENSOR FOR LINE A FAILS DUE TO LOCAL FAULTS	2.00E-02
21 8FSNFBHW	3		7	D TANK 48 NITROGEN FLOW SENSOR FOR LINE B FAILS DUE TO LOCAL FAULTS	2.00E-02
22 8HOUSE02			1	NO ACTION TAKEN FOR 48 HOURS	1.00E+00
23 8HITHTRHW	3		7	D LOCAL MECHANICAL FAULTS OF TANK 48 HEATER	3.36E-06
24 8TLFANHWW	3		7	D INTERLOCK FAILURE (FAN EXHAUST FLOW METER) CLOSSES FLOW CONTROL VALVE	7.70E-03
25 8GPC-HS			1	OPERATOR FAILS TO ENTER MODE C - FIELD CONTROL (HIGH STRESS LEVELS)	1.00E+00
26 8GPC-HS			1	OPERATOR FAILS TO ENTER MODE C - FIELD CONTROL (MODERATE STRESS LEVELS)	1.00E+00
27 8OPTRNBF			1	OPERATOR FAILS TO ALIGN AND START TRAIN B FOR OPERATION - EXHAUST SIDE	1.00E+00
28 8PRPV1HW	3		7	D MECHANICAL FAULTS OF TANK 48 PRESSURE REGULATING VALVE 1205PV1	3.70E-04
29 8PPPV2HW	3		7	D MECHANICAL FAULTS OF TANK 48 PRESSURE REGULATING VALVE 1205PV2	3.70E-04
30 8PRPV2TM	1		2	N TANK 48 PRESSURE REGULATING VALVE 1205PV2 UNAVAILABLE DUE TO MAINTENANCE	7.20E-03
31 8PRREGHW	3		7	D TANK 48 FAILURE OF PRESSURE REGULATING VALVE 1217PV	3.70E-04
32 8SFFANHW	3		7	D SENSOR DETECTING FAN OPERATION FOR NORMALLY RUNNING FAN FAILS	3.52E-03
33 8VSVACHW	3		7	D TANK 48 VACUUM SENSOR FAILS AND CLOSSES FAN FLOW CONTROL VALVES	5.88E-04
34 8XV8N2PG	3		7	D TANK 48 VALVE T48-N2 FROM THE NITROGEN SUPPLY FAILS TO REMAIN OPEN (PLUG)	2.35E-06
35 8XV8N5PG	3		7	D TANK 48 PATH B INLET MANUAL VALVE T48-N5 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
36 8XV8N8PG	3		7	D MANUAL VALVE T48-N8 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
37 8XVHV2PG	3		7	D MANUAL VALVE T48-HV2 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
38 8XVHV3PG	3		7	D MANUAL VALVE T48-HV3 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
39 8XVHV4PG	3		7	D MANUAL VALVE T48-HV4 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
40 8XVHV9PG	3		7	D TANK 48 O2 ANALYZER DISCHARGE VALVE T48-HV9 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
41 8XVN22PG	3		7	D TANK 48 PATH A INLET MANUAL VALVE T48-N22 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
42 8XVN24PG	3		7	D TANK 48 PATH A DISCHARGE VALVE T48-N24 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
43 8XVN31PG	3		7	D TANK 48 TANK INLET VALVE T48-N31 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
44 8XVV10PG	3		7	D MANUAL VALVE T48-HV10 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
45 8XVV11PG	3		7	D MANUAL VALVE T48-HV11 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
46 8XVV15PG	3		7	D MANUAL VALVE T48-HV15 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
47 8XVV17PG	3		7	D MANUAL VALVE T48-HV17 FAILS TO REMAIN OPEN (PLUG)	2.35E-06

NAME	C	FACTOR	U	DESC	PROB
48 8XVV19HW	1		1	N MANUAL VALVE T48-HV19 FAILS TO OPEN ON DEMAND	1.60E-04
49 8YVV20PG	3		7	D MANUAL VALVE T48-HV20 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
50 8XVV21PG	3		7	D MANUAL VALVE T48-HV21 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
51 8XVV22PG	3		7	D MANUAL VALVE T48-HV22 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
52 8XVV33PG	3		7	D MANUAL VALVE T48-HV33 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
53 9AZO21HW	3		7	D TANK 49 O2 ANALYZER 1 HARDWARE FAULTS	4.92E-02
54 9AZO22HW	3		7	D TANK 49 O2 ANALYZER 2 HARDWARE FAULTS	4.92E-02
55 9AZO22TH	1		2	N TANK 49 O2 ANALYZER 2 UNAVAILABLE DUE TO MAINTENANCE	3.60E-03
56 9AZO2SCH	3		7	D COMMON MODE SENSOR MISCALIBRATION FAILURE FOR O2 ANALYZERS	4.55E-03
57 9CNCONHW	3		7	D LOCAL FAULTS OF TANK 49 CONDENSER	5.04E-04
58 9DMDEMHW	3		7	D LOCAL FAULTS OF TANK 49 DEMISTER	6.05E-04
59 9FC121HW	3		7	D MECHANICAL FAULT OF TANK 49 FLOW CONTROL VALVE 1251FV	1.43E-03
60 9FC122HW	3		7	D MECHANICAL FAULT OF TANK 49 FLOW CONTROL VALVE 1252FV	1.43E-03
61 9FC122TH	1		2	N TANK 49 FLOW CONTROL VALVE 1252FV UNAVAILABLE DUE TO MAINTENANCE	7.20E-03
62 9FC511HW	3		7	D FLOW CONTROL VALVE 1251PV1 MECHANICAL FAULT	1.43E-03
63 9FC511TH	1		2	N FLOW CONTROL VALVE 1251PV1 MAINTENANCE	7.20E-03
64 9FC512HW	3		7	D FLOW CONTROL VALVE 1251PV2 MECHANICAL FAULT	1.43E-03
65 9FLHP2HW	3		7	D LOCAL FAULT OF TANK 49 HEPA FILTER 2	1.68E-04
66 9FN511HW	3		7	D TANK 49 EXHAUST FAN Y349-52-11 FAILS TO RUN	1.34E-03
67 9FN511ST	1		1	N TANK 49 EXHAUST FAN Y349-52-11 FAILS TO START DUE TO MECHANICAL FAULTS	4.80E-04
68 9FN511TH	1		2	N TANK 49 EXHAUST FAN Y349-52-11 UNAVAILABLE DUE TO MAINTENANCE	3.60E-03
69 9FN512HW	3		7	D TANK 49 EXHAUST FAN Y349-52-12 FAILS DUE TO MECHANICAL FAULTS	1.34E-03
70 9FSEXHHW	3		7	D TANK 49 NITROGEN FLOW SENSOR FOR EXHAUST LINE FAILS	2.00E-02
71 9FSEPHHW	3		7	D FLOW SENSOR ACROSS HEPA FILTERS FAILS	2.00E-02
72 9FSNFANHW	3		7	D TANK 49 NITROGEN FLOW SENSOR FOR LINE A FAILS DUE TO LOCAL FAULTS	2.00E-02
73 9FSNFBHWH	3		7	D TANK 49 NITROGEN FLOW SENSOR FOR LINE B FAILS DUE TO LOCAL FAULTS	2.00E-02
74 9HOUSEO2			1	NO ACTION TAKEN FOR 30 HRS	1.00E+00
75 9HTHTRHW	3		7	D LOCAL MECHANICAL FAULTS OF TANK 49 HEATER	3.36E-06
76 9ILPANHW	3		7	D INTERLOCK FAILURE (FAN EXHAUST FLOW METER) CLOSSES FLOW CONTROL VALVE	7.70E-03
77 9OPC-HS			1	OPERATOR FAILS TO ENTER MODE C - FIELD CONTROL (HIGH STRESS LEVELS)	1.00E+00
78 9OPC-MS			1	OPERATOR FAILS TO ENTER MODE C - FIELD CONTROL (MODERATE STRESS LEVELS)	1.00E+00
79 9GTRN3E			1	OPERATOR FAILS TO ALIGN AND START TRAIN B FOR OPERATION - EXHAUST SIDE	1.00E+00
80 9PRPV1HW	3		7	D MECHANICAL FAULTS OF TANK 49 PRESSURE REGULATING VALVE 1255PV1	3.70E-04
81 9PRPV2HW	3		7	D MECHANICAL FAULTS OF TANK 49 PRESSURE REGULATING VALVE 1255PV2	3.70E-04
82 9PRIV2TH	1		2	N TANK 49 PRESSURE REGULATING VALVE 1255PV2 UNAVAILABLE DUE TO MAINTENANCE	7.20E-03
83 9PRREGHW	3		7	D TANK 49 FAILURE OF PRESSURE REGULATING VALVE 1257PV	3.70E-04
84 9SPFANHW	3		7	D SENSOR DETECTING FAN OPERATION FOR NORMALLY RUNNING FAN FAILS	3.52E-03
85 9VSVACHW	3		7	D TANK 49 VACUUM SENSOR FAILS AND CLOSSES FAN FLOW CONTROL VALVES	5.88E-04
86 9XVHV2PG	3		7	D MANUAL VALVE T49-HV2 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
87 9XVHV3PG	3		7	D MANUAL VALVE T49-HV3 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
88 9XVHV4PG	3		7	D MANUAL VALVE T49-HV4 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
89 9XVHV9PG	3		7	D TANK 49 O2 ANALYZER DISCHARGE VALVE T49-HV11 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
90 9XVN10PG	3		7	D MANUAL VALVE T49-N10 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
91 9XVN13PG	3		7	D MANUAL VALVE T49-N13 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
92 9XVN15PG	3		7	D TANK 49 PATH B DISCHARGE VALVE T49-N15 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
93 9XVN16PG	3		7	D TANK 49 PATH A DISCHARGE VALVE T49-N16 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
94 9XVN19PG	3		7	D TANK 49 PATH A INLET VALVE T49-N19 FAILS TO REMAIN OPEN (PLUG)	2.35E-06

3 of 3

NAME	C	FACTOR	U	DESC	PROB
95 9XVN24PG	3		7	D TANK 49 TANK INLET VALVE T49-N24 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
96 9XVV10PG	3		7	D MANUAL VALVE T49-HV10 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
97 9XVV11PG	3		7	D MANUAL VALVE T49-HV11 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
98 9XVV15PG	3		7	D MANUAL VALVE T49-HV15 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
99 9XVV17PG	3		7	D MANUAL VALVE T49-HV17 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
100 9XVV19HW	1		1	N MANUAL VALVE T49-HV19 FAILS TO OPEN ON DEMAND	1.60E-04
101 9XVV20PG	3		7	D MANUAL VALVE T49-HV20 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
102 9XVV21PG	3		7	D MANUAL VALVE T49-HV21 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
103 9XVV22PG	3		7	D MANUAL VALVE T49-HV22 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
104 9XVV33PG	3		7	D MANUAL VALVE T49-HV33 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
105 EFN1/2SC	1		1	N COMMON MODE FAILURE OF EMERGENCY PURGE VENTILATION SYSTEM FOR A PAIR OF FANS	2.26E-05
106 EFN3/4SC	1		1	N COMMON MODE FAILURE OF EMERGENCY PURGE VENTILATION SYSTEM FOR A PAIR OF FANS	2.26E-05
107 EFNCCN>2		1.13E-5		COMMON CAUSE FAILURE OF EMERGENCY PURGE VENTILATION SYSTEM FOR >2 FANS	1.13E-05
108 EFNSK1RR	3		7	D EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO RUN	1.34E-03
109 EFNSK1SS	1		1	N EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO START	1.00E-02
110 EFNSK2RR	3		7	D EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO RUN	1.34E-03
111 EFNSK2SS	1		1	N EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO START	1.00E-02
112 EFNSK3RR	3		7	D EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO RUN	1.34E-03
113 EFNSK3SS	1		1	N EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO START	1.00E-02
114 EFNSK4RR	3		7	D EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO RUN	1.34E-03
115 EFNSK4SS	1		1	N EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO START	1.00E-02
116 NCPDCSHW	3		7	D LOCAL MECHANICAL FAULTS OF DCS COMPUTER	1.50E-02
117 NCWCHRIHW	3		7	D MECHANICAL FAULTS IN CHROMATED COOLING WATER SYSTEM	4.19E-03
118 NELGRDHW	3		7	D LOSS OF H-AREA POWER	5.75E-03
119 NFSNFSCH	3		7	D BOTH NITROGEN FLOW SENSORS FAIL DUE TO COMMON MODE MISCALIBRATION	8.40E-03
120 NHOUSE01		0.125		CONDITIONAL PROBABILITY OF OUTSIDE TEMPERATURE BEING > 80 F	1.25E-01
121 NHVCOMHW	3		7	D LOSS OF HVAC TO ROOM CONTAINING DCS COMPUTER	2.68E-03
122 NOPC-HS			1	OPERATOR FAILS TO ENTER MODE C - FIELD CONTROL (HIGH STRESS LEVELS)	1.00E+00
123 NOPTRNBS			1	OPERATOR FAILS TO ALIGN TRAIN B FOR OPERATION - SUPPLY SIDE	1.00E+00
124 NFPDIVBK	3		7	D ISOLABLE GUILLOTINE PIPE BREAK	1.68E-07
125 NPPNONBK	3		7	D NON-ISOLABLE GUILLOTINE PIPE BREAK	1.68E-07
126 NFR245HW	3		7	D PRESSURE REGULATOR 2045PV FAILS	3.70E-04
127 NPR245TH	1		2	N PRESSURE REGULATOR 2045PV MAINTENANCE	7.20E-03
128 NPR246HW	3		7	D PRESSURE REGULATOR 2046PV FAILS	3.70E-04
129 NSPFANCH	3		7	D MISCALIBRATION FAILURE OF SENSORS DETECTING FAN OPERATION	8.40E-03
130 NSSSTHHW	3		7	D LOSS OF STEAM SUPPLY TO HEATER	4.92E-02
131 NTKTKAHW	3		7	D NITROGEN STORAGE TANK 1 LEAKS	3.86E-07
132 NVPVPAHW	3		7	D FAILURE OF VAPORIZER A DUE TO HARDWARE FAULTS	6.89E-05
133 NVPVPRHW	3		7	D FAILURE OF VAPORIZER B DUE TO HARDWARE FAULTS	6.89E-05
134 NXV032PG	3		7	D MANUAL VALVE N32 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
135 NXVN12PG	3		7	D VALVE N12 FROM THE NITROGEN SUPPLY FAILS TO REMAIN OPEN (PLUG)	2.35E-06
136 NXVN15HW	1		1	N MANUAL VALVE N15 FAILS TO OPEN	1.60E-04
137 NXVN16HW	1		1	N MANUAL VALVE N16 FAILS TO OPEN ON DEMAND	1.60E-04
138 NXVN18PG	3		7	D PATH B OUTLET VALVE N18 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
139 NXVN20PG	3		7	D PATH A OUTLET VALVE N20 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
140 NXVN22PG	3		7	D PATH B INLET VALVE N22 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
141 NXVN24PG	3		7	D PATH A INLET VALVE N24 FAILS TO REMAIN OPEN (PLUG)	2.35E-06

NAME	C	FACTOR	U	DESC	PROB
142 NXVN25PG	3		7 D	MANUAL VALVE N25 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
143 NXVN26PG	3		7 D	MANUAL VALVE N26 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
144 NXVN33PG	3		7 D	MANUAL VALVE N33 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
145 NXVN46PG	3		7 D	MANUAL VALVE N45 FAILS TO REMAIN OPEN (PLUG)	2.35E-06
146 NXVN47HW	1		1 N	MANUAL VALVE N47 FAILS TO OPEN ON DEMAND	1.60E-04
147 NXVN92PG	3		7 D	MANUAL VALVE N92 FAILS TO REMAIN OPEN (PLUG)	2.35E-06

TC FILE FOR EXTERNAL EVENT FAULT TREES

TYPE	RATE	U	DESC	SOURCE	COMMON
1 AZ CM	2.38E-1	Y	O2 ANALYZER COMMON MODE MISCALIBRATION	Table 4-1, #8	
2 AZ HW	3.0E-4	H	O2 ANALYZER ??? MECHANICAL FAULT	Table 4-1, #1, Pg 10	
3 AZ TM	1.8E-3	N	O2 ANALYZER ??? MAINTENANCE	Calculation	
4 CN HW	3.0E-6	H	CONDENSER ??? MECHANICAL FAULT	Table 4-1, #3	
5 CP HW	9.0E-5	H	DIGITAL CONTROL SYSTEM ??? MECHANICAL FAULT	Table 4-1, #5	
6 CW HW	2.5E-5	H	COOLING WATER MECHANICAL FAULT	Table 4-1, #6	
7 DM HW	3.6E-6	H	DEMISTER ??? FAILS DUE TO PLUGGING	Table 4-1, #10	
8 EL HW	3.43E-5	H	LOSS OF H-AREA POWER	Table 4-1, #7	
9 FC CM	1.0E-4	N	COMMON CAUSE FAILURE OF FLOW CONTROL VALVES TO OPEN	Section 4.1.2	
10 FC HW	8.5E-6	H	FLOW CONTROL VALVE ??? MECHANICAL FAULT	Table 4-1, #1, Pg 35	
11 FC NN	1.0E-3	N	FLOW CONTROL VALVE ??? FAILS TO OPEN	Table 4-1, #2, Pg 38	
12 FC TM	3.6E-3	N	FLOW CONTROL VALVE ??? MAINTENANCE	Calculation	
13 FL HW	1.0E-6	H	HEPA FILTER ??? MECHANICAL FAULT	Table 4-1, #1, Pg 16	
14 FL TM	1.8E-3	N	HEPA FILTER ??? MAINTENANCE	CALCULATION	
15 FN CM	4.8E-5	N	COMMON CAUSE FAILURE OF FANS TO START	Section 4.1.2	
16 FN HW	8.0E-6	H	EXHAUST FAN ??? FAILS TO RUN	Table 4-1, #1, Pg 16	
17 FN RR	8.0E-6	H	EMERGENCY PURGE VENTILATION SYSTEM ??? FAILS TO RUN	Table 4-1, #9	
18 FN SC	2.26E-5	N	COMMON MODE FAILURE OF EMERGENCY PURGE VENTILATION SYSTEM	Table 4-1, #9	
19 FN SS	1.0E-2	N	EMERGENCY PURGE VENTILATION SYSTEM ??? FAILS TO START	Table 4-1, #9	
20 FN ST	4.8E-4	N	EXHAUST FAN ??? FAILS TO START	Table 4-1, #10	
21 FN TM	1.8E-3	N	EXHAUST FAN ??? MAINTENANCE	Calculation	
22 FS CM	4.4E-1	Y	FLOW SENSOR MISCALIBRATION	Table 4-1, #8	
23 FS HW	1.2E-4	H	FLOW SENSOR ??? MECHANICAL FAULT	Table 4-1, #1, Pg 16	
24 HT HW	2.0E-8	H	HEATER ??? MECHANICAL FAULT	Table 4-1, #3	
25 HV HW	1.6E-5	H	HVAC MECHANICAL FAULT	Table 4-1, #4, Cp 85	
26 IL HW	4.6E-5	H	INTERLOCK MECHANICAL FAULT	Table 4-1, #3	
27 PP BK	1.0E-9	H	GUILLOTINE PIPE BREAK	Table 4-1, #1, Pg 21	
28 PR CM	8.1E-4	N	COMMON CAUSE FAILURE OF PRESSURE REGULATING VALVES TO OPEN	Section 4.1.2	
29 PR HW	2.2E-6	H	PRESSURE REGULATING VALVE ??? MECHANICAL FAULT	Table 4-1, #1, Pg 22	
30 PR NN	8.1E-3	N	PRESSURE REGULATING VALVE ??? FAILS TO OPEN	Table 4-1, #10	
31 PR TM	3.6E-3	N	PRESSURE REGULATING VALVE ??? MAINTENANCE	Calculation	
32 SF CM	4.4E-1	Y	FAN SENSOR MISCALIBRATION	Table 4-1, #8	
33 SF HW	2.1E-5	H	FAN SENSOR ??? MECHANICAL FAULT	Table 4-1, #1, Pg 25	
34 ES HW	3.0E-4	H	STEAM SUPPLY MECHANICAL FAULT	Table 4-1, #6	
35 TT HW	2.3E-9	H	NITROGEN STORAGE TANK ??? LEAKS	Table 4-1, #3	
36 VP HW	4.1E-7	H	VAPORIZER ??? FAILS DUE TO PLUGGING	Table 4-1, #2	
37 VS HW	3.5E-6	H	VACUUM SENSOR MECHANICAL FAULT	Table 4-1, #1, Pg 25	
38 XV HW	1.6E-4	N	MANUAL VALVE ??? FAILS TO OPEN ON DEMAND	Table 4-1, #4, Cp 57	
39 XV PG	1.4E-8	H	MANUAL VALVE ??? FAILS TO REMAIN OPEN (PLUG)	Table 4-1, #4, Cp 57	

**CUTSETS FOR EXTERNAL EVENTS FAULT TREE (EXT100) -
NO RECOVERIES APPLIED**

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
1) EXT100					*1.82E-05
1) EFNCCN>2	COMMON CAUSE FAILURE OF EMERGENCY PURGE VENTILATION SYSTEM FOR >2		1.13E-5	1.13E-05	1.13E-05
2) EFNSK1SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO START	1.0E-2	1	1.00E-02	1.00E-06
EFNSK2SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO START	1.0E-2	1	1.00E-02	
EFNSK3SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO START	1.0E-2	1	1.00E-02	
3) EFNSK1SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO START	1.0E-2	1	1.00E-02	1.00E-06
EFNSK2SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO START	1.0E-2	1	1.00E-02	
EFNSK4SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO START	1.0E-2	1	1.00E-02	
4) EFNSK2SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO START	1.0E-2	1	1.00E-02	1.00E-06
EFNSK3SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO START	1.0E-2	1	1.00E-02	
EFNSK4SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO START	1.0E-2	1	1.00E-02	
5) EFNSK1SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO START	1.0E-2	1	1.00E-02	1.00E-06
EFNSK3SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO START	1.0E-2	1	1.00E-02	
EFNSK4SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO START	1.0E-2	1	1.00E-02	
6) EFN3/4SC	COMMON MODE FAILURE OF EMERGENCY PURGE VENTILATION SYSTEM FOR A PA	2.26E-5	1	2.26E-05	2.26E-07
EFNSK2SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO START	1.0E-2	1	1.00E-02	
7) EFN1/2SC	COMMON MODE FAILURE OF EMERGENCY PURGE VENTILATION SYSTEM FOR A PA	2.26E-5	1	2.26E-05	2.26E-07
EFNSK3SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO START	1.0E-2	1	1.00E-02	
8) EFN3/4SC	COMMON MODE FAILURE OF EMERGENCY PURGE VENTILATION SYSTEM FOR A PA	2.26E-5	1	2.26E-05	2.26E-07
EFNSK1SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO START	1.0E-2	1	1.00E-02	
2) EFN1/2SC	COMMON MODE FAILURE OF EMERGENCY PURGE VENTILATION SYSTEM FOR A PA	2.26E-5	1	2.26E-05	2.26E-07
EFNSK4SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO START	1.0E-2	1	1.00E-02	
10) EFNSK1SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO START	1.0E-2	1	1.00E-02	1.34E-07
EFNSK3RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO RUN	8.0E-6	7	1.34E-03	
EFNSK4SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO START	1.0E-2	1	1.00E-02	
11) EFNSK1RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO RUN	8.0E-6	7	1.34E-03	1.34E-07
EFNSK2SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO START	1.0E-2	1	1.00E-02	
EFNSK3SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO START	1.0E-2	1	1.00E-02	
12) EFNSK1SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO START	1.0E-2	1	1.00E-02	1.34E-07
EFNSK2SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO START	1.0E-2	1	1.00E-02	
EFNSK3RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO RUN	8.0E-6	7	1.34E-03	
13) EFNSK2SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO START	1.0E-2	1	1.00E-02	1.34E-07
EFNSK3SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO START	1.0E-2	1	1.00E-02	
EFNSK4RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO RUN	8.0E-6	7	1.34E-03	
14) EFNSK1SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO START	1.0E-2	1	1.00E-02	1.34E-07
EFNSK3SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO START	1.0E-2	1	1.00E-02	
EFNSK4RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO RUN	8.0E-6	7	1.34E-03	
15) EFNSK2RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO RUN	8.0E-6	7	1.34E-03	1.34E-07
EFNSK3SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO START	1.0E-2	1	1.00E-02	
EFNSK4SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO START	1.0E-2	1	1.00E-02	
16) EFNSK2SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO START	1.0E-2	1	1.00E-02	1.34E-07
EFNSK3RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO RUN	8.0E-6	7	1.34E-03	
EFNSK4SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO START	1.0E-2	1	1.00E-02	
17) EFNSK1SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO START	1.0E-2	1	1.00E-02	1.34E-07
EFNSK2SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO START	1.0E-2	1	1.00E-02	
EFNSK4RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO RUN	8.0E-6	7	1.34E-03	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
18) EFNSK1SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO START	1.0E-2	1	1.00E-02	1.34E-07
EFNSK2RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO RUN	8.0E-6	7	1.34E-03	
EFNSK4SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO START	1.0E-2	1	1.00E-02	
19) EFNSK1RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO RUN	8.0E-6	7	1.34E-03	1.34E-07
EFNSK3SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO START	1.0E-2	1	1.00E-02	
EFNSK4SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO START	1.0E-2	1	1.00E-02	
20) EFNSK1SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO START	1.0E-2	1	1.00E-02	1.34E-07
EFNSK2RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO RUN	8.0E-6	7	1.34E-03	
EFNSK3SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO START	1.0E-2	1	1.00E-02	
21) EFNSK1RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO RUN	8.0E-6	7	1.34E-03	1.34E-07
EFNSK2SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO START	1.0E-2	1	1.00E-02	
EFNSK4SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO START	1.0E-2	1	1.00E-02	
22) EFN1/2SC	COMMON MODE FAILURE OF EMERGENCY PURGE VENTILATION SYSTEM FOR A PA	2.26E-5	1	2.26E-05	3.04E-08
EFNSK3RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO RUN	8.0E-6	7	1.34E-03	
23) EFN3/4SC	COMMON MODE FAILURE OF EMERGENCY PURGE VENTILATION SYSTEM FOR A PA	2.26E-5	1	2.26E-05	3.04E-08
EFNSK1RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO RUN	8.0E-6	7	1.34E-03	
24) EFN1/2SC	COMMON MODE FAILURE OF EMERGENCY PURGE VENTILATION SYSTEM FOR A PA	2.26E-5	1	2.26E-05	3.04E-08
EFNSK4RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO RUN	8.0E-6	7	1.34E-03	
25) EFN3/4SC	COMMON MODE FAILURE OF EMERGENCY PURGE VENTILATION SYSTEM FOR A PA	2.26E-5	1	2.26E-05	3.04E-08
EFNSK2RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO RUN	8.0E-6	7	1.34E-03	
26) EFNSK1RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO RUN	8.0E-6	7	1.34E-03	1.80E-08
EFNSK3RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO RUN	8.0E-6	7	1.34E-03	
EFNSK4SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO START	1.0E-2	1	1.00E-02	
27) EFNSK1RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO RUN	8.0E-6	7	1.34E-03	1.80E-08
EFNSK2RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO RUN	8.0E-6	7	1.34E-03	
EFNSK4SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO START	1.0E-2	1	1.00E-02	
28) EFNSK1RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO RUN	8.0E-6	7	1.34E-03	1.80E-08
EFNSK2RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO RUN	8.0E-6	7	1.34E-03	
EFNSK3SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO START	1.0E-2	1	1.00E-02	
29) EFNSK2RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO RUN	8.0E-6	7	1.34E-03	1.80E-08
EFNSK3RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO RUN	8.0E-6	7	1.34E-03	
EFNSK4SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO START	1.0E-2	1	1.00E-02	
30) EFNSK1RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO RUN	8.0E-6	7	1.34E-03	1.80E-08
EFNSK2SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO START	1.0E-2	1	1.00E-02	
EFNSK3RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO RUN	8.0E-6	7	1.34E-03	
31) EFNSK1SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO START	1.0E-2	1	1.00E-02	1.80E-08
EFNSK2RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO RUN	8.0E-6	7	1.34E-03	
EFNSK4RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO RUN	8.0E-6	7	1.34E-03	
32) EFNSK2RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO RUN	8.0E-6	7	1.34E-03	1.80E-08
EFNSK3SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO START	1.0E-2	1	1.00E-02	
EFNSK4RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO RUN	8.0E-6	7	1.34E-03	
33) EFNSK2SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO START	1.0E-2	1	1.00E-02	1.80E-08
EFNSK3RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO RUN	8.0E-6	7	1.34E-03	
EFNSK4RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO RUN	8.0E-6	7	1.34E-03	
34) EFNSK1RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO RUN	8.0E-6	7	1.34E-03	1.80E-08
EFNSK3SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO START	1.0E-2	1	1.00E-02	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
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EFNSK4RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO RUN	8.0E-6	7	1.34E-03	
35) EFNSK1SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO START	1.0E-2	1	1.00E-02	1.80E-08
EFNSK3RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO RUN	8.0E-6	7	1.34E-03	
EFNSK4RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO RUN	8.0E-6	7	1.34E-03	
36) EFNSK1RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO RUN	8.0E-6	7	1.34E-03	1.80E-08
EFNSK2SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO START	1.0E-2	1	1.00E-02	
EFNSK4RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO RUN	8.0E-6	7	1.34E-03	
37) EFNSK1SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO START	1.0E-2	1	1.00E-02	1.80E-08
EFNSK2RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO RUN	8.0E-6	7	1.34E-03	
EFNSK3RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO RUN	8.0E-6	7	1.34E-03	
38) EFNSK1RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO RUN	8.0E-6	7	1.34E-03	2.42E-09
EFNSK2RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO RUN	8.0E-6	7	1.34E-03	
EFNSK3RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO RUN	8.0E-6	7	1.34E-03	
39) EFNSK1RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO RUN	8.0E-6	7	1.34E-03	2.42E-09
EFNSK2RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO RUN	8.0E-6	7	1.34E-03	
EFNSK4RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO RUN	8.0E-6	7	1.34E-03	
40) EFNSK2RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO RUN	8.0E-6	7	1.34E-03	2.42E-09
EFNSK3RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO RUN	8.0E-6	7	1.34E-03	
EFNSK4RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO RUN	8.0E-6	7	1.34E-03	
41) EFNSK1RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO RUN	8.0E-6	7	1.34E-03	2.42E-09
EFNSK3RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO RUN	8.0E-6	7	1.34E-03	
EFNSK4RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO RUN	8.0E-6	7	1.34E-03	
42) EFN1/2SC	COMMON MODE FAILURE OF EMERGENCY PURGE VENTILATION SYSTEM FOR A PA	2.26E-5	1	2.26E-05	5.11E-10
EFN3/4SC	COMMON MODE FAILURE OF EMERGENCY PURGE VENTILATION SYSTEM FOR A PA	2.26E-5	1	2.26E-05	

TC FILE FOR EXTERNAL EVENT FAULT TREES

TYPE	RATE	U	DESC	SOURCE	COMMON
1 AZ CM	2.38E-1	Y	O2 ANALYZER COMMON MODE MISCALIBRATION	Table 4-1, #8	
2 AZ HW	3.0E-4	H	O2 ANALYZER ??? MECHANICAL FAULT	Table 4-1, #1, Pg 10	
3 AZ TM	1.8E-3	N	O2 ANALYZER ??? MAINTENANCE	Calculation	
4 CN HW	3.0E-6	H	CONDENSER ??? MECHANICAL FAULT	Table 4-1, #3	
5 CP HW	9.0E-5	H	DIGITAL CONTROL SYSTEM ??? MECHANICAL FAULT	Table 4-1, #5	
6 CW HW	2.5E-5	H	COOLING WATER MECHANICAL FAULT	Table 4-1, #6	
7 DM HW	3.6E-6	H	DEMISTER ??? FAILS DUE TO PLUGGING	Table 4-1, #10	
8 EL HW	3.43E-5	H	LOSS OF H-AREA POWER	Table 4-1, #7	
9 FC CM	1.0E-4	N	COMMON CAUSE FAILURE OF FLOW CONTROL VALVES TO OPEN	Section 4.1.2	
10 FC HW	8.5E-6	H	FLOW CONTROL VALVE ??? MECHANICAL FAULT	Table 4-1, #1, Pg 35	
11 FC NN	1.0E-3	N	FLOW CONTROL VALVE ??? FAILS TO OPEN	Table 4-1, #2, Pg 38	
12 FC TM	3.6E-3	N	FLOW CONTROL VALVE ??? MAINTENANCE	Calculation	
13 FL HW	1.0E-6	H	HEPA FILTER ??? MECHANICAL FAULT	Table 4-1, #1, Pg 16	
14 FL TM	1.8E-3	N	HEPA FILTER ??? MAINTENANCE	CALCULATION	
15 FN CM	4.8E-5	N	COMMON CAUSE FAILURE OF FANS TO START	Section 4.1.2	
16 FN HW	8.0E-6	H	EXHAUST FAN ??? FAILS TO RUN	Table 4-1, #1, Pg 16	
17 FN RR	8.0E-6	H	EMERGENCY PURGE VENTILATION SYSTEM ??? FAILS TO RUN	Table 4-1, #9	
18 FN SC	2.26E-5	N	COMMON MODE FAILURE OF EMERGENCY PURGE VENTILATION SYSTEM	Table 4-1, #9	
19 FN SS	1.0E-2	N	EMERGENCY PURGE VENTILATION SYSTEM ??? FAILS TO START	Table 4-1, #9	
20 FN ST	4.8E-4	N	EXHAUST FAN ??? FAILS TO START	Table 4-1, #10	
21 FN TM	1.8E-3	N	EXHAUST FAN ??? MAINTENANCE	Calculation	
22 FS CM	4.4E-1	Y	FLOW SENSOR MISCALIBRATION	Table 4-1, #8	
23 FS HW	1.2E-4	H	FLOW SENSOR ??? MECHANICAL FAULT	Table 4-1, #1, Pg 16	
24 HT HW	2.0E-8	H	HEATER ??? MECHANICAL FAULT	Table 4-1, #3	
25 HV HW	1.6E-5	H	HVAC MECHANICAL FAULT	Table 4-1, #4, Cp 85	
26 IL HW	4.6E-5	H	INTERLOCK MECHANICAL FAULT	Table 4-1, #3	
27 PP BK	1.0E-9	H	GUILLOTINE PIPE BREAK	Table 4-1, #1, Pg 21	
28 PR CM	8.1E-4	N	COMMON CAUSE FAILURE OF PRESSURE REGULATING VALVES TO OPEN	Section 4.1.2	
29 PR HW	2.2E-6	H	PRESSURE REGULATING VALVE ??? MECHANICAL FAULT	Table 4-1, #1, Pg 22	
30 PR NN	8.1E-3	N	PRESSURE REGULATING VALVE ??? FAILS TO OPEN	Table 4-1, #10	
31 PR TM	3.6E-3	N	PRESSURE REGULATING VALVE ??? MAINTENANCE	Calculation	
32 SF CM	4.4E-1	Y	FAN SENSOR MISCALIBRATION	Table 4-1, #8	
33 SF HW	2.1E-5	H	FAN SENSOR ??? MECHANICAL FAULT	Table 4-1, #1, Pg 25	
34 SS HW	3.0E-4	H	STEAM SUPPLY MECHANICAL FAULT	Table 4-1, #6	
35 TT HW	2.3E-9	H	NITROGEN STORAGE TANK ??? LEAKS	Table 4-1, #3	
36 VP HW	4.1E-7	H	VAPORIZER ??? FAILS DUE TO PLUGGING	Table 4-1, #2	
37 VS HW	3.5E-6	H	VACUUM SENSOR MECHANICAL FAULT	Table 4-1, #1, Pg 25	
38 XV HW	1.6E-4	N	MANUAL VALVE ??? FAILS TO OPEN ON DEMAND	Table 4-1, #4, Cp 57	
39 XV PG	1.4E-8	H	MANUAL VALVE ??? FAILS TO REMAIN OPEN (PLUG)	Table 4-1, #4, Cp 57	

**CUTSETS FOR EXTERNAL EVENTS FAULT TREE (EXT100) -
NO RECOVERIES APPLIED**

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
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1) EXT100					*1.82E-05
1) EFNCCN>2	COMMON CAUSE FAILURE OF EMERGENCY PURGE VENTILATION SYSTEM FOR >2		1.13E-5	1.13E-05	1.13E-05
2) EFNSK1SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO START	1.0E-2	1	1.00E-02	1.00E-06
EFNSK2SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO START	1.0E-2	1	1.00E-02	
EFNSK3SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO START	1.0E-2	1	1.00E-02	
3) EFNSK1SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO START	1.0E-2	1	1.00E-02	1.00E-06
EFNSK2SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO START	1.0E-2	1	1.00E-02	
EFNSK4SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO START	1.0E-2	1	1.00E-02	
4) EFNSK2SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO START	1.0E-2	1	1.00E-02	1.00E-06
EFNSK3SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO START	1.0E-2	1	1.00E-02	
EFNSK4SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO START	1.0E-2	1	1.00E-02	
5) EFNSK1SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO START	1.0E-2	1	1.00E-02	1.00E-06
EFNSK3SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO START	1.0E-2	1	1.00E-02	
EFNSK4SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO START	1.0E-2	1	1.00E-02	
6) EFN3/4SC	COMMON MODE FAILURE OF EMERGENCY PURGE VENTILATION SYSTEM FOR A PA	2.26E-5	1	2.26E-05	2.26E-07
EFNSK2SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO START	1.0E-2	1	1.00E-02	
7) EFN1/2SC	COMMON MODE FAILURE OF EMERGENCY PURGE VENTILATION SYSTEM FOR A PA	2.26E-5	1	2.26E-05	2.26E-07
EFNSK3SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO START	1.0E-2	1	1.00E-02	
8) EFN3/4SC	COMMON MODE FAILURE OF EMERGENCY PURGE VENTILATION SYSTEM FOR A PA	2.26E-5	1	2.26E-05	2.26E-07
EFNSK1SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO START	1.0E-2	1	1.00E-02	
2) EFN1/2SC	COMMON MODE FAILURE OF EMERGENCY PURGE VENTILATION SYSTEM FOR A PA	2.26E-5	1	2.26E-05	2.26E-07
EFNSK4SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO START	1.0E-2	1	1.00E-02	
10) EFNSK1SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO START	1.0E-2	1	1.00E-02	1.34E-07
EFNSK3RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO RUN	8.0E-6	7	1.34E-03	
EFNSK4SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO START	1.0E-2	1	1.00E-02	
11) EFNSK1RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO RUN	8.0E-6	7	1.34E-03	1.34E-07
EFNSK2SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO START	1.0E-2	1	1.00E-02	
EFNSK3SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO START	1.0E-2	1	1.00E-02	
12) EFNSK1SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO START	1.0E-2	1	1.00E-02	1.34E-07
EFNSK2SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO START	1.0E-2	1	1.00E-02	
EFNSK3RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO RUN	8.0E-6	7	1.34E-03	
13) EFNSK2SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO START	1.0E-2	1	1.00E-02	1.34E-07
EFNSK3SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO START	1.0E-2	1	1.00E-02	
EFNSK4RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO RUN	8.0E-6	7	1.34E-03	
14) EFNSK1SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO START	1.0E-2	1	1.00E-02	1.34E-07
EFNSK3SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO START	1.0E-2	1	1.00E-02	
EFNSK4RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO RUN	8.0E-6	7	1.34E-03	
15) EFNSK2RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO RUN	8.0E-6	7	1.34E-03	1.34E-07
EFNSK3SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO START	1.0E-2	1	1.00E-02	
EFNSK4SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO START	1.0E-2	1	1.00E-02	
16) EFNSK2SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO START	1.0E-2	1	1.00E-02	1.34E-07
EFNSK3RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO RUN	8.0E-6	7	1.34E-03	
EFNSK4SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO START	1.0E-2	1	1.00E-02	
17) EFNSK1SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO START	1.0E-2	1	1.00E-02	1.34E-07
EFNSK2SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO START	1.0E-2	1	1.00E-02	
EFNSK4RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO RUN	8.0E-6	7	1.34E-03	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
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18) EFNSK1SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO START	1.0E-2	1	1.00E-02	1.34E-07
EFNSK2RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO RUN	8.0E-6	7	1.34E-03	
EFNSK4SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO START	1.0E-2	1	1.00E-02	
19) EFNSK1RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO RUN	8.0E-6	7	1.34E-03	1.34E-07
EFNSK3SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO START	1.0E-2	1	1.00E-02	
EFNSK4SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO START	1.0E-2	1	1.00E-02	
20) EFNSK1SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO START	1.0E-2	1	1.00E-02	1.34E-07
EFNSK2RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO RUN	8.0E-6	7	1.34E-03	
EFNSK3SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO START	1.0E-2	1	1.00E-02	
21) EFNSK1RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO RUN	8.0E-6	7	1.34E-03	1.34E-07
EFNSK2SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO START	1.0E-2	1	1.00E-02	
EFNSK4SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO START	1.0E-2	1	1.00E-02	
22) EFN1/2SC	COMMON MODE FAILURE OF EMERGENCY PURGE VENTILATION SYSTEM FOR A PA	2.26E-5	1	2.26E-05	3.04E-08
EFNSK3RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO RUN	8.0E-6	7	1.34E-03	
23) EFN3/4SC	COMMON MODE FAILURE OF EMERGENCY PURGE VENTILATION SYSTEM FOR A PA	2.26E-5	1	2.26E-05	3.04E-08
EFNSK1RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO RUN	8.0E-6	7	1.34E-03	
24) EFN1/2SC	COMMON MODE FAILURE OF EMERGENCY PURGE VENTILATION SYSTEM FOR A PA	2.26E-5	1	2.26E-05	3.04E-08
EFNSK4RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO RUN	8.0E-6	7	1.34E-03	
25) EFN3/4SC	COMMON MODE FAILURE OF EMERGENCY PURGE VENTILATION SYSTEM FOR A PA	2.26E-5	1	2.26E-05	3.04E-08
EFNSK2RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO RUN	8.0E-6	7	1.34E-03	
26) EFNSK1RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO RUN	8.0E-6	7	1.34E-03	1.80E-08
EFNSK3RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO RUN	8.0E-6	7	1.34E-03	
EFNSK4SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO START	1.0E-2	1	1.00E-02	
27) EFNSK1RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO RUN	8.0E-6	7	1.34E-03	1.80E-08
EFNSK2RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO RUN	8.0E-6	7	1.34E-03	
EFNSK4SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO START	1.0E-2	1	1.00E-02	
28) EFNSK1RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO RUN	8.0E-6	7	1.34E-03	1.80E-08
EFNSK2RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO RUN	8.0E-6	7	1.34E-03	
EFNSK3SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO START	1.0E-2	1	1.00E-02	
29) EFNSK2RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO RUN	8.0E-6	7	1.34E-03	1.80E-08
EFNSK3RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO RUN	8.0E-6	7	1.34E-03	
EFNSK4SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO START	1.0E-2	1	1.00E-02	
30) EFNSK1RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO RUN	8.0E-6	7	1.34E-03	1.80E-08
EFNSK2SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO START	1.0E-2	1	1.00E-02	
EFNSK3RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO RUN	8.0E-6	7	1.34E-03	
31) EFNSK1SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO START	1.0E-2	1	1.00E-02	1.80E-08
EFNSK2RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO RUN	8.0E-6	7	1.34E-03	
EFNSK4RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO RUN	8.0E-6	7	1.34E-03	
32) EFNSK2RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO RUN	8.0E-6	7	1.34E-03	1.80E-08
EFNSK3SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO START	1.0E-2	1	1.00E-02	
EFNSK4RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO RUN	8.0E-6	7	1.34E-03	
33) EFNSK2SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO START	1.0E-2	1	1.00E-02	1.80E-08
EFNSK3RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO RUN	8.0E-6	7	1.34E-03	
EFNSK4RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO RUN	8.0E-6	7	1.34E-03	
34) EFNSK1RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO RUN	8.0E-6	7	1.34E-03	1.80E-08
EFNSK3SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO START	1.0E-2	1	1.00E-02	

1. CUTSETTEXT1.CUT
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NODE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
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EFNSK4RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO RUN	8.0E-6	7	1.34E-03	
35) EFNSK1SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO START	1.0E-2	1	1.00E-02	1.80E-08
EFNSK3RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO RUN	8.0E-6	7	1.34E-03	
EFNSK4RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO RUN	8.0E-6	7	1.34E-03	
36) EFNSK1RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO RUN	8.0E-6	7	1.34E-03	1.80E-08
EFNSK2SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO START	1.0E-2	1	1.00E-02	
EFNSK4RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO RUN	8.0E-6	7	1.34E-03	
37) EFNSK1SS	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO START	1.0E-2	1	1.00E-02	1.80E-08
EFNSK2RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO RUN	8.0E-6	7	1.34E-03	
EFNSK3RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO RUN	8.0E-6	7	1.34E-03	
38) EFNSK1RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO RUN	8.0E-6	7	1.34E-03	2.42E-09
EFNSK2RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO RUN	8.0E-6	7	1.34E-03	
EFNSK3RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO RUN	8.0E-6	7	1.34E-03	
39) EFNSK1RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO RUN	8.0E-6	7	1.34E-03	2.42E-09
EFNSK2RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO RUN	8.0E-6	7	1.34E-03	
EFNSK4RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO RUN	8.0E-6	7	1.34E-03	
40) EFNSK2RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 2 FAILS TO RUN	8.0E-6	7	1.34E-03	2.42E-09
EFNSK3RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO RUN	8.0E-6	7	1.34E-03	
EFNSK4RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO RUN	8.0E-6	7	1.34E-03	
41) EFNSK1RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 1 FAILS TO RUN	8.0E-6	7	1.34E-03	2.42E-09
EFNSK3RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 3 FAILS TO RUN	8.0E-6	7	1.34E-03	
EFNSK4RR	EMERGENCY PURGE VENTILATION SYSTEM FAN 4 FAILS TO RUN	8.0E-6	7	1.34E-03	
42) EFN1/2SC	COMMON MODE FAILURE OF EMERGENCY PURGE VENTILATION SYSTEM FOR A PA	2.26E-5	1	2.26E-05	5.11E-10
EFN3/4SC	COMMON MODE FAILURE OF EMERGENCY PURGE VENTILATION SYSTEM FOR A PA	2.26E-5	1	2.26E-05	

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